1987 CASUALTY LOSS

TRANSCRIPT

RESERVE SEMINAR

The following pages include the transcript and/or handout materials from the panel sessions and addresses presented at the 1987 Casualty Loss Reserve Seminar.

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Special thanks are extended to the moderators, panelists and recorders of these sessions for the invaluable time and effort that they contributed to the editing and prepartion of this volume.

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1987 CASUALTY LOSS RESERVE SEMINAR

1B/6A - COMMON PITFALLS IN RESERVE ANALYSIS

Moderator: Richard Sherman, Partner
Coopers & Lybrand

Panelist: Roberta J. Pflum, Assistant Actuary
Fireman's Fund Insurance Company

Recorder: Terrence M. O'Brien, Sr. Consultant
Coopers & Lybrand

RICHARD SHERMAN: I'm Rick Sherman, I'll be moderating this panel and I've also been asked to be a panelist. I'm left with the modestly uncomfortable exercise of introducing myself, and will proceed to do so. This session is Common Reserve Pitfalls, and the session has generated a great deal of interest in the past and the current seminar because I think there is a lot of concern out there that you want to make sure that you're doing the right things in performing a reserve analysis. There are a lot of things out there that make a lot of intuitive sense that ultimately are going to produce results that aren't appropriate.

I received a Bachelors and Masters degree in Mathematics from the University of California. The first five years of my career I spend with Milliman & Robertson as a consultant in their Pasadena office, and became a fellow of the Casualty Actuarial Society at the end of that time. In the last year there, I co-authored a paper there with Jim Barquist, "Loss Reserve Adequacy Testing", which is in the proceedings of the Casualty Actuarial Society. That paper won the Dorweiller Prize that year, and has since become known as one of several primers on the subject which is relatively widely read especially by those who have to labor through the exams because it is on the syllabus. After serving there I worked for Fireman's Fund Insurance Company for three years, where I served as a commercial lines actuary. At the time that I left there to go to Coopers & Lybrand, my boss told me that I wouldn't have much opportunity to use management skills in consulting because I wouldn't be managing many people. And I thought he was right to some extent but I didn't realize that he would be that far off. Today I manage a staff of 35 people in the Los Angeles, Newport Beach, San Francisco and Seattle offices of the Western Region for Coopers & Lybrand and am located in the San Francisco office. Probably best known now for serving as a regular columnist in Business Insurance, some people refer to me as the "Dear Abby" of the profession for writing that column. This is probably the sixth or seventh Casualty Loss Reserve Seminar that I have had the pleasure of speaking at and it seems like the interest in the topic of pitfalls is one that has grown steadily during that time, although I haven't always spoken on that topic. In the course of my 12 year career in consulting, I've been involved in reserve adequacy studies for 17 of the 60 largest property/casualty companies in the country. And I say that not so much to brag, if you will, but to simply say that I've had a lot of experience in loss reserves because I'm afraid in the course of giving this presentation I'm going to be stepping on a few toes. And perhaps, suggesting that some of the things that a few of you out in the audience might be doing may not be correct.

I'd like to entitle my talk for today "The Hazards of Intuitively Appealing Ideas". After all, that's how we always get into trouble it seems: taking something that makes a lot of sense initially and running with it. I'd like to give you an idea of how far off you can get with that kind of approach. I would submit to you that based solely on personal experience--personal experience only, not what you've read in textbooks or seen in photographs or whatever -- it would be very reasonable for you to conclude that the earth is flat. After all, as far as the eye can see it appears that way even when you get up in a plane - it appears to be flat. As a matter of fact, it is a rather good assumption on a local basis. The curvature of the earth is only 1 foot per mile, that's an error of only .002%. I think that's close enough for government work. However, if I start with that intuitively appealing idea and I were to use it as the hypothesis from which to base a trip straight out from here 4,000 miles horizontally, and I expect to still have my feet on the ground, I would find myself 16,056 miles above the surface of the earth. I guess what this illustrates is that sometimes assumptions that make a lot of sense on a local basis end up not making a great deal of sense, and are in fact, quite wrong when they are applied to a global situation. I think that has a lot of analogies to a number of the things that we are going to be covering in this session. What I'm also trying to suggest here is that there are different perspectives in the reserving process, and there are different professionals that are involved in that process, and that we need to look to the different professionals in that area and recognize the strengths and weaknesses each of them have. If I may, I'd like to draw an analogy between the land surveyor as the claims adjuster and the geophysicist or astronaut as the actuary in this regard. You don't go to the land surveyor and ask him to provide for you a detailed map of North America; you'd rather look to the guy whose been out in space and who has the broader view of things to give you the sense of what North America looks like. On the other hand, you don't go to the astronaut and ask him to provide you with a lot of close details on a relatively basic piece of ground. That's obviously something that is a lot better performed by the land surveyor. I think the analogy here changes in a sense because we're moving from variables. In one sense the variable in my analogy is space, if you will, and the analogy between the claims adjuster and the actuary applies more on a time basis than on a space basis.

[SLIDE]

Let's take a global view of the claims process and see some of the things that it indicates and talk about range of intuitive ideas that we can come up with. What we have here is a track record over 10 years of time on a fixed group of claims. This is workers' compensation experience and we're looking at accident year 1975. That is all of these claims arose from incidents that occurred in 1975. Not all of them were reported in 1975, a few of them were reported later than that. What we have in the top row is a summarization of all of the transactions that occurred with regard to claims in the calendar year 1975. We have $5,504,000 in paid losses. We closed 16,568 claims at an average of $332 per claim. The second row provides us with a summarization of the transactions that occurred in calendar year 1976. Now the 4th, 5th, and 6th columns provide us with a cumulative summarization of payments to date for that period and all the prior periods going back to the beginning of the accident year. There are several things that can happen that I want to illustrate. No. 1, suppose you took this viewpoint -- you are at the end of 1976 in this process and you say -- well, we have closed almost 35,000 claims for this accident year -- 92% of the claims that will ultimately be closed for this accident year. That means only 8% of the claims remain, and it would seem intuitively reasonable that you ought to be able to use some of the information that you've gotten from closing that 92% of all of your claims to draw some conclusions about what the remaining 8% of the claims are going to be like. Let's suppose that you did that by saying well -- if you look in Column 6 we can see that on those 35,000 claims, we were able to close them at an average of $525 per claim. Why not conclude that that average ought to also apply to the remaining outstanding claims? I've seen that method applied where we take the average paid and multiply it by the number of outstanding claims. We then conclude that the reserves are nice and strong. Let's look at the last three columns, and this is a different way of configuring the data we have here -- hindsight indications. To develop these, we go all the way out to the most recent point in time that we have (10 years out); we know what we've paid over the 10 years plus, there is a relatively small reserve. The hindsight reserve is what we know today in terms of total payments plus the remaining reserve at the end of 10 years, less the payments that had occurred from that particular point in time. For example, in year one, the reserve that should have been set up at that point in time is $30,718,000. It's not necessarily what was set up but it is what we know today should have been set up at that point in time. We also know how many open and IBNR claims there are basically, and we have the average hindsight reserve, and that's the reserve amount that should have been set up on average for those claims. Let's go out from row 2 and look at that hindsight reserve at the end of the second year. The average there is $6,124.00. What we know in this particular case, and this is a very typical example, is that the average reserve at that point is 12 times the average paid amount on the claims that have been closed in the first 24 months. What I'm trying to say here is that it is very, very hazardous to try to draw conclusions about the nature of open claims based on the nature of what you have already closed.

I want to give you a listing of some intuitively appealing ideas that I want to shoot down during this session. The first, as I mentioned, is that the population of open claims has got to be quite similar to the population of recently closed claims plus some provision for inflation. I think this particular example shows how untrue that is, that often the average outstanding reserve is much, much larger than your average paid. A second intuitively appealing idea is that if only a small percentage of claims remains open for a given accident year, then the reserve must be relatively small compared to what has been paid. In this particular case if you're out at the end of 2 years of development, 8% of the claims are unsettled. However, if you do a little math with this chart, what you see is that the reserve should be almost $21 million at that point and you have paid out $18.3 million. What I am saying is that those remaining 8% o all claims account for 50% of the dollars. It's easy to say in your own mind well there are only a few claims left, so therefore there aren't that many dollars left out there. You can get into some problems based on that assumption. I think this live and typical example illustrates that problem. I'll state it again, and I've seen other methods based on this hypothesis, that if something is small in terms of the number of claims, then it must be small in terms of total dollars. You can get into a lot of problems associated with that assumption. Another very common assumption that has a number of problems with it is that if you usually close a claim for less than the case reserve then your total reserves must be fat. I've heard this I don't know how many times. I'm not saying that it's not true, it's just that it is very tough to draw conclusions about the condition of total reserves based upon savings on closure. We'll get into that more in the next example.

Another problem area is the notion that if you take a cross section of what has occurred recently in terms of the ratio of what you're paying on allocated loss adjusted expense compared to what you're paying on losses that you can apply that same relationship to the loss reserve to get the allocated loss adjustment expense reserve. Here again, that relationship really does not hold.

Another problem area is that there is a common feeling that if you want to get a handle on what your total reserve should be, the best person to talk to is the claims auditor. I think there are a lot of things that a claims auditor can do for you that are tremendously valuable but that's really not the question that the claims auditor is best equipped to answer. He's really best equipped to answer the question -- what would a highly seasoned professional claims man properly reserve on these files given the state of information in those files currently, and what can be reasonably anticipated based upon what is known in the files?

That's what you want to know and I think it is a very important thing to know, but it is a ways away from the answer of whether your total reserves are adequate.

A sixth problem is the notion that if you've only got 4 years of loss development information to analyze that beyond 4 years of development, nothing more is going to occur. If you don't have enough experience, then things aren't going to continue to move after that period of time.

A final one is that you only really need to apply one loss reserve technique to come up with the right answer, and you might but it is hazardous.

This is a hypothetical example that I constructed using some common characteristics of claim development patterns that I want to use to illustrate some points. Again, I emphasize that it is hypothetical but the real life situation is so complex that it is sometimes difficult to see some of these things without a simple example to look at first. This is accident year 1978 and we're looking at what has happened over successive periods as these claims are closed. In 1979, $4,000 was paid to close claims and the final reserve on the claims that were closed was $11,000. That resulted in savings of $7,000 or a percentage savings of 64%. I have exaggerated this example a little bit to just illustrate a point. It's usually not quite this extreme. In 1980 we paid out $2,000; the final reserve was $12,000; the savings were $10,000; the percentage savings was 83%. For the 5 years involved here, if we look at the total statistics, we find that the savings on closure of claims was 27%. The question is, given that information what can you conclude about the overall condition of the reserve? My response would be that you really can't conclude anything. And yet I think there is a strong tendency that I have seen in various parts of the industry to say that that gives us some assurance that the reserves are fat. Let's look at the bottom part of the page where we provide a spread sheet tracking of the status of each of these 10 claims at successive year ends. The top row represents Claim No. 1, which started out with a reserve of $5,000 and it was closed during 1980; and the asterisk there shows you that it closed at $2,000, so its incurred status remains at $2,000 for successive year ends. So on and so forth for several of the claims that you have there. In this particular example, 8 of the 10 claims settled for less than the initial reserve -- 9 settled for less than the final reserve. That is, 80% of the claims developed downward or favorably, and 20% developed upward. Again, it sounds like you ought to be able to conclude from that that the reserves are strong. Let's take a look at another indicator which I would recommend be given some attention and that is the bottom line, which appears at the bottom of this chart. That's the total incurred for this group of 10 claims. What we see there is that the total incurred amount is rather creeping upward over time. This is not at all an atypical situation. One way to improve the analysis in terms of the savings in closure is to compare the payment with the initial reserve. That helps the situation a fair amount in terms of giving you a less misleading situation. By the way, I don't want to imply here that there aren't some good uses that these savings on closure numbers can give to the claims department in terms of monitoring overall activity. However, it should be used for the purpose for which it was derived and that is to monitor overall activity and to note changes in the general activity rather than to try and draw a conclusion on where things are going forward.

Let's look at Claim No. 9. As it started out we didn't know much about it so we set up a basic reserve of $5,000. A year later as the facts emerged on the case it was looking rather serious according to the nature of the injury so we raised it to $25,000, although it still looked like the claimant wasn't going to pursue the thing much. Then in the subsequent year a law firm was brought in and the reserve was raised to $50,000. In 1982, they replaced the law firm and brought in F. Lee Bailey, the reserve went up to $100,000, and they finally settled it for $115,000. What am I trying to suggest by this example? Some common characteristics. Most claims settle for less than the reserve in terms of absolute numbers. That's the most typical situation-- you're going to be able to settle it for less than the reserve. Again here, if you start with this hypothesis that what happens in terms of numbers of claims can lead you to the conclusion about what's going to happen on the total dollars, you can end up with some problems. Another pattern here is that it is the relatively small proportion of claims that ends up driving the bottom line. You've got a few claims that get out of hand and settle for a whole lot more than anybody would ever have hoped for -- except the claimant. It ends up being those claims that have a bigger influence on the bottom line than a lot of the small claims that you manage to settle for less than you reserve them for. It's this process of claims development that needs to be understood in order to start applying some techniques analytically to come to conclusions about the conditions of reserves.

Let's go to the next slide. The example I put up before is so simple that it tends to lose some credibility, so let's go to a more typical situation here. We start with a given accident year and at the end of the accident year we've got 150 open claims. You see that in the left hand margin. This is not in your handout. This one appeared in the latest issue of Business Insurance. If you want a copy, I think it appeared in the

September issue. Of the 150 claims that are open we've got 135 of them with an initial reserve of $1,000, 12 with a reserve of $10,000 and 3 with a reserve of $100,000. This is a fairly typical situation. The total case reserves are $555,000, and you've paid out $245,000 in this first year. If we then take each of these blocks of claims and we track them through to conclusion what we typically see is a pattern like this: if you start with that top block of 135, we see that of that group, 3 of them settled adversely -- went from $1,000 to actually settle at $10,000, 65 of them settled for right around the reserve and 67 of them you were able to settle for nothing. So you ended up with some savings on that large group of fast closing claims-- the 135 that were reserved for $1,000. On the 12 that were reserved for $10,000, we've tracked them through and one of them developed adversely and settled for $100,000; six of them for around the reserve; and five of them you settled for nothing. I guess this is really more like a liability example where you do have a fair number of them that you can manage to close out for nothing if you're just looking at the indemnity side of things. Finally, you've got three claims reserved at $100,000. As it turns out of those one of them finally settled for $300,000. Another one for $100,000, and one for nothing. What happens here is that you end up having favorable development on over half of your claims, and almost all of the rest of them settling for near the reserve. And yet, that total case reserve of $555,000 ended up settling for $100,000 more than they were originally reserved for. You have the situation where most of the time you end up settling for less and yet the bottom line still goes up.

A number of these problems with regard to the closed claim method have formed the basis in the past for the IRS closed claim method, which fortunately was revised about a year and a half ago. Previous to that time, it bore many of the characteristics of a marvelously incorrect method. It produced great results in terms of maximizing taxes and minimizing reserves because you would always conclude that things are redundant. The fact is that the claims that are easy close quickly, and you get the redundancy on that and the tough ones are hanging out there. The way the sample is taken by just looking at closed claims, you end up with the conclusion that things are fat when they often aren't. The method has been improved considerably now, but they are still using the same hypothesis. They've improved it considerably by greatly lengthening the time period involved from 4 or 5 years to 8 years and even 15 to 20 years in some cases, although there are still a number of problems in applying the IRS method. It assumes that there have been no changes in reserving practices over a 20 year period of time and that's a tough one to swallow, and it's particularly difficult to apply if you've got a newer company. Another major weakness of it is that if you are a workers' compensation company, you aren't going to settle for at least 20 years. Those are the life pension cases and those are left out of that sample of closed claims that you're dealing with. In the examples that we had looked at originally, if you would have applied the closed claim method you would have said that the reserves were 80% redundant and would have concluded that they needed to be taken down substantially when in fact we know from this example that they should have been raised substantially.

[SLIDE]

I want to talk about two other related problem areas. This is in your handout entitled "Using Calendar Year Ratios to Estimate the Allocated Loss Adjustment Expense Reserves." We have here an example which has been greatly simplified in order to illustrate the problem of the method itself. This is the Boring Insurance Company: there's no growth, there is no change, there is no inflation. Year after year, we have a situation where you pay out $1 million in the accident year; $2 million the year after the accident year; $500,000 the third year; and $300,000 the fourth. In this particular example, it's very easy to figure out what the reserve is, you draw your stair-step diagonal line and you sum up the numbers below the diagonal, and that gives you a required loss reserve of $3.9 million, and everything is easy to work with. In the middle of the page we have paid allocated loss expenses. What is realistic about this example, and this is also drawn from compensation, is the percentages that appear in the middle of that page. In other words, on the quick closing claims that close in that first year, allocated paid is about 1.5% of losses; for those that close the year after it is about 3.5%; for those that close in the third year it is about 7%, and then it rises to about 10%. It is again symptomatic of the idea that the tough ones hang out there, and you've got a lot more lawyers' fees to deal with on the ones that are still lying around after 3 or 4 years are included. Applying the paid-to-paid allocated method, what we would do in this case is sum up the losses just above the stair-step, and in this case it is $3,800,000, and then sum up the paid allocated just above the stair-step in the middle there, and that's about $150,000 of paid allocated. That gives you a ratio just a little under 4% for your allocated payments to loss payments. The technique that has been applied by a number of companies, and it's getting less and less common but is still used, is to take that calendar year ratio and apply it to the loss reserve to get the allocated loss adjustment expense reserve. In this case if we did that, we take 4% of the 3,900,000, and we end up with the $154,000 as the allocated loss adjustment expense reserve. However, in this case it's easy to figure out what the reserves should have been. All we do is add up the numbers below the stair-step in the middle of the page and we get a required reserve of $230,000, so the allocated reserve derived by this technique turns out to be 49% deficient. Why are we getting this, what is the problem? I often hear it described that the problem with this method is that inflation and growth that cause the method to produce an incorrect situation. Here is an example where there is no inflation and no growth and we still have a significant misstatement of the reserve. I think we can illustrate now what the problem is. First of all, what we've done is we've drawn a biased sample, if you will, from paid results in trying to draw an inference about the remaining claims, which as I say is a common characteristic of a lot of incorrect approaches. What we've done is we've taken a sample of claims which were somewhat evenly drawn from the situations where the ratio of paid allocated to paid losses was either 1.5%, 3.5%, or 7%. However, if we look at the characteristics of the reserve, what we ought to be doing is totally ignoring those fast settling claims where the ratio is 1.5%. That portion ought to be totally thrown out. The 3.5% ought to be counted once; the 7% ought to be counted twice; and the 10% counted three times. What's going on is that the reserve contains a much heavier amount of claims where that 10% ratio applies than the 1.5%, which doesn't occur at all in the reserves. You've got a situation where the actual relationship for the reserve is going to be a weighted average with a lot of weight being thrown further out in the triangle to those claims where the ratio of allocated to the loss is a lot higher than it is otherwise. If you think back to the initial example that we have of workers' compensation claims, what we saw is that the claims closed during first year average around $350; those in the second year average around $700; and from the third year on the average fluctuated between $6,000 and $8,000. There are techniques that can be applied where you're looking at the average amount you have paid. And again, what you're doing is you're drawing a sample from here, here, and here, to try and draw conclusions about what is down here. What's important to understand is the $350 average claim in the reserve point. You only have a representation of one $700 claim, and you've got this very, very heavy representation here of those claims that average $7,000 in terms of the reserve. There's a lot of risk in any conclusions at all from any sort of closed claim information to get some conclusions about the nature of the reserves.

Let's go on to another common situation. Let's go through a little exercise here. No, we don't need the slide yet. We've only got four years of loss experience and we're doing a reserve analysis and we have to select a tail factor to take the experience from 4 years of development to an ultimate basis. We have nothing for our own company for which to base that. Let's just go through this exercise here. Here are the historical factors. First, let's just take general liability. The incurred development factor going from one year of development to two years of development is 1.84; from 2 years to 3 years it is 1.28, then we have 1.19. The question is, what factor are you going to select to get you from 4 years of development to 15 years of development? What I've done in this example, by the way, is based on the average of 5 companies where I actually have 15 years of development experience. I've gone back and stopped at the point where there were only 4 years of development and said okay -- what can I do to try to predict what's going to happen in the next 11 years, based on what's happened in the first four years? What do you want to select here from 4 years of development to 15? I guess there is one method which simply says you just take the last factor and stick it in there -- that gives you 1.19. Does anybody else want to guess what you might put in there? This is a typical subline ... what about workers' compensation? You've got this type of pattern or see that the factors are declining fairly rapidly as we head outward over time. Why don't you pick a number in your own mind? Now let's go to the excess workers' compensation. Notice here that the factor is a bit larger for the first year, and there's even a difference as it widens for the first year and then it widens for the second year. What are we going to pick now to get us from 4 years to 15 years? Just pick a number in your own mind. We're looking at 1.69. What about to get from 15 years of development to 25 years? You've got to apply 1.3, and God only knows where it is after 25 years. What about excess malpractice? This is the current information -- horrendous factors. What would you pick here to go from 4 years to 15? 3.58. That implies that after 4 years of development, only about 23% of our losses have been reported. Now we've got to get from 15 years to 25 years. What do we use in this case? I guess what I'm trying to illustrate here is that it is a rather difficult process to select tail factors.

[SLIDE]

What you have in Exhibits 4 and 5 are actual factors from historical experience, and a curve-fitting technique which tries to extrapolate what the tails should be. If you're in a situation where you only have 3 or 4 years worth of experience, I think what you ought to be doing is looking for some external model of a company or an industry situation that you feel is as analogous to your own situation as possible. To the extent that you can't find that, then you've got to take that outside information and modify it according to the extent to which your situation differs from that of the outside experience in trying to select tail factors. Another approach to use is to take that outside experience and to make a comparison on a historical basis for the information that you do have, note whether your development has been higher or lower and make some assumptions about what the tail factor ought to be proportionally.

I think you're more likely to end up with an appropriate result if you apply this type of technique then if you just simply make a guess as to what it's going to be.

Recapping some principles here because I want to give Roberta some unrushed time to go through her portion of the presentation, and then I'll come back and finish up after she is through.

Some principles here: First, the small easy ones settle quickly, the tough large ones settle slowly. You have to keep that in mind. You can't conclude what open claims are like by looking only at closed claims, and especially only the quickly closing ones. If you're going to use the paid method, let's use paid loss development where you've got a long track record of history to help you out. Second, most claims tend to settle for less than the reserve. These tend to be the smaller claims that settle quickly. And adverse development on a few big claims tends to more than offset the favorable development on the small ones. If you combine those two ideas together you end up with the conclusion that if you just look at savings on closure you end up fooling yourself a bit in terms of the condition of reserve. Another principle: any sample of closed claims over any period of time contains a much larger proportion of smaller, fast settling claims than claims similar to those with outstanding reserves. We're talking two different buckets of claims when we're talking open claims versus closed claims. That concludes part one of my discussion, and now I'll have Roberta proceed with her presentation.

I'd like to introduce Roberta Pflum. She received her Bachelors degree from Fordham University in 1973, and then served for the Insurance Services Office from 1973 to 1983 in the commercial and personal lines pricing departments. Since 1983, she has been with the Fireman's Fund Insurance Company and has done some work in the personal lines pricing area, for the last three years she has been responsible for the reserving function at Fireman's Fund. I'd like to welcome Roberta Pflum.

ROBERTA PFLUM: I'd like to begin by saying that I see the number one pitfall in reserve analysis not necessarily being technique oriented or methodology oriented, but it is what I would call "putting on the rose colored glasses". There are a lot of things changing in most companies. A lot of people telling me that everything is getting better. Case reserves are better because the claims adjusters are handling them better. Underwriting is better, we're only writing the good class of business, we've gotten rid of all the bad classes. We're paying faster, better, we're getting tougher on cases. There are a lot of things that could lead you to believe that when you do incurred or paid projections you may be overstating those projections. But I think that sometimes you have to put on the gray glasses and try and dig deeper and try and really find out what's going on in the company. The most important thing is to know your underwriting; know your claims department; know what kind of business you're writing and how it's changed. What you were writing several years ago versus what you're writing today. Every actuary would love a nice stable company that has a stable book of business over the past 15 years, hasn't shifted markets, hasn't shifted geographical location, has stable management. Unfortunately, I don't think there are too many companies or actuaries that have that luxury. What we're faced with is constantly trying to delve into what's happening today versus what's happened in the past.

One of the number one pitfalls I see is using Schedule P for reserve analysis. Schedule P lines are composed of auto liability, workers' compensation, malpractice, and a combination of homeowners', farm owners', and CMP. What are the problems with using Schedule P lines to set your reserves? Again, if you have a very stable book of business, for example, for auto liability, if you haven't shifted very much from personal to commercial or vice versa, it may not be too bad. Even though each individual piece may have different tail characteristics. If over time the proportion of each component is pretty stable, you're okay. What happens though if you significantly shift into commercial lines? You're going to have a longer tail, historical tail factors are going to be nowhere adequate and you may be faced with a severe reserve problem. It could happen the other way around, if you significantly go after personal line.

GL is much worse. You've got a conglomeration of service and retail type of establishments -- slip and fall, very quick closing, generally not very severe claims. Then you've also got products liability. You may be writing drug or chemical companies. You can have a tremendous mix within that one line. Again, the tail factors on this line can be so inappropriate for the current book of business you're writing. What's the point? The point is to know what your current book of business is. If in the past you wrote small types of insureds, low exposure, and now you're going into the Fortune 500 companies, and you're going heavily into manufacturing, you better look at those tail factors. You're also going to look at the social and legal environment which pertains to the whole industry, not necessarily just to your own book of business.

Compensation is fairly homogeneous as a line but varies greatly depending on the states you're writing in. Different states have very different benefit levels. Again, if you shift drastically from one type of benefit level state to other types of states, your development factors can change dramatically. Some states have escalating benefits and some don't.

The last line I would like to talk about and what is absolutely the worst to throw together for purposes of reserving is the CMP -- commercial multi-peril line. Here you're talking about property and liability. Mixing property and liability for reserving is like oil and water -- it just doesn't mix. In fact, years ago when the SMP policies were first promulgated by ISO they restricted eligibility. There were only certain types of risks that were normally written in the package, and the larger, more complex risks were written in monoline. I don't think that's the case anymore, I think most companies now will write almost anything in a package that they would write monoline. Therefore, I think you have a real change in the kind of insureds you have in the package policy. If you're looking at a 10 year or 15 year history, I think you've got a real change in the mix of property versus liability. A real change in the type of insureds and therefore the tail factors. The point is, for a package policy, even if the premium is indivisible, you should separate property versus liability losses for reserving. Your development patterns, your payout patterns, your tail factors are drastically different for these pieces. To assume that the proportions of property and liability are going to stay constant over time is a very, very dangerous assumption.

Some other line problems -- what are some other problems with Schedule P? You're taking a Schedule P and trying to square the triangle. You've got loss portfolio transfers -- very often loss portfolio transfers are treated as a paid loss. You may buy or sell a company and assume reserves from a company you buy and put them up on your books immediately. Or you may sell a company and get rid of reserves. This is going to look like development where actually all it is changes in your exposure and volume. You have to be really careful about looking at your Schedule P. There are an awful lot of distortions that come mainly from the accounting side of the house and not necessarily from the emergence of claims. You want to keep your reserve data clean of any of these accounting transactions -- any of these loss portfolio transactions.

A couple of other things that can cause data distortions are problems in your data. New business versus renewal -- if you're writing a lot of new business, what kind of new business are you writing. Basically what you're assuming is it the same as the old business -- that you're just expanding in the kind of market that you've always had. That's fine, but often new business may be generated from new sources and you have to find out how fast am I growing -- where am I growing? -- what's the quality of the business that I'm putting on the books? Again, the point is to know what your underwriters and marketing people are doing. What kind of business are you facing.

A few other things that can distort your paid or incurred triangles. Changing retentions. If you are currently retaining more, because of reinsurance pricing, for example. Obviously, if you're retaining more you need to have a much different tail factor. Policy limits --if you're writing much higher limits. For example, if you are going after affluent markets in personal lines and you're trying to push $300,000 and $500,000 in personal auto versus basic limits, you'll need a much longer development tail. If you are concentrating on fault or no-faults state -- if you have any of these shifts going on where you have different laws in different states, this can again affect your development triangle. That's what I call target markets.

Another problem can be with excess versus primary coverage. If you look at most companies, especially for Schedule P purposes, you have excess and primary coverage in your general liability line, for example, all lumped together. You have dramatically different tail factors, depending on if you're writing primary versus excess. If, for example, you start writing a lot of umbrella policies, you're going to see that tail lengthen quite a bit. Growth -- again if you're growing very rapidly you have to know in what areas you're growing and whether the quality of the business is similar to what you would have expected based on past experience. You may be picking up totally new kinds of exposure that you never had.

Allocated loss expense sometimes is the poor sister of reserve analysis. It's just not given the attention -- some one picks a factor to a reserve or factor to an incurred loss -- that's the allocated loss expense reserve. As legal expenses have grown and the litigious awareness has grown, allocated loss expense is becoming a very substantial part of a company's loss and loss expense reserve. It probably deserves a bit more attention than it's been getting in general. It's a very highly leveraged reserve. Most companies do not establish case reserves for allocated loss expense. Most companies just have their payment history and whatever IBNR is established. They do not have case basis reserve. What you're dealing with for the most current accident year is a very, very, small proportion emerged and a huge IBNR reserve. How do most companies develop an IBNR reserve. A factor to loss is a very common way. You try and project by line of insurance for every dollar of loss you pay what do you need to pay in loss expense. For a line like auto liability it may be 10 cents on the dollar. For every dollar of loss you ultimately pay out you'll need 10 cents for allocated loss expense. For a line like general liability it may be 30 or 35%, where legal expenses as large. Again, for the most current accident years you have very little information to work with. This goes back to the issue of the types of claims that settle very quickly versus the long-term claims. The information you have in the first couple of years is on those small claims. Those small claims don't have much legal expense. That's not where you're spending the money defending the claims. Where the legal expenses come in and where your heavy ALE comes in is in the claims that hang around a long time. You have a tremendously disproportionate amount of ALE in those very few claims that stay open for a long time. Many companies are looking to in-house counsel as a way to control their legal expenses. Instead of going outside and being at the mercy of attorneys and billing hours, they've established their own law firms. It is expected to cut down eventually on legal expenses. However, it can really distort your projections, if all of a sudden you make a major shift in the way you handle the case. Going from outside attorneys of $150 per hour to inside attorneys that may cost you $60 or $70 an hour, that can be a major shift. You have to know how you're handling your claims. You have to know what the impact on your development triangle will be. In that particular situation, if you do have a major shift to in-house counsel, you have to determine how you are going to charge yourself for it. Is it going to be unallocated loss expense or allocated loss expense. It can be charged just as any other salary or any other claims department expense, or it can be literally billed back to yourself. You can literally charge yourself as if it were an outside firm. You would need to know that. An example, if you suddenly made a shift to in-house counsel, your payments probably just would fall off tremendously, and you'd have to know what to expect the impact of that to be.

That comes back to billing patterns and processing problems. If you make a change in the way you process claims, the way you process legal expenses, and the way you bill. Companies have often shifted from end of case billing to interim billing, back to end of case billing. For example, your administration or your attorneys may be decided that they are going to bill every six months instead of every three months, or they may wait until the end of the case to bill you. You can see that when you're dealing only with payments, any changes in merely getting the checks out the door is going to impact your payout patterns, and you have to take that into consideration. For example, if you decide to go to end of case billing, you'll see all of a sudden an absence of payments. It's not that you're not incurring the costs, it's just that you're delaying them and they're going to come in on the next calendar year. So when you look at calendar year payments you can have some real distortions just because of processing changes.

Processing changes, of course, are not only an issue with loss expense, they are an issue with claims too. How long does it take you to get claims into the system? How quick is your processing office? Have you made changes in your processing environment that would allow you to get claims into the system slower, faster or whatever. Are you backlogged? Do you have an onslaught of claims? Are you growing rapidly and do you have a large increase in the numbers of claims and you haven't hired the additional staff to do it.

That brings us to staffing in the claims department. We've been dwelling so far on really knowing what's going on in your underwriting areas, but knowing what's going on in your claims department is one of the most crucial things you need in reserving. Your claims department staffing, your workload, have tremendous impact on the kind of data you're looking at. You should want to know what the volume of cases per adjuster -- is it growing? Is it shrinking? What kinds of adjusters are you using to handle the cases? Are you making changes in the assignment of cases to adjusters? For example, are you using senior adjusters for the most difficult cases. Are you requiring that cases over a certain amount must go to the home office and be reviewed by a specialist. Is it the other way around -- are you decentralizing? Are you allowing the branches or regional offices to handle more claims or higher limits than they were previously allowed to do? All of these kinds of things have tremendous impact on the level of case reserves that are set and the payout pattern. For example, if you're growing rapidly and you have a large increase in claims and you don't staff up to meet it. What's going to happen? You're going to have a slowdown in processing and payout, which is not going to get the checks out the door as quickly as you did. You're not going to investigate them as quickly as you use to, and you're not going to get the case reserves up as quickly or as well as you used to. You can do all sorts of projections, you can take your paid data and project them out. But all of a sudden maybe those payments have slowed down. You can take incurred losses and develop those out based on historical development factors, and those aren't going to be adequate either because you haven't paid attention to your individual cases and gotten the case reserves up to snuff. You can have two methods -- you look at your payments, your case incurred, and your project amount and they all look okay, but what you haven't dealt with is that they all look okay because you haven't adjusted for some substantial changes in the way in which you're handling claims. The point is to get underneath the data and find out what's going on -- the rate at which you're settling claims -- the rate at which you're paying them out, and the types of claims you had.

One last item on this list is structured settlements. I don't know if it is a big issue right now but a couple of years ago there was a big push to use structured settlements as a way to cut down the present value of what a company paid out ultimately for a particular claim. What happened is some of these very large claims instead of being dragged out over a period of several years, settlement was reached fairly early in the claim life. What happened was you had these large payments fairly early after the accident was reported -- it looked like a tremendous blip in the payout pattern. That's the schedule of Schedule P problem where you merely complete the paid triangle.

What are some things to look at? What are a couple of methods and what are some of the things to look at, so we can try and avoid some of these situations? You should look at historical loss ratios by accident year. Look at your pricing and make some inflation assumptions. Many companies will take that loss ratio and multiply it by the premium, subtract out the reported losses and call it the IBNR. If you stubbornly stick to that loss ratio at some point your reported losses can be greater than your expected losses, and some companies will actually set up negative IBNR. However, another way of getting to an expected loss ratio that is a real problem is just taking 100 and minus the expense ratio -- not allowing for any kind of discounting or not recognizing that rates may be discounted. However, it can be a really good method if you get underneath it and really try to figure out what the expected loss ratio should be. For example, pricing monitoring, over the past few years we've had tremendous shifts in pricing compared to historical average. If you take the average of a couple of loss ratios, that could be totally misleading. If you can start within a historical period of loss ratios, that are fairly well developed, and do a pretty good job of monitoring your pricing, and use realistic claim cost trend assumptions, you can do a pretty good job of projecting what you think the loss ratio should be. Given a fairly stable book of business, given that you have a good handle on where your pricing is, that could be a check on your other reserving methods -- on your incurred triangle methods, and on your paid projections.

Some other things you want to look at are severity trends in both payments in case reserves. You're always trying to monitor case reserve adequacy. You're always trying to get a handle on the case reserves now, compared to where they were in the past. Are we setting them up better, quicker, or are they declining in adequacy. You want to look at trends by accident year by equal stage of development, so you're comparing apples to apples. You want to look at what are the paid trends versus what are the trends in case reserves. And if your payments by accident year, for example, on your cases closed within one year, if those trends are marching up at 10-12%, which is what you'd expect based on inflation, then you'd better make sure that your outstanding reserves are marching up about that same rate, and if they're not you'd want to find out why. You'd have to have some pretty substantial changes in your book and the way you handle your claim to account for those trends to not be in sync. Again, the idea of reasonableness checks -- you can do all the projections and all the sophisticated math in the world, but you've got to have some reasonableness checks. You've got to look at loss ratio trends. For example, if you're projecting improving loss ratio trends in 1983 and 1984, you'd really want to question what your methods were telling you. You're coming up with severity trends at 2 or 3% on liability, unless you can really quantify that you've got some big changes going on, you'd want to question what's going on. Again, loss ratio trends and severity trends are probably two of the best bottom line checks you can have on both your own projections and also comparing them to the industry. Again, in most lines you can't deviate tremendously from the industry either in trends or loss ratios, without some real clear reasons. The bottom line is, it's got to all hang together in terms of being a reasonable projection. Those are the points that I wanted to reach.

RICHARD SHERMAN: I believe we ran out of copies of my handout. How many of you out there have not been able to get a copy of it? The only thing that I could do at this point is to suggest that since we're out of them that if you could leave me your business card I could mail one to you.

I want to deal with a couple of additional things here. One is with regard to how you handle large losses in your analysis. I think there is a tendency to pull out large losses and to say they are exceptional and they're not going to happen again. You've got to be careful about that because even though large losses are infrequent, they do occur and continue to occur with some frequency, and you've got to be careful how you treat those. I would suggest that in the area of large losses that you develop a spreadsheet analysis on the largest claims that you have. It's like Exhibit 2 in your handout, where you take each claim and take a look at what the reserve was, what the status was. It may have started out looking a little innocent, and then have a status code for litigation or whatever. If you can do that, do that spreadsheet analysis and look at your big claims, you may see some patterns that you can use to try and postulate where those reserves on those big claims are going to go. I also think it's very valuable to have a claims audit done in relation to those large claims. In fact, I guess what I suggest is to do a combination of both -- the spreadsheet tracking and a claims audit. If you have both of those pieces of information available whoever is doing an actuarial projection is going to have a much better basis on knowing where to go with those large claims, particularly if they're going to pull them out of your basic information. You then have to put them back in again, and too often you may just assume that there is going to be no change in those reserves. That may or may not be appropriate depending upon conditions in your company, and also how much you know about those claims.

I'd like to go on and tell a very quick tale. It's the tale of two loss reserve specialists. The first loss reserve specialist's name is M. Penn Dingdoom, and he forms an analysis for a company which has $100 million in loss reserves and $20 million in surplus. Mr. Dingdoom walks into the office of the president and tells him that the reserves should be $144 million instead of $100 million, and that he's in the tank by almost $20 million. The president, after recovering says well I've also hired Mr. Moore Caw Shush, and Mr. Shush did a pay loss projection that indicated that the reserve should be $65 million rather than $100 million, and our reserves are $35 million redundant. I'm telling this tale to make a couple of points. No. 1, I think it's important to apply a multiplicity of methods, and try to do some reconciliation as to why there are differences. Second, even if the different methods you apply give you the same answer, it may happen to be that all of those methods are equally wrong. You've got to be careful about that too.

In this particular case of Mr. Dingdoom and Mr. Shush in their analysis. What Mr. Dingdoom should have done is to ask some questions that would have provided some answers relative to the underlying assumptions of the incurred loss development method. Have there been consistent practices in the setting of cases reserves? Has there been a constant adequacy level of the case reserves? In the case of this particular company, the validity of the adequacy assumption was very, very poor. There was a very major increase in the adequacy of the reserves in the historical period that was analyzed, and as a result it greatly distorted the incurred projections and caused them to shoot too high. On the paid side, Mr. Shush should have found out what was going on in the claim department. If he had, he would have found out that there really wasn't the constant rate of closing claims, that there was a rapid slowdown in the rate of settling claims. A couple of questions you may ask, how could Mr. Dingdoom and Mr. Shush have found these things out? Number one, the interview process is very helpful but I think you need to do more than the interview process. You need to try and find some statistics--some hard solid numbers that are going to tend to verify or deny the existence of that because after all, everybody really believes that things are better now than they used to be. You've got to treat that with at least a small bit of skepticism.

One thing to look at in terms of the question of case reserve adequacy is the development triangle where you're looking at the average case reserve over time. In this particular case, what you see is that as you cross that stair-step line which represents what occurred during 1979, there were dramatic increases in the average case reserves. That's the sort of statistic that you can look at to give you some sort of idea, that is assuming that you've got good claim statistics which make the averages meaningful, which you may not. But if you do it may be very helpful in verifying or denying that and it can also serve as a basis for trying to take some of the distortions out of the incurred projection. For example, in this case you could have gone back and significantly increased the reserves above the diagonal line and restated the history of the incurred and reapplied the method and you would have gotten a much lower set of numbers.

On the paid side, one thing that I'd suggest looking at is the claims disposed ratio -- the ratio of claims closed to claims reported over different periods of development. What we see in this case is there has been a continual processing slowdown in the settlement of claims. In 1976 at the end of the first year, 42% of the claims were closed. Now 5 years later only 31% of them are closed. You might have a situation where you were out at 6 years of development and you were applying a paid method, and during the periods on which you were basing your estimate, virtually everything was closed whereas currently there's a fairly significant percentage of unclosed claims. That can cause the paid method to significantly understate the projection. Also use the statistics to try to serve as a base for making an adjustment to the method. One way of doing that is to take some of the prior periods of time that you have and note the relationship between the claims disposed ratio and paid losses to date as a percentage of ultimate losses.

I think we've got a few minutes for questions, so I think I'll stop my presentation at this point. Roberta if you want to come up here so together we can field some questions. No questions? Thank you very much.

1987 CASUALTY LOSS RESERVE SEMINAR

1B/6A COMMON PITFALLS IN RESERVE ANALYSIS

by

Richard E. Sherman

Workers' Compensation
Accident Year 1975

Year of Development	(1) Paid Losses (000's)	(2) Claims Closed	(3) Average Paid Loss	(4) Cumulative Paid Loss (000's)	(5) Cumulative Claims Closed	(6) Cumulative Average Paid Loss	(7) Hindsight Outstanding Reserve (000's)	(8) Number of Open & IBNR Claims	(9) Average Hindsight Reserve
1	$5,504	16,568	$332	$5,504	16,568	$332	$30,718	21,330	$1,440
2	12,874	18,416	699	18,378	34,984	525	17,844	2,914	6,124
3	6,938	1,393	4,981	25,316	36,377	696	10,906	1,521	7,170
4	4,155	504	8,244	29,471	36,881	799	6,751	1,017	6,638
5	2,171	286	7,591	31,642	37,167	851	4,580	731	6,265
6	1,270	184	6,902	32,912	37,351	881	3,310	547	6,051
7	818	128	6,391	33,730	37,479	900	2,492	419	5,947
8	453	85	5,329	34,183	37,564	910	2,039	334	6,105
9	345	135	2,556	34,528	37,699	916	1,694	199	8,513
10	312	53	5,887	34,840	37,752	923	1,382	146	9,466

EXHIBIT 1

DECEPTIVE CLAIMS STATISTICS

Year	Paid on Closure	Final Reserve	Savings	Percentage Savings
1979	4	11	7	64%
1980	2	12	10	83
1981	2	15	13	87
1982	50	100	50	50
1983	135	125	(10)	(8)
Total	193	263	70	27%

Claim Number	Incurred Losses (000's) As of 12/78	12/79	12/80	12/81	12/82	12/83
1	5	5	2*	2	2	2
2	5	2*	2	2	2	2
3	5	5	5	2*	2	2
4	5	2*	2	2	2	2
5	10	10	10	0*	0	0
6	1	0*	0	0	0	0
7	10	10	0*	0	0	0
8	25	35'	50	100	50*	50
9	5	25	50	50	100	115*
10	—	—	—	—	25	20*
Total	71	94	121	158	183	193

*Year of Closure

CASUALTY ACTUARIAL SOCIETY

C. K. Khury
[illegible]

23 Main Street
Holmdel, NJ 07733
(201) [illegible]-5400

December 4, 1984

Mr. M. S. Hughey
President
American Academy of Actuaries
1835 K Street, N.W.
Washington, D.C. 20006

Dear Stan:

At its November 11 meeting, the CAS Board of Directors adopted the following resolution:

> The CAS Board of Directors endorses the statement of the Committee on Reserves (on the IRS closed claim method) and approves its publication in the next edition of Proceedings (1984) as a Statement of Opinion of the CAS Board of Directors and of the Committee on Reserves.

Attached is a copy of the subject report.

I was directed by the Board to pass this information along to the AAA for use in connection with Academy public interface activities. No preference for a particular course of action (by the AAA) was expressed by the CAS Board.

After you have had an opportunity to discuss this matter with the AAA Executive Committee, I'd appreciate it if you would let me know how you propose to proceed. In the meantime if you wish to discuss, please call.

Thanks.

Sincerely,

Stan

C. K. Khury
President

cc: √S. G. Kellison
CAS Board of Directors
CAS Executive Council

Casualty Actuarial Society

Committee on Reserves

Position Paper: Closed Case Method

for Reviewing the Adequacy of Loss Reserves

Comparison of the cost of closed claims to reserves has been used for many years, often simplistically, to evaluate loss reserve adequacy. Recently a particular "closed case" method, developed by the Internal Revenue Service, has received attention within the insurance industry. The Committee on Reserves has reviewed this method for its adherence to sound actuarial principles. The Committee finds that the closed case method is seriously inconsistent with the Casualty Actuarial Society's Statement of Principles Regarding Property and Casualty Loss and Loss Adjustment Expense Liabilities and is inappropriate for testing the adequacy of loss reserves. The following statement expands upon this finding.

Description of Method

In its basic form the closed case method of testing loss reserves examines claims by line of business which were reported and case reserved, but unpaid, as of an earlier reserve evaluation date and which have been settled subsequently.

It develops an "experience rate" by dividing the amount reserved for these settled claims at the reserve evaluation date by the total amount paid on them subsequently. The experience rate is applied to (divided into) total reserves, reported and unreported, as of the current reserve date to adjust current reserves to an indicated zero redundancy/deficiency level. Typically, the earlier reserve date (test year) would precede the current date by five to seven years, and the experience rate would be the average of the rate developed for each of the test years.

Implicit Assumptions

Application of the closed case methodology carries certain implicit assumptions. For its indicated results to be valid, satisfactory testing of the acceptability of these assumptions would be necessary. Major implicit assumptions are:

(a) The relative strength of case reserves at the earlier reserve evaluation date, for claims that are settled by the current reserve date, is comparable to that of total reserves at the current reserve date.

(b) The relative strength of the estimate for incurred but not reported (IBNR) claims at the current reserve date is comparable to that of the case reserves. The implication here is that the combined frequency and severity components of the IBNR reserve are comparable in strength to the severity component alone of case reserves. Alternatively, if the strength of the severity component of the IBNR reserve alone is comparable to that of the case reserves, then the frequency component is exact.

(c) The relative strength of the reserves for reinsurance assumed from all sources is comparable to that of the direct case reserves.

(d) Estimates of credits for ceded reinsurance are proportional to the direct case reserves and to assumed reinsurance in their impact on relative adequacy.

Adherence to Actuarial Principles

The Statement of Principles Regarding Property and Casualty Loss and Loss Adjustment Expense Liabilities outlines a series of principles which must be considered for a reasonable and appropriate review of reserves. A comparison of these principles to the closed case method clearly illustrates that this method does not meet the criteria established by the CAS for proper review or establishment of reserves.

Key principles outlined in this statement and corresponding deficiencies in the closed case method are:

1. "Loss reserving procedures should operate on well defined groups of losses" and give consideration to all elements of the total loss reserve.

The closed case method:

(a) gives no consideration to IBNR claims or reopened claims in the determination of the experience rate.

(b) ignores the extent to which reinsurance arrangements applicable to claims outstanding at the current reserve date might differ from programs in place for claims in the test years and the effect such differences might have on claims emergence and development patterns.

(c) has drawbacks even as a means for testing only the case reserves. The implicit assumption that the relative strength of case reserves has remained constant is always questionable absent a review of average outstanding values over successive periods. Further, the method does not consider claims reserved at the test date but not yet settled nor any changes in the reserves thereon. These are the claims likely to be in litigation with their ultimate settled values less certain. For workers' compensation, permanent disability claims and even certain temporary disability claims would remain open and not considered even though periodic payments are being made on them. Additionally, if the case reserves are meant to contain a provision for reopened claims, the closed case method of testing would not consider this element since the reopened claims would not have been specifically case reserved at the reserve evaluation date.

2. "Understanding the trends and changes affecting the data base is a prerequisite to the application of actuarially sound reserving methods. A knowledge of changes in underwriting, claims handling, data processing and accounting, as well as changes in the legal and social environment affecting the experience is essential to the accurate interpretation and evaluation of observed data and the choice of reserving method."

"It is not sufficient for the actuary merely to apply historical analytical procedures in the calculation of reserves. Whenever the impact of internal or external changes on claim data can be isolated or reasonably quantified, adjustment of the data is warranted before applying various reserving methods."

"A competent actuary will ordinarily examine the indications of more than one method before arriving at an evaluation of an insurer's reserve liability for a specific group of claims."

The closed case method:

(a) does not recognize or adjust for changes in size of distribution, external influences, operational changes, reinsurance retention changes, aggregate limit changes, or other underlying changes affecting losses;

(b) is a straight application of a formula with no consideration of trends or changes affecting the data;

(c) is generally used as an only method rather than in conjunction with other reserving methods.

3. "The actuary should be conversant with the general characteristics of the insurance portfolio for which reserves are to be established." There should also be a thorough knowledge of claims practices. This principle implies that having this knowledge will affect one's reserve evalution.

The closed case method does not fulfill this requirement in that:

(a) it ignores general characteristics of the nature of losses between various lines of business. The method is assumed to work equally well for low frequency/high severity lines as it does for high frequency/low severity lines of business;

(b) out-of-the-ordinary claims practices, such as discounting loss reserves, are not given special recognition;

(c) it provides no variation for differences in settlement patterns amoung different groups of claims, which is contrary to the Statement of Principles note that "the length of time that it normally takes for reported claims to be settled will affect the choice of the loss reserving procedure";

(d) all data is treated to be fully credible, with no consideration given to the lack of credibility of indications based on small volumes of historical data.

Proponents' Viewpoint

Proponents of the closed case method argue that it is improper to use estimates to test reserves that are themselves estimates. They believe that the use of a test period of claims settlements produces a more accurate indicator by which to adjust current reserves. However, proper use of estimates in no way violates the Statement of Principles. Rather, the closed case method ignores significant information, which can be valuable when used with proper analytical techniques.

Committee Position

The Committee on Reserves believes that the closed case method of testing the adequacy of loss reserves, as described in the foregoing statement, does not conform to sound actuarial principles. While the method provides indications as to the historical adequacy of case reserves, such indications are incomplete and may be misleading. The committee has no objections to the underlying data used in the closed case method. However, they are appropriate only when used with proper actuarial techniques. In general, the committee finds that the closed case method is unsound and should not be used to evaluate total loss reserves.

EXHIBIT 3

USING CALENDAR YEAR RATIOS TO
ESTIMATE THE ALAE RESERVE

Paid Losses (000's)

Accident Year	12	24	36	48	
1980	1,000	2,000	500	300	
1981	1,000	2,000	500	300	
1982	1,000	2,000	500	300	Required Reserve = 3,900
1983	1,000	2,000	500	300	
1984	1,000	2,000	500	300	

Paid Allocated Loss Expense (000's)

1980	15	70	35	30	
1981	15	70	35	30	
1982	15	70	35	30	Required Reserve = 230
1983	15	70	35	30	
1984	15	70	35	30	
Ratio of Paid ALAE to Paid Loss	1.5%	3.5%	7.0%	10.0%	

Ratio of Calendar Year Paid ALAE to Paid Loss $= \frac{150}{3,800} = 3.95\%$

(Calender Year Ratio) x Loss Reserve = 3.95% x $3,900 = $154

ALAE Reserve Based on Calendar Year Ratio = $154

Actual Required Reserve = $230

Percentage Reserve Deficiency = 49.4%

Prepared by: Richard Sherman

Prepared for: Common Reserve Pitfalls

COMPARISON OF ACTUAL AND FITTED INCURRED LOSS DEVELOPMENT FACTORS

REINSURANCE ASSOCIATION OF AMERICA EXPERIENCE

Years of Development	Automobile Liability		General Liability		Medical Malpractice		Workers' Compensation	
	Actual*	Fitted	Actual*	Fitted	Actual*	Fitted	Actual*	Fitted
2:1	1.760	1.619	2.300	2.290	7.876	6.104	1.634	1.630
3:2	1.227	1.264	1.541	1.536	2.172	2.480	1.285	1.287
4:3	1.100	1.123	1.295	1.287	1.654	1.717	1.169	1.172
5:4	1.061	1.062	1.171	1.177	1.334	1.429	1.134	1.118
6:5	1.031	1.033	1.109	1.119	1.150	1.288	1.092	1.088
7:6	1.015	1.018	1.093	1.085	1.156	1.208	1.053	1.068
8:7	1.015	1.011	1.060	1.064	1.163	1.158	1.055	1.055
9:8	1.008	1.007	1.046	1.050	1.120	1.124	1.048	1.046
10:9	1.006	1.004	1.045	1.039	1.133	1.101	1.039	1.039
11:10	1.000	1.003	1.039	1.032	1.023	1.084	1.036	1.034
12:11	1.001	1.002	1.022	1.027	1.058	1.070	1.014	1.029
13:12	1.001	1.001	1.024	1.022	1.090	1.060	1.017	1.026
14:13	1.001	1.001	1.004	1.019	1.063	1.052	1.030	1.023
15:14	1.000	1.001	1.019	1.016	1.089	1.046	1.023	1.021
16:15	1.000	1.000	1.008	1.014		1.040	1.016	1.019
17:16	1.001	1.000	1.010	1.012		1.036	1.032	1.017
18:17	.999	1.000	1.008	1.011		1.032	1.005	1.016
19:18	1.000	1.000	1.018	1.010		1.029	1.021	1.015
20:19	1.000	1.000	1.004	1.009		1.027	1.015	1.014
21:20	.999	1.000	1.005	1.008		1.024	1.037	1.013
22:21	1.000	1.000	1.017	1.007		1.022	.996	1.012
23:22	1.000	1.000	1.000	1.006		1.020	1.038	1.011
24:23	1.000	1.000	.997	1.006		1.019	1.026	1.010
25:24	1.000	1.000	1.000	1.005		1.017	1.018	1.010

*These factors are the average of the latest 10 accident years for each given year of development from the 1983 edition of the RAA's Loss Development Study.

EXHIBIT 4

COMPARISON OF ACTUAL AND FITTED INCURRED LOSS DEVELOPMENT FACTORS USING AN INVERSE POWER FUNCTION

Years of Development	Auto Bodily Injury Liability Actual	Auto Bodily Injury Liability Fitted	General Liability Actual	General Liability Fitted	Workers' Compensation Actual	Workers' Compensation Fitted
2	1.634	1.680	1.839	1.886	1.493	1.490
3	1.094	1.077	1.279	1.266	1.167	1.159
4	1.025	1.022	1.185	1.132	1.094	1.082
5	1.008	1.009	1.077	1.080	1.046	1.052
6	1.003	1.004	1.039	1.054	1.033	1.036
7	1.003	1.002	1.033	1.040	1.028	1.027
8	1.001	1.002	1.029	1.030	1.019	1.021
9	1.000	1.001	1.030	1.024	1.012	1.017
10	1.001	1.001	1.019	1.020	1.010	1.014
11	-	-	1.014	1.016	1.011	1.012
12	-	-	1.016	1.014	1.010	1.010
13	-	-	1.013	1.012	1.009	1.009
14	-	-	1.012	1.010	1.008	1.008
15	-	-	1.008	1.009	1.007	1.007
Goodness of fit (R^2)	.98462		.98278		.98551	
Parameters						
a =	.68047		.88614		.48984	
b =	3.14215		1.73380		1.62362	
c =	-1.00000		-1.00000		-1.00000	

Notes:

1) The actual factors above represent composite experience from five major carriers for each line of business.

2) The goodness of fit is measured by the coefficient of determination (R^2)

M. PENN DINGDOOM'S ANALYSIS

CUMULATIVE INCURRED LOSS AS OF DECEMBER 31, 1980

ACCIDENT YEAR	MONTHS OF DEVELOPMENT 12	24	36	48	60
1976	8100	15500	16700	17200	17200
1977	10000	19300	27100	25700	
1978	12400	38100	37400		
1979	23700	51000			
1980	31400				

ACCIDENT YEAR	MONTHS OF DEVELOPMENT 12	24	36	48	60
1976	1.914	1.077	1.030	1.000	
1977	1.930	1.404	0.948		
1978	3.073	0.982			
1979	2.152				
1980					
AVERAGE	2.267	1.154	0.989	1.000	
WEIGHTED AVERAGE	2.360	1.138	0.976	1.000	
LINEAR TREND					
SLOPE	0.186	-0.048	-0.082		
INTERCEPT	1.803	1.250	1.112		
R2	0.192	0.047	1.000		
PROJECTED	2.731	1.059	0.867		
EXPONENTIAL CURVE					
SLOPE	8.514	-4.549	-7.923		
INTERCEPT	1.812	1.252	1.119		
R2	0.225	0.063	1.000		
PROJECTED	2.727	1.039	0.873		
SELECTED	2.267	1.154	0.989	1.000	1.000

ULTIMATE LOSS BASED ON INCURRED LOSS DEVELOPMENT AS OF DECEMBER 31, 1980

ACCIDENT YEAR	CUMULATIVE INCURRED LOSS	SELECTED DEVELOPMENT FACTOR	CUMULATIVE DEVELOPMENT FACTOR	ULTIMATE LOSS (1)X(3)
	(1)	(2)	(3)	(4)
1976	17200	1.000	1.000	17200
1977	25700	1.000	1.000	25700
1978	37400	0.989	0.989	36989
1979	51000	1.154	1.141	58207
1980	31400	2.267	2.587	81242

EXHIBIT 7

REVISING INCURRED LOSS PROJECTIONS FOR CHANGES IN RESERVE ADEQUACY

CASE LOSS RESERVES PER OPEN CLAIM AS OF DECEMBER 31, 1980

ACCIDENT YEAR	MONTHS OF DEVELOPMENT 12	24	36	48	60
1976	450	1500	2000	4501	19626
1977	500	1700	4600	5200	
1978	560	3900	5301		
1979	1300	4500			
1980	1500				

ACTUAL CASE LOSS RESERVES AS OF DECEMBER 31, 1980

ACCIDENT YEAR	MONTHS OF DEVELOPMENT 12	24	36	48	60
1976	3100	6500	4100	4100	2100
1977	4200	9000	12600	6500	
1978	5700	26300	18600		
1979	16000	37400			
1980	22500				

ADJUSTED CASE LOSS RESERVES AS OF DECEMBER 31, 1980

ACCIDENT YEAR	MONTHS OF DEVELOPMENT 12	24	36	48	60
1976	5900	12800	8200	4100	2100
1977	8300	18000	12600	6500	
1978	11600	26300	18600		
1979	16000	37400			
1980	22500				

CUMULATIVE INCURRED LOSS AS OF DECEMBER 31, 1980

ACCIDENT YEAR	MONTHS OF DEVELOPMENT 12	24	36	48	60
1976	10900	21800	20800	17200	17200
1977	14100	28300	27100	25700	
1978	18300	38100	37400		
1979	23700	51000			
1980	31400				

ACCIDENT YEAR	MONTHS OF DEVELOPMENT 12	24	36	48	60
1976	2.000	0.954	0.827	1.000	
1977	2.007	0.958	0.948		
1978	2.082	0.982			
1979	2.152				
1980					
AVERAGE	2.060	0.964	0.888	1.000	

ULTIMATE LOSS BASED ON INCURRED LOSS DEVELOPMENT AS OF DECEMBER 31, 1980

ACCIDENT YEAR	CUMULATIVE INCURRED LOSS (1)	SELECTED DEVELOPMENT FACTOR (2)	CUMULATIVE DEVELOPMENT FACTOR (3)	ULTIMATE LOSS (1)X(3) (4)
1976	17200	1.000	1.000	17200
1977	25700	1.000	1.000	25700
1978	37400	0.888	0.888	33211
1979	51000	0.964	0.856	43658
1980	31400	2.060	1.763	55372

MOORE CAW SHUSH'S ANALYSIS

CUMULATIVE PAID LOSS
AS OF DECEMBER 31, 1980

ACCIDENT YEAR	MONTHS OF DEVELOPMENT 12	24	36	48	60
1976	5000	9000	12600	13100	15100
1977	5800	10300	14500	19200	
1978	6700	11800	18800		
1979	7700	13600			
1980	8900				

ACCIDENT YEAR	MONTHS OF DEVELOPMENT 12	24	36	48	60
1976	1.800	1.400	1.040	1.153	
1977	1.776	1.408	1.324		
1978	1.761	1.593			
1979	1.766				
1980					
AVERAGE	1.776	1.467	1.182	1.153	
WEIGHTED AVERAGE	1.770	1.499	1.229	1.153	
LINEAR TREND					
SLOPE	-0.012	0.097	0.284		
INTERCEPT	1.805	1.274	0.755		
R2	0.755	0.780	1.000		
PROJECTED	1.747	1.660	1.609		
EXPONENTIAL CURVE					
SLOPE	-0.649	6.678	27.360		
INTERCEPT	1.805	1.287	0.816		
R2	0.755	0.782	1.000		
PROJECTED	1.747	1.666	1.686		
SELECTED	1.776	1.467	1.182	1.153	1.154

ULTIMATE LOSS BASED ON PAID LOSS DEVELOPMENT
AS OF DECEMBER 31, 1980

ACCIDENT YEAR	CUMULATIVE PAID LOSS (1)	SELECTED DEVELOPMENT FACTOR (2)	CUMULATIVE DEVELOPMENT FACTOR (3)	ULTIMATE LOSS (1)X(3) (4)
1976	15100	1.157	1.157	17471
1977	19200	1.153	1.334	25613
1978	18800	1.182	1.577	29644
1979	13600	1.467	2.313	31459
1980	8900	1.776	4.108	36563

EXHIBIT 9

REVISING PAID LOSS PROJECTIONS FOR CHANGES IN THE RATE OF SETTLEMENT OF CLAIMS

RATIO OF CUMULATIVE CLOSED CLAIMS TO CUMULATIVE REPORTED CLAIMS AS OF DECEMBER 31, 1980

ACCIDENT YEAR	MONTHS OF DEVELOPMENT 12	24	36	48	60
1976	0.420	0.670	0.852	0.943	0.993
1977	0.395	0.653	0.831	0.932	
1978	0.372	0.621	0.814		
1979	0.344	0.599			
1980	0.313				

ADJUSTED CUMULATIVE PAID LOSS DECEMBER 31, 1980

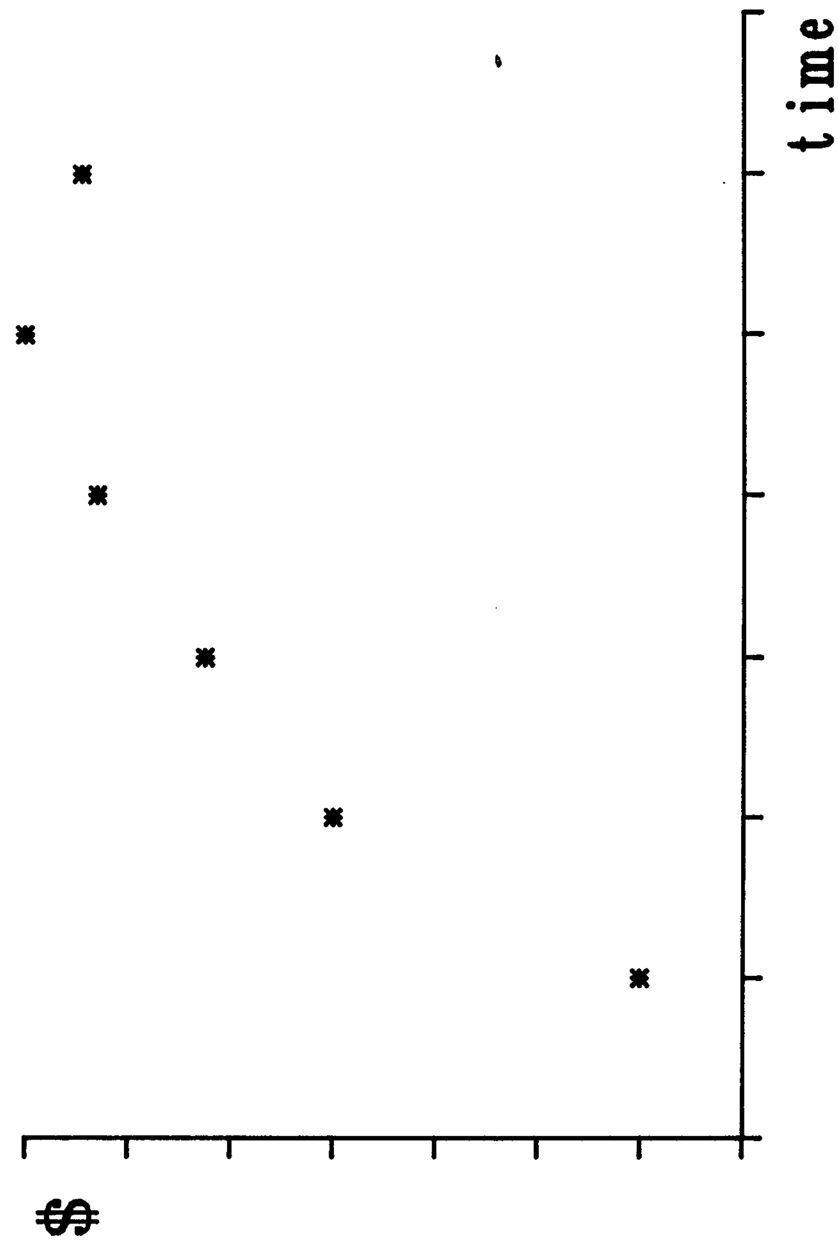
ACCIDENT YEAR	MONTHS OF DEVELOPMENT 12	24	36	48	60
1976	3300	7900	12000	12900	14900
1977	4200	9300	14200	19200	
1978	5200	11300	18800		
1979	6700	13600			
1980	8900				

ACCIDENT YEAR	MONTHS OF DEVELOPMENT 12	24	36	48	60
1976	2.394	1.519	1.075	1.155	
1977	2.214	1.527	1.352		
1978	2.173	1.664			
1979	2.030				
1980					
AVERAGE	2.203	1.570	1.214	1.155	
WEIGHTED AVERAGE	2.146	1.594	1.260	1.155	

ULTIMATE LOSS BASED ON PAID LOSS DEVELOPMENT DECEMBER 31, 1980

ACCIDENT YEAR	CUMULATIVE PAID LOSS	SELECTED DEVELOPMENT FACTOR	CUMULATIVE DEVELOPMENT FACTOR	ULTIMATE LOSS (1)X(3)
	(1)	(2)	(3)	(4)
1976	14900	1.151	1.151	17150
1977	19200	1.155	1.329	25525
1978	18800	1.214	1.614	30341
1979	13600	1.570	2.534	34460
1980	8900	2.203	5.582	49680

Exhibit 10



1987 CASUALTY LOSS RESERVE SEMINAR

1C/5C - INTERMEDIATE TECHNIQUES I

Moderator: Timothy L. Wisecarver, Senior Consultant
Coopers & Lybrand

Panel: James A. Andler, Associate Actuary
SAFECO Insurance Company

D. Lee Barclay, Actuary-Chief Property & Casualty
Washington State Insurance Department

Recorder: Brian A. Jones, Supervising Specialist
Coopers & Lybrand

TIMOTHY L. WISECARVER: On my immediate right is Lee Barclay, who is the Chief Property Casualty Actuary with the Washington Insurance Department. Lee is going to be doing the portion of the program on the hindsight reserve technique. To his right is Jim Andler, who is the Manager of the Commercial Lines department at Safeco. Jim will be discussing the loss reserve test as known Bornhuetter-Ferguson technique. I'm Tim Wisecarver and I'm a Senior Consultant with Coopers & Lybrand's Actuarial Benefits and Compensation Consulting Group in Seattle. Without further comments, I'll turn this over to Jim and he'll begin the first portion of the program.

JIM ANDLER: Bornhuetter-Ferguson is a loss development technique which attempts to develop IBNR loss estimates where the estimates would be independent of the losses that have been reported to date. Using traditional methods if you showed a large loss in an early development period and multiplied it by some development factor, your developed losses would be too large. If you don't have any/many losses in the early periods and multiplied them by the factor you would end up with too few losses. This is the failing of the loss development technique. The other traditional technique commonly used is the expected loss ratio technique where you take your losses to date and subtract them from your expected losses and the remaining amounts are taken to be the IBNR; at my company we had a situation like that where a large loss was reported in the Plus 2 period, and we found that we would have had to have negative IBNR from then on. To the rescue comes the Bornhuetter-Ferguson technique.

We are going to go through the exhibits that I put together. Exhibits 1 through 4 will be what you've probably seen several times and they are a collection of triangles with calculations. We won't see Bornhuetter-Ferguson until Exhibit 5. And then with a twist we'll go through Exhibit 6 through 10 which are really restated Exhibits 1 through 5. The twist is that instead of using earned premium in the left column we'll use exposures. Exhibits 11 through 13 will put the discussion in perspective.

Exhibit 1. I'm sure you are all familiar with a loss triangle. How many of you went through the basic sessions yesterday? (about one-half). The rest of you either went through the advanced sessions or don't remember. Bornhuetter-Ferguson gives you a great deal of flexibility. For example, we have incurred loss at the top. You could have allocated adjustment expense included in loss and I suppose you could have unallocated as well. Accident years are in the second column. We could use policy years instead. In the place of the years, of course, we could use months, quarters, etc.

Exhibit 2. We take the dollars of loss and divide by earned premium to get loss ratios.

Exhibit 3. This will take us through the calculation of loss development factors. The summation in column 2 is divided by that in column 2 and so on. Just to clarify, we see an A1 and A2 on Exhibit 3. A2 would either be the sum of the dollars or it could be their average -- either arithmetic or weighted. You don't have to use three periods but any number you want. You now have a development factor that will take you from Column 1 to Column 2. Again, we realize we're not into the Bornhuetter-Ferguson technique yet, but just a traditional loss development factor calculation. What I have chosen to do on Exhibit 3 is to take A2 divided by A1 with A2 just being the sum of the three data points and A1 being the sum of its three data points. The result is 1.356. The same applies to B1 and B2. In C1 and C2 I took the datapoint at the bottom of Column 4. Finally, we have factors that go from 1 to 2, 2 to 3, and 3 to 4. Multiply them to get the factors from 1 to ultimate and so on.

Exhibit 4. Again using the traditional loss development factor technique, take the loss ratios on the last diagonal from Exhibit 2, and multiply them by their respective loss development factors from Exhibit 3, the result will be a column labeled ultimate loss ratio. Look at those loss ratios and determine what average loss ratio we can expect. We select 50% to be the normal ultimate loss ratio for each year. The 50% could have been estimated by inspection, by averaging or by any way you wanted. However, it must be something that seems reasonable.

Exhibit 5. Now we get to Bornhuetter-Ferguson. I'd like to ask if Mr. Bornhuetter or Mr. Ferguson is in the audience. No --that's good. The first line on the Exhibit says IBNR equals the expected loss times the quantity 1 minus the inverse of the LDF. In the body of Exhibit 5, we have the familiar accident years, earned premiums and the expected loss ratio. Multiply to get the expected loss dollars for each accident year. We display the loss development factors calculated on Exhibit 3. Put those loss development factors through the formula. What the result would be, for example, in 1985 would be .422. That means that at the present point of development for 1985, the IBNR should be .442 times the expected loss dollars. Taking .442 times $1,600,000 gives an IBNR of $770,000. Suppose one year passes, and now we're recalculating IBNR for the 1985 accident year. What would you calculate it to be? Again, we have 1985 expected losses of $1,600,000. Then we take it times .244. Does everybody see that? By the way, I don't know if Tim mentioned about asking questions, but feel free during the presentations to do so. Each of my co-panelists said they didn't mind if all the questions were asked of me, but with your help we could play a little trick on them. Take the IBNR factors times the expected loss dollars and develop the IBNR in the right hand column --add then up, and we have IBNR of $1,244,000. It seems simple doesn't it -- it is.

We'll change the column showing earned premium and change it to exposure units. The exposure units chosen could be sales, payroll, number of vehicles, man-hours, or whatever you want.

Exhibit 7 takes the dollars and divides them by the exposure units to develop pure premiums. Pure premium is, of course, the dollars of loss per exposure unit.

Exhibit 8 calculates pure premium development factors which are similar to loss development factors. We use the technique identical to that on Exhibit 3.

Exhibit 9 shows ultimate pure premiums using the technique on Exhibit 4. In the first 5 exhibits we had loss ratios that were quite tame that clustered around 50%. In this case we've got numbers that are seemingly clustered around nothing but seem to be increasing. Graphing this data would form a reasonable line. And what I mean by a reasonable line is that the numbers seem to be an increasing function of time. The Bornhuetter-Ferguson paper in the CAS proceedings suggested to trend the pure premiums. That is, draw or calculate some line through them: straight, exponential, etc. The line I fitted on the data developed the following numbers: For 1983, 1984, and 1985 I chose 109, 119, and 130 respectively. Your trending may develop somewhat different numbers, but that is not important. It's important though that your numbers look reasonable.

Exhibit 10 displays the calculated pure premiums of 109, 119 and 130 taken from Exhibit 9. Again, multiply the ultimate pure premiums times the exposure units to get the expected losses. The expected losses are slightly different (as they might be expected to be) from the ones on Exhibit 5. We have the loss development factors that we've just calculated on the two prior exhibits. We convert our LDF's by our simple formula and multiply the formula result by the expected loss dollars to develop the IBNR. If in the first five exhibits the loss ratio indicated some trend, then you probably would have been well advised to employ the technique that we just used on Exhibit 9, i.e., trending the loss ratios rather than just using a flat 50%. Also, to re-emphasize, IBNR on Exhibit 10 is independent of the losses that have been reported and that is the major strength of the Bornhuetter-Ferguson method! It could also be a major weakness if it becomes apparent that claim frequencies and/or severities are going to be beyond what one would have reasonably expected.

Exhibit 11. Somebody might ask you -- well, in accident year 1985 you just developed an IBNR of $738,000 that will emerge over the next umpteen years. (That's a rarely used actuarial term that in this case describes the years beyond plus-one development.) What do you estimate to be the losses that will

emerge over the next two or three years for the 85 accident year? We calculate the answer on Exhibit 11. We took the $16,077,000 expected loss dollars times the .440 factor and said $738,000 is the IBNR from plus-one to ultimate. If we take $16,077,000 times the .241 factor, we'll develop the IBNR that would emerge from plus-two to ultimate. Subtracting the dollar difference should give us the IBNR that we expect to emerge from period 1 to 2, i.e., $738,000 less $404,000 equals $334,000. In the 1986 calendar year, we should expect $334,000 of losses to emerge from the 1985 accident year. Using the same technique we subtract $171,000 from $404,000 and see that $233,000 is what we would expect to emerge in the 1987 calendar from the 1985 accident year.

Exhibit 12. During yesterday's presentation of this material I said that no presentation is complete without a list. Actually, I didn't want to say it yesterday because I was afraid of putting my co-panelists on the spot for fear that maybe they didn't have lists. But I was in luck as they did have lists. However, one of them was marginally acceptable. I'll leave it to you to decide which one. Exhibit 12 lists those factors to consider when setting IBNR reserves. The list is not intended to be an exhaustive list, but it's everything I know. To save some time I'll just say that the list is self-explanatory and continue to the next exhibit.

Exhibit 13 is probably something that should have been shown at the beginning. It's titled "When to use Bornhuetter-Ferguson." Bornhuetter-Ferguson is intended to be used when the data is sparse or when you're beginning a new program with the data begin extremely sparse. With a new program you have to rely on judgment of your own and/or judgment of others that feel may know something about the program of line of business in question. What you have to do is pick an expected loss ratio and a development pattern. As the program matures you should obtain a better feeling for what the development patterns are going to be. Bornhuetter-Ferguson is good to use with severity lines of business which, of course, give you patterns of development that aren't smooth. Again, this is one of the strengths of Bornhuetter-Ferguson because it's IBNR isn't affected by emerging losses. That's not to say from one period to the next you may not change your development factors because of emerging losses. When you get back home you may wish to review the calculations and derive new factors with each calendar year's emerging losses. Don't be influenced extremely heavily by the actual losses that have taken place. Generally exposure would be, for example, an individual risk, a policy year or an accident year. Report year is something for which you would not want to use Bornhuetter-Ferguson due to mismatching of premiums and losses.

This concludes the Bornhuetter-Ferguson presentation. Time-wise we have a few minutes for questions, otherwise we'll go on to the next speaker.

TIMOTHY L. WISECARVER: Thank you Jim. It was my oversight not to mention the format this morning. We would like you to raise any questions that occur to you as we're going through any of these portions of the presentation -- maybe we can address those on a more current basis in that fashion. We will give you an opportunity at the end as well to pick up any second thoughts or summarizing kinds of questions. My portion of the program is on a loss reserve test method, the Fisher-Lange lost reserve test. In some of his closing comments, Jim mentioned that report year is not a good way to organize your data if you're going to apply Bornhuetter-Ferguson, as it turns out, report year <u>is</u> the way to organize it for the Fisher-Lange reserve test. This is a distinguishing characteristic in this particular calculation. As you probably know, in most loss reserve calculations data is organized by accident year, policy year, or underwriting year. There are more common but this one does use the report year segregation. On Exhibit 1 there is a very terse difference to what the definition of report year is, if that's not already clear to you. That is simply a period of time in which you would count any claim on which the company got notice of an occurrence that would or could give rise to a claim. The method that we will be doing here basically proceeds by making two separate estimates; one of the rate at which any outstanding claims that you have from previous report years will be settled, and a separate estimate of what their expected value will be based on your estimate of when those settlements will be occurring. You combine those to get an appropriate loss estimate, and thereby the reserve estimate, for each one of the report years.

A couple features of this method that may be more or less obvious are, first of all your claim counts are not subject to any development here because by definition at the end of the report year that's a fixed figure and there will be no additional charges coming in on it. The reserve method here proceeds by calculating all of the parameters that you need effectively from paid loss data, which gives a certain level of comfort to at least some people because that's probably the most concrete kind of data that you can have, and it doesn't include changes in loss reserving patterns and so forth. The method will also make absolutely no provision for pure IBNR claims that are actually late reported, so in and of itself it's probably not a very good idea to use Fisher-Lange in computing reserve requirements for the company. One area where the method would be clearly very helpful is if you are having dialogues with the claims department about their reserving practices and their reserve year adequacy or deficiency. This eliminates part of the discussion where they claim that your reserve estimates are higher than theirs because you're counting things they haven't seen yet. This does eliminate that difference and allows you to talk about a common body of cases. These will be claims that the department has actually set up individual claim file estimates on.

The next three exhibits in this handout, which we'll be going through show the data requirements to drive the method, and we'll talk a little bit about what each one of those are in sequence. Exhibit 2 is brutally simple. This is simple a recitation of some hypothetical claim counts that might have come in some report years. In a lot of cases as you probably know when you're looking at claim counts, you'll see the customary development triangle for their late reports and additional claims coming in subsequent periods. We've eliminated that phenomenon here by defining our "years" as being the report years. Again, these are immutable numbers once the end of the year has passed. The next two exhibits are triangular in form. The data that's shown on those is incremental data. A lot of times the development triangle that you use in a loss reserve analysis will be cumulative. They'll show either number of claims or amounts paid or loss estimates or whatever they're tracking on a cumulative basis. These need to show them on an incremental basis. If you have cumulative triangles obviously you can convert then to this basis fairly easily. Exhibit 3 shows numbers of claims settled by age and report year. We're assuming basically a five-year payout pattern in this analysis. Obviously when you do this in practice that period may and commonly would be somewhat longer than this.

Exhibit 4 is another incremental exhibit. This matches dollars paid to the settlements that we were showing in Exhibit 3. Again, these are incrementals that are shown in thousands of dollars and we're saying for the claims that were reported in 1981 and were also settled in the same year 1981, we paid $355,000 on those cases. That's the first number in the 1981 column. In the ensuing 12 months we settled a commensurately smaller number of those report year claims, expected to be more significant settlements. However, in the aggregate, payments for those settlements (it's not a cumulative number) would be $345,000. The interpretation of the rest of the numbers is identical. These are just the settlements that are matched up against the closures that are occurring in each age cell for each report year. This limited number of data exhibits can be used to drive the parameters in the reserve test year. The next several exhibits will show various steps in that analytical process.

Exhibit 5, first of all, computes an average cost of the claims settled for each report year and each age interval. This rests on Exhibits 3 and 4 that preceded it. You simply divide the dollars paid in each one of those settlement cells by the numbers of claims appearing in the same cell. Typically you can see here, and this is something that is perceived to usually be the case, that as claims for a report year settle out at later dates they tend to be more expensive. More trivial and less expensive claims settle early. The more complicated and serious ones tend to settle later. There's a need here for purposes of a reserve estimate, then, to fill in the lower right portion of the triangle with estimated values of what the future settlements would be for claims at different age intervals for more recent report years that have not yet closed. Thus, amounts on this exhibit are underlined. There's not a required methodology here. As Jim had indicated on Bornhuetter-Ferguson, you have some latitude in doing this. The technique only requires that you make the estimate. The suggestion in the Fisher-Lange paper actually is to use data for prior report years in each age interval. They fit an exponential curve through their illustration so I carry that forward in this development as well to get an estimate of future averages. The $3,459, which is the second figure in the 1985 column underlined as an estimate, is an exponential projection based on those previous four data points -- 1981 through 1984. I did a similar kind of exercise for the 25 to 36, and 37 to 48 month periods. Usually, and hopefully in your reserve analysis, you have more data points than this so you can do something more reliable than fitting a curve through two point, but I did this for purposes of illustration. In the last one I actually just selected a percentage increase to use in my model, based on the result I was getting in the previous periods. The authors of the Fisher-Lange paper mentioned a couple of alternatives to this simple exponential curve. One thing they say is you can weight these values giving more credence to the more recent values if there was a serious trend here. They also mention the possibility of fitting a straight line through the data, which intuitively probably doesn't reflect what they perceived to be a kind of inflationary phenomenon. That may or may not be true. My feeling is that for whatever things you can think of as reasonable representations of this kind of change in settlement cost for claims that are of a comparable age over time, give them a try with your data and see what kind of fit and what kind of projections you get, and settle on something that is the most reasonable number that you can derive from the information at hand.

Exhibit 6 is a triangle of settlement rates, or disposal rates, that are derived based on Exhibits 2 and 3. This is simply taking the numbers of claims that are settled at each age interval for a given report year and dividing it by the number of total report year claims. It gives you the percentage of the report year claims that are settled in the period 0 to 12 months; 13 to 24 an so forth down the grid. The other part of the estimate, as I mentioned at the outset, aside from figuring out what the average cost of a claim will be when it settles, is what portion of your outstanding claims will settle at various points in time. This is the springboard for making that particular estimate. Here again, there would be a variety of ways of doing it. What the authors of the paper did is shown in one example on Exhibit 7, and basically their method was pretty simple. They took the most recent report year for which they had information in a given settlement period. I've illustrated this in making the estimate for 1985, so they used the report year 1984. They say in the period 13 to 24 months, what portion of the claims that were outstanding at the beginning of that period for that report year were settled. By reference to Exhibit 6 you can find the numbers. There were 25.9% of the total report year claims for 1984 settled in that second cell, and there have been 55.1% settled in the first increment, so that's 25.9% out of the remaining population of just under 45%. That's 57.7% of the outstanding claims, and they then look at report year 1985 and they take 57.7% of the remaining portion of those report year claims to get an estimate of what they would think would settle in the 13 to 24 month cell for that particular report year. They carry this forward just basically working backwards either on the prior actuals or estimates to get a completed triangle. On Exhibit 8 for my particular set of data all the estimates of what the remaining disposal rates would be for each report year through year 5, which I've assumed is the ultimate resolution of all of these cases, have been made. Again, I think you can be a little creative in getting an estimate like this. One other alternative that has occurred to me would be to go back to the triangle of those disposal rates in Exhibit 7 and cumulate them for the moment, to get the aggregate portion of your total report year claims that have been settled. You can take a similar analysis to what we did on the average claim there setting some kind of a trend line through those cumulatives and then make estimates of what the cumulative resolution of the more recent report years would be, and dismantle those into incremental components for purposes of this calculation.

The hard work has been done at this point. When you go to Exhibit 9, this is just simply an illustration for a single one of these report years and how you would than consolidate your estimates of future disposal rates and future average costs into what is an average incurred claim for report year 1985. You can see that this involves one calculation that is a set of known numbers. We know what has actually been settled for report year 1985 for 12 months. The next four are estimated values from prior exhibits and we take the product of those individually. Of course the individual products are not very meaningful because there is partial weight given to an average that will apply to part of the claims. But in total when you add them up, it is in fact the weighted average or the average incurred claim for that particular report year. Similar calculations of earlier report years would obviously have more actual points in them, and fewer estimated ones. These can be compared to claim department estimates, either by report year or in the aggregate, to get an estimate of how either deficient or redundant those claim department estimates will be on known cases. One of the things that is presented as a strength of this method is, in some instances, the report year when the claim came in may be a more operative factor in determining what kind of claim department practices and procedures were operating on that claim than, perhaps, accident year or some other kind of organization, so that you can actually isolate out of an overall deficiency or redundancy what parts of that are being contributed by early report years as opposed to more recent ones to see what effect may have occurred in some of the handling processes that may have changed over time in the claims department.

I suspect, and I'm not sure about this, I may well be the guy with the marginally acceptable list that Jim made previous reference to. Such as it is, it appears on Exhibit 10 in the handout. This is an attempt to give at least a cursory summary of some of the points about the Fisher-Lange test, and then raise a couple of considerations that I haven't delved into detail in the exhibits but which I will talk about just a little bit here. Obviously as I said, by comparing the ultimate average claim that you've estimated on known claims in each report year to claim department estimates, you can get both overall reserve positions and allocation of that to individual report years. By tracking the changes in this reserve position over time, one can also track the effect of reserve equity changes, of either reserve strengthening or weakening over time, on company results. When I thought about this in reading the paper it occurred to me that the premise here was that some of the claim department estimates were going into the company's financial results without benefit of perhaps an additional loading of IBNR or a bulk reserve that would be calculated to correct for later reporting claims or things of this nature. You have to be a little careful about just doing this without understanding how those previous results had been presented. To the extent that the claim department's estimates flow through the income statement, obviously changes in reserve position are important. As we all know, when our own IBNR calculations or aggregate reserves change these are also important in that process. There are a couple of special considerations about the Fisher-Lange method. I think that most often they seem to occur in the line of workers' compensation, although they're probably not the exclusive domain of that. One of these as mentioned in the paper, are partial payments. If you'll recall, when we were looking at the average cost of claims we were matching settlement cost with the claims that were actually resolved in each age interval. Partial payments, if they're being made, and again this most commonly occurs in workers' compensation, would require some kind of special treatment. You don't want those showing up in age intervals of 0 to 12 months if the claim hasn't been closed and its count is going to show up in some subsequent period. The suggestion made in terms of your data organization to handle this is simply to hold the partial payments out of your paid data until the point where the claim actually is resolved, and then the aggregate payment to date would be counted as a settlement cost on that claim. Another issue that needs some treatment here is the possibility of re-openings. Basically this method as I presented is assumes that once a claim is closed it remains closed and it doesn't contribute any subsequent payments nor any subsequent closing counts to your data triangles. Again, in workers' compensation that's not typically the case. There is a propensity for claims to re-open and produce additional payments once they have closed. Also, there are usually methods available to make a specific estimate of the re-opened claim reserve, and that's what's advocated if you're using Fisher-Lange as a correction or an additional component of your overall reserve calculation to make provision for re-opened claims.

The triangle that shows the disposal rates was the subject of quite a bit of discussion in some of the written comments which followed Fisher-Lange's paper. Some of the comments centered on why those disposal rates would change over time, and some alternative reserve methods that can be used to either take those changes into account or literally correct for them. There are about three methods here that I can perceive in the literature so far. I'll just make a quick comment about each one of them. The method as I've shown here that Fisher and Lange set out basically suggests that you try and measure those changes in disposal rate over time and tailor your estimates in some fashion so that they are at least somewhat responsive to your actual data. They're basically of the opinion that while it may be of interest to know that these changes are occurring in your reserve estimate, it's of more importance to recognize it. In fact, they are happening, and your estimate should take this into account. A person named Sampson had a little different approach which was referred to in one of the discussions of this paper, and that was essentially to equalize the disposal rates at common age intervals for adjacent report years. If you had two report years you would create an imbalance in his average if he didn't make a corresponding adjustment there. I haven't delved in great detail into how he did this. The construct that's used is called a "variance claim." The assumption is that either the additional claim he has to add or the few that he has to delete from given settlement increment for a report year are from the very top-end of that period. Given the pattern of claims settled for older and older ages costing more and more, he tends to either add or delete claims of an average somewhat higher than the existing average for his report year group. I believe he then essentially proceeds with this methodology as we've outlined it here. Skurnick, who reviewed this paper, has another suggestion which would require some computer support, and which I found pretty interesting. That was rather than measuring these disposal rates in terms of absolute cutoffs where you say 12 months is 1 point -- 24 months is another and so forth, he suggests looking at each of the report years that you have data on in terms of what percentile of the report year claims have actually been settled, irrespective of how long that may take. He would have a data triangle that might have a first cut-off at 10% or the report year claims and the other one 25 and 50 and whatever increments he decided to select. If you have computer resources it will actually let you look at the individual claims in detail and you can obviously do this. His premise is basically that as long as the changes in these disposal rates are a result of claim department practices, these speed ups and slow downs aren't probably going to be manifested in a real significant change in the ultimate cost of the cases as they're being paid. The thing that concerns him in that regard would be a change in the underlying types of claims being received, whether it's by the mix of business being underwritten or some other phenomenon that was causing a change in the types of cases being presented for payment. As long as the disposal rate is really a speed up or slow down in an otherwise consistent group of cases, his methodology, he suggests, would actually produce more consistent averages across the triangle because he would then be comparing a more homogeneous group of claims in this settlement process. Does anyone have any questions about this part of the program?

QUESTION: How do you treat closed without payments?

ANSWER: My reading of this suggests that there's probably not a great deal of merit in including those claims that close without payments in that first interval -- 0 to 12 months. If you delete them from your report year claims and don't count them as closed cases as well, then they don't make any subsequent difference in the process. One of the suggestions is that in that early period, the number of closings without payments might be a relatively unstable number, and by including them you might tend to distort these averages. Once you've closed the report year count, you have to then include closed no-pays as a part of the continuing disposal process or you'll get a column that doesn't add up to 100% of the report year claims. The suggestion is to leave them out for the first increment, and then you have to count them thereafter.

Lee's talk is on hindsight reserves, and just a comment about the handouts. If you don't have one of Lee's papers, I understand we came up a little bit short on those. If you can situate yourself so that you're next to somebody, that will be pretty important for the purposes of following his talk. Obviously it will be in the transcripts that won't come out for some time.

D. LEE BARCLAY: Before I begin I would like to state that you are welcome to interrupt me as we go through this hindsight reserve method this morning if you have questions. It's a little bit more complicated than the two methods that have been presented in the first part of this session. My handout, in fact, has more exhibits in it. I would mention that it's not as complicated as the set of 20 exhibits would indicate because some of the exhibits are not really essential to the process. Some of them are explanatory and display what we have already got and others display things from more than one angle. Please try to follow carefully and interrupt me if you have a question so that we don't get lost in the middle of things.

The method of hindsight reserves is actually one of the methods that I use most often in estimating loss reserves. They say that hindsight is 20/20, but that isn't quite true here in the case of casualty loss reserving. The idea of hindsight reserve is to take a look backward and see what you know now. The only problem is that given what we know now, it still isn't 20/20 because we don't have perfect knowledge about how our reserves are going to work out. Maybe after 10, 15, or 20 years for some of these long tail lines we do have that kind of 20/20 hindsight, but by then nobody cares. The hindsight reserve technique will not be perfect but it will be something I think we can use. Hindsight reserving has different meanings to different people. Sometimes it's used in a sense of looking backward and seeing what should have been reserved and trying to evaluate your past procedures in light of what you know now. What I would like to offer to you this morning is a little bit different from this perspective. I would like to present a method that gives you a current estimate of what your reserves should be based on what should have been reserved in the past. If you look at Exhibit 1 and look down to the middle of it, I'd like to describe the procedure that we'll be going through very briefly.

First of all, the method we'll be starting with uses accident years, but it could also use accident quarters, policy years, or report years. We begin by estimating for the first period and then that results in an estimate for the next one and for the next one and so on, until we get to the latest accident year. The second item in the procedure estimates the average outstanding reserve for the preceding period at the same stage of development. We can roll back the clock and see what we should have reserved for 1981 a year ago. That may tell us something about what we should have reserved for 1982 now, which is that one year left of development. First of all, because we are dealing with outstanding reserves primarily, we'll be getting outstanding reserves by taking ultimate estimates and subtracting off what's already paid or already closed. We will need a cumulative paid loss triangle and a triangle of data for cumulative closed claim counts. Because we would like to have an estimate of outstanding claims, we'll have to be able to estimate the ultimate claim count for each period. On a report year basis, similar to the one presented in the Fisher-Lange method, you'll have no problem with this. You have the claims as of 12 months -- that's it. You have that ultimate claim count in that particular situation, otherwise, you'll have to estimate it in some fashion. Finally, we need a starting point. We need to be able to estimate the ultimate loss for an initial year or maybe in a couple of years, just to have a place to begin.

At the end of the presentation this morning we're going to talk about some variations of this method. I'm going to try and present it in it's simplest form first and then we'll introduce a trend factor. We'll also introduce the idea of not making it strictly recursive from one year to the next but to use several prior years in a calculation for one year. I will also show you how it can be combined with other actuarial methods. You probably don't want to use this technique as your only method.

Let's go on to Exhibits 2, 3 and 4. These exhibits will help us obtain an estimate of ultimate claim counts in this particular numerical example. Again, you can do this anyway that you want. This is not really a part of the method -- it's just that we have to get these estimates of ultimate claim counts to use in the hindsight reserve method. Exhibit 2 displays a triangle of reported claim counts by accident year and development period. Using this data, we employ a technique very similar to what you have probably seen done in a paid loss or incurred loss development method. In this case we're just doing reported claim count development when we look at development factors from one stage to the next. The development factors produced from Exhibit 2 are shown on Exhibit 3 with various statistical analysis appended to help us select appropriate development factors to estimate ultimate claims. We show our selections on the bottom of this exhibit.

Exhibit 4 contains the final calculation to estimate ultimate claim counts. The latest value for the cumulative claims are shown in this exhibit. In Column 2 you see the selected development factor that we just brought from Exhibit 3. In Column 4 we have the estimates that we're going to be using for ultimate claims.

Another of the things we said we needed was a cumulative closed claim count triangle and here we have an example of that in Exhibit 5. Again, we're going to be working with outstanding claims and the average reserves for those claims. In Exhibit 6, we have the number of open and IBNR claims. It probably should read an estimate of the number of open and IBNR claims because the way we obtained Exhibit 6 is to take our estimated ultimate claims and subtract out claims already closed. We have ultimate claims less closed claims and this will give us a triangle that is the number of open and IBNR claims. When we talk about average reserves at any point in time, the average outstanding amount is the numbers in Exhibit 6 that will form the denominator for our division process These will be the claim counts that we'll be dividing by to get an average reserve.

Exhibit 7 is a presentation of another triangle that we need - cumulative paid loss. Any questions so far? We're at the height of the presentation and we want to make sure that we're ready for this.

Exhibit 8 is arranged a little bit differently. Everything you've seen up to this point has the accident years in rows. In order to get Exhibit 8 all on one page, we had to change things and look at columns instead of rows. We should go through this exhibit and we'll rearrange things in rows in just a moment and take another look at this. As we said in the initial exhibit, you have to have a starting point. As you look at the 1982 column, you see $1,900,000 in a box there. That is our starting point and I've simply selected it from my database. Incurred loss amounts are at 60 months of development. I could have estimated ultimate loss for 1981 in some other way, but we just have to have a point to start with. It's not developed by some method that we've already seen or it's not in the data that we've already seen. That's just our beginning point. In order to make an estimate for accident year 1982, we review 1981 and see what should have been the reserves for 1981 at the same point of development that 1982 is now. That's 48 months. We say okay, what was paid on 1981 at 48 months? If you go back to the paid loss triangle you'll find it's at $850,000. We'll take our ultimate loss of $1,090,000, subtract off $850,000, and we obtain what should have been reserved given what we know now and this is $240,000. We also had an estimate of the number of open and IBNR claims at that particular time -- at 48 months it was 54. If we divide $240,000 by 54, we'll get what the average reserves should have been at that point which is $4,444. Ignoring any kind of trend for the moment, we'll say - if $4,444 was what we should have observed on the average for 1981 claims as of 48 months, let's use that number for 1982 as well. We're going to assume that $4,444 is the average reserve for 1982 at 48 months. Now we'll multiply that by the number of outstanding claims which is estimated to be 32 from my triangle for 1982 at 48 months, and that results in an estimated outstanding loss of about $142,000. We add to that what's already paid which is $1 million at 48 months and that gives us an estimated ultimate loss of $1,142,000. We've used an estimate for 1981 to come up with an answer to 1982. Now we'll take the bottom line for 1982 and bring is up to the top to use as a starting point to get 1983. And we follow the calculation through in exactly the same way --down the 1983 column to get a final number for 1983 and similarly for 1984 and 1985. The recursive method is evident here where we're using one accident year ultimate loss estimate to get the next. Any questions about this exhibit before we go on?

QUESTION: How did you get your starting point for 1981?

ANSWER: In this particular case I have an incurred loss data triangle that will be presented later on. I just take the incurred losses as of 60 months assuming that was fully developed. I could use any other method that I have at my disposal such as paid or incurred loss development or some other knowledge to obtain a starting point.

Exhibit 9 essentially shows what we have done in a quick summary. It doesn't say exactly how we got those average outstanding amounts, but it shows for each accident year the estimate. We have an estimate of the number of claims outstanding and multiply it by its average outstanding amount to get the total outstanding loss. We then add total paid to get an estimate of ultimate loss. That merely summarizes the results of Exhibit 8 without showing the recursive process of calculating average outstanding amounts.

Exhibits 10 and 11 also are exhibits that illustrate the process. They're not essential to the process at this point though. Exhibit 10 indicates what the reserves should have been at any point in time for each accident year based on the estimates that we just made with the hindsight reserve method.

Exhibit 11 takes Exhibit 10 and divides it by those outstanding claim counts that we saw before -- those claim counts that were always going to be the denominator. Here they're used again. Exhibit 11 shows what has happened in terms of a triangle with outstanding average loss amounts. For 1981 you've taken an estimate of ultimate loss and seen what that implies at 48 months as to what the average reserves should have been. Then we have chosen an estimate for 1982 which has essentially forced the 48-month column for 1982 to be exactly the same as what it was for 1981. The same thing happened if you look at the 36-month column. The 1982 and 1983 numbers are the same. That's because we've chosen the ultimate estimate that has forced 1983 to be the same as 1982 and so on. That's basically a different view of what we've done by this method.

QUESTION: Are the average outstanding reserves on an incremental or cumulative basis?

ANSWER: The averages are cumulative in a sense. You're really cumulating the other way by this time heading out to the right in the sense that you're looking at all outstanding losses -- what should be reserved for those divided by all outstanding claims. It's really the ultimate less what's cumulated so far in terms of closed and paid.

If you look at Exhibit 12, you'll remember that we promised to introduce a trend factor. Again, in an inflationary environment it's very logical to do this from the very first. If I were using the hindsight reserve technique, I would not do it the way we've just done it without a trend factor. I would use a trend factor. Exhibit 12 looks very much like Exhibit 8. The only difference you will see is in the middle where a trend factor is introduced. I've used an 8% annual trend here so that for 1982 when we look at 1981 we saw the average reserve should have been $4,444 at 48 months. This time we're going to take that number and multiply it by 1.08 and that turns out to be $4,800. Then we'll pick the $4,800 as the average outstanding reserve for 1982 at 48 months. Exhibit 13 shows the ultimate losses that result from what we just did in Exhibit 8 instead of 12, but rearranged by rows. Again, it doesn't explain how we got those average outstanding amounts and then it summarizes what we have done. One thing that you might notice in applying this trend factor is that the method is not as sensitive to the trend factor as what you might think. For 1985, the ultimate loss estimate is $1,643,100, and for the untrended figure it turned out to be $1,443,236. The difference is about 14% I believe. On the other hand, if you take 8% and you just compound that for 4 years, you wind up with a 35% change. The difference is that we're only applying that 8% to the outstanding loss and not to the entire ultimate loss estimate.

At the beginning of this presentation we had said that we were going to look at a couple of variations and enhancements. We've only looked at one which is not really an enhancement. It's really quite basic to use a trend factor when it's appropriate. What I would like to do now is to look at how the method can be used in combination with other methods and at the same time we're going to look at how to use more than one year in estimating other years. I should have pointed out that when we were on Exhibit 11 the outstanding reserve amounts that we are selecting for the most recent year is just the prior year. I take the 24-month column there on Exhibit 11 and use the $4,092 and we do the next year the same, but the average outstanding amounts for the earlier years in that column - $4,041 and $3,903 - were not even used in our analysis.

Now look at Exhibit 14, 15 and 16. They are not part of the hindsight reserve method. They simply calculate ultimate losses in another way. It's the method we're going to use in combination with hindsight reserves. We're going to use incurred loss development that you should be familiar with. You should have seen it in the basic track if nowhere else.

Exhibit 14 displays the triangle of data for cumulative incurred loss. Exhibit 15 shows development factors calculated from these amounts. At the bottom of Exhibit 15 we have selected some development factors that we're going to use in Exhibit 16 to get an estimate of ultimate loss. Column 1 shows cumulative loss to date and column 2 shows the selected development factors. These are cumulated in Column 3, and we get an estimate of ultimate loss in Column 4. This is not the ultimate loss obtained by the hindsight reserve method again. This is ultimate loss calculated independently by the incurred loss development method.

Given the incurred loss development method and the ultimate estimates on Exhibit 16, Exhibit 17 shows what the reserves should have been at each stage of development for each year. Exhibit 17 show the indicated loss reserves resulting from the incurred loss development method estimates.

Exhibit 18 again performs the division process that we have gone through before stating what the average reserves should have been. Again, we're still looking at the incurred loss development method taking what the reserves should have been from Exhibit 17, and dividing by the open and IBNR claims that we had a long time ago -- about Exhibit 6 or so. We'll then get the average outstanding reserves that should have been based on the ultimate estimates from incurred loss development. Let's pretend, at least that for this example, that we'll really trust the incurred loss development method for the first three years. But for some reason there is a problem with the last couple of years and we'd like to get an estimate in another way by hindsight. We use the incurred loss development estimates as the basis for the first three years and then we use that as a basis for a hindsight reserve estimate for the last two years. And to do this in Exhibit 18 we're going to use the numbers in the 12 and 24 columns that are in the box there. The hindsight estimate for 1984 is based on 1981, 1982, and 1983. What we really want to do is replace the average outstanding reserve of 5,657 with a different estimate -- with an estimate resulting from the hindsight method. What we're going to do is look at the preceding 3 years at 24 months -- and just take the average of those 3 years. We'll take the average of $4,041, $5,223, and $5,159 -- and trend it forward at a given rate of 8%. The midpoint of our average is accident year 1982, so we'll trend it forward for 2 years. I've taken the average, multiplied it by 1.08 twice and I come up with $5,608 as the hindsight reserve for the outstanding reserve for 1984. Then we'll use that instead of the 5,657 that was indicated by incurred loss development. The same thing applies to the 12 month column. First, we average the top three numbers. This time we'll trend the average 3 years from the 1982 midpoint of those numbers to 1985, and we come out with an average estimated reserve of $4,249.

QUESTION: How did you derive an 8% trend factor?

ANSWER: I have not said anything about how I arrived at the trend factor, but you have to have some idea of what your inflationary trend is. We'll talk about this in one second.

Finally, Exhibit 19 summarizes our results. What we've done is constructed a hindsight estimate for the last 2 years -- for 1984 and 1985, and we've done it by selecting average outstanding amounts -- the $5,608 and $4,249 respectively. Exhibit 19 shows the ultimate loss estimates that are based on hindsight reserves. We now have two ultimate estimates for 1984 and 1985 -- based on incurred loss development and hindsight reserves -- and we can choose what we think is the best or most logical.

Exhibit 20 is my list of considerations. Again, it's not exhaustive, but I wanted to mention several things. One is that in applying this method we have to consider our ability to estimate ultimate claims. If your have fairly uniform reporting patterns you can get a good estimate there. If you have report year data, then you've got it. It's very important to be able to accurately estimate ultimate claims and because you're using that number to calculate the number of outstanding claims. If you don't know how many outstanding claims you have then you've got a problem in applying this method. Secondly, you want to apply this method when you've got a significant number of outstanding claims under consideration. This is what typically makes this method better for later years. It is better for the less mature years where you have more open claims and less closed claims. If you go to an old year and there's 3 outstanding claims or something like that, who are you to say what the average reserve for those few claims ought to be -- if it ought to be the same as last year of 8% more than last year or whatever. You just don't have enough claims there to count on the law of large numbers to make that average meaningful. It's likely to be more applicable to the less mature years. Thirdly, this method requires an additional estimate calculated independently to use as a starting point where you have confidence in that initial estimate because that is going to affect your calculation for all the succeeding years. Another matter to consider is any changes in claim settlement practices or procedures. If the claims department suddenly starts settling claims faster or slower, that's going to change what the average outstanding reserve looks like at a given point in time. That's something that needs to be considered. A fourth item is the appropriateness of trend factors. I tend to get on a soapbox about this a little bit. As a regulator, I see all kinds of different trend calculations such as straight lines, quadratics, cubics, and exponential fits. People tend to get used to one kind of a trend calculation when data isn't consistent with that at all. What I see most commonly in recent days is the exponential curve fit. They show data points that kind of go like this and they fit trends that kind of go like that. It doesn't make any sense. One thing I would caution you on is to get a trend that is a reasonable fit to the data that you have, and it doesn't necessarily have to be 8% for each development period or 12% or 15% across the board for all years. The second caution is that it's really tempting here to use a trend factor that's just taken from some general severity data based on your total book of claims or industry factors. Claims at any particular point in time are not the same as your total claims. The outstanding claims are more complex and are usually the larger ones. And there's no necessary reason that the trend factor of those should be the same as the trend for severity of all of your claims. That's just a caution. I'm not giving any indication of how you should do it. Something that you must keep in mind is that your severity trend factor may not be appropriate.

The final consideration is, and this one is related somewhat to Item 2, the sensitivity of alternate methods. For paid loss development and incurred loss development for the least mature years, a very high loss development factor may apply. You may be taking your paid losses as of 12 months and applying a factor of 5, 10 or 20. So those methods are very sensitive to the actual dollars that you had as of 12 months. A change of a few dollars could result in a big change in the ultimate loss. The hindsight reserve method gives you perhaps a better method for some of those later years since you have lots of open claims. When there's not much maturity, I tend to prefer some kind of method that's based on an average -- the average for all the claims or average reserves -- like the hindsight reserve method. Are there any additional questions?

QUESTION: If you were using this method on a long tail line, would you be more inclined to begin the recursive process somewhere in the middle of your data?

ANSWER: I think that's true and that's really what I tried to do with this last method using the incurred loss development method combined with hindsight reserves. I would probably use the hindsight reserve all by itself at least on the most recent years. I tend to trust the incurred loss development method for the older years and then use my method of hindsight reserve -- for the last 3 or 4 years. Again, that's where I'd begin my recursive procedure. Again, it doesn't necessarily have to be just straight recursive. You can use all the prior years or as many as you want in developing those average reserve estimates.

INTERMEDIATE TECHNIQUES I

METHOD: FISHER-LANGE RESERVE TEST

PANELIST: TIMOTHY L. WISECARVER

EXHIBIT 1

FISHER-LANGE REPORT YEAR RESERVE TEST

REPORT YEAR: YEAR IN WHICH THE CLAIM WAS REPORTED TO THE COMPANY

*CLAIM COUNTS FIXED AT YEAR END

*PARAMETERS ESTIMATED FROM PAID LOSS DATA

*TEST OF RESERVES ON KNOWN CASES

EXHIBIT 2

NUMBER OF CLAIMS REPORTED BY YEAR

REPORT YEAR	CLAIM COUNTS
1981	432
1982	444
1983	454
1984	532
1985	511

EXHIBIT 3

NUMBER OF CLAIMS SETTLED BY REPORT YEAR AGE

AGE OF REPORT YEAR AT SETTLEMENT DATE	REPORT YEARS 1981	1982	1983	1984	1985
0 - 12 MONTHS	260	261	266	293	290
13 - 24 MONTHS	115	120	124	138	
25 - 36 MONTHS	30	33	32		
37 - 48 MONTHS	17	19			
48 - 60 MONTHS	10				

EXHIBIT 4

PAID SETTLEMENTS BY REPORT YEAR AGE
(AMOUNTS IN 000'S)

AGE OF REPORT YEAR AT SETTLEMENT DATE	REPORT YEARS 1981	1982	1983	1984	1985
0 - 12 MONTHS	355	359	380	440	479
13 - 24 MONTHS	345	371	397	462	
25 - 36 MONTHS	111	125	140		
37 - 48 MONTHS	68	81			
48 - 60 MONTHS	55				

EXHIBIT 5

AVERAGE COST OF CLAIMS SETTLED BY REPORT YEAR AGE

AGE OF REPORT YEAR AT SETTLEMENT DATE	REPORT YEARS 1981	1982	1983	1984	1985
0 - 12 MONTHS	1,365	1,375	1,429	1,502	1,652
13 - 24 MONTHS	3,000	3,092	3,202	3,348	3,459
25 - 36 MONTHS	3,700	3,788	4,375	4,663	5,070
37 - 48 MONTHS	4,000	4,263	4,543	4,842	5,160
48 - 60 MONTHS	5,500	5,830	6,180	6,551	6,945

NOTE: UNDERLINED VALUES ESTIMATED USING EXPONENTIAL LEAST-SQUARES FIT FOR SETTLEMENT INTERVALS THROUGH 48 MONTHS; SELECTED PERCENTAGE INCREASE FOR 60 MONTHS.

EXHIBIT 6

PERCENT OF REPORT YEAR CLAIMS SETTLED BY REPORT YEAR AGE

AGE OF REPORT YEAR AT SETTLEMENT DATE	REPORT YEARS 1981	1982	1983	1984	1985
0 - 12 MONTHS	.603	.588	.586	.551	.568
13 - 24 MONTHS	.266	.270	.273	.259	
25 - 36 MONTHS	.069	.074	.070		
37 - 48 MONTHS	.039	.043			
48 - 60 MONTHS	.023				

EXHIBIT 7

SAMPLE METHOD OF ESTIMATING FUTURE SETTLEMENT RATES

REPORT YEAR 1985 AT 13 - 24 MONTHS:

$$\frac{\text{(PORTION OF 1984 REPORT YEAR CLAIMS SETTLED IN 13 - 24 MONTHS)}}{\text{(PORTION OF 1984 REPORT YEAR CLAIMS OUTSTANDING AT 13 MONTHS)}} = \frac{.259}{(1.000 - .551)} = .577$$

.577 X (PORTION OF 1985 REPORT YEAR CLAIMS OUTSTANDING AT 13 MONTHS) = .577 X (1.000 - .568)

= .249

EXHIBIT 8

PERCENT OF REPORT YEAR CLAIMS SETTLED BY REPORT YEAR AGE

AGE OF REPORT YEAR AT SETTLEMENT DATE	REPORT YEARS 1981	1982	1983	1984	1985
0 - 12 MONTHS	.603	.588	.586	.551	.568
13 - 24 MONTHS	.266	.270	.273	.259	<u>.249</u>
25 - 36 MONTHS	.069	.074	.070	<u>.094</u>	<u>.091</u>
37 - 48 MONTHS	.039	.043	<u>.045</u>	<u>.061</u>	<u>.058</u>
48 - 60 MONTHS	.023	<u>.025</u>	<u>.026</u>	<u>.035</u>	<u>.034</u>

NOTE: UNDERLINEWD VALUES ESTIMATED USING TECHNIQUE FROM EXHIBIT 7

EXHIBIT 9

SAMPLE CALCULATION OF AVERAGE INCURRED LOSS BY REPORT YEAR

REPORT YEAR 1985

SETTLEMENT INTERVAL	PERCENT OF REPORTED TO BE SETTLED	AVERAGE COST		PRODUCT
0 - 12 MONTHS	.568	1,652		938.34
13 - 24 MONTHS	.249	3,459		861.29
25 - 36 MONTHS	.091	5,070		461.37
37 - 48 MONTHS	.058	5,160		299.28
49 - 60 MONTHS	.034	6,945		236.13
		TOTAL	=	2,796

NOTE: UNDERLINED VALUES ARE ESTIMATED

EXHIBIT 10

REPORT YEAR ANALYSIS:

* PROJECTED INCURRED LESS CLAIM DEPARTMENT ESTIMATES GIVES RESERVE DEFICIENCY (OR REDUNDANCY)

* OVERALL RESERVE POSITION CAN BE ALLOCATED TO SPECIFIC REPORT YEARS

* EFFECT OF RESERVE EQUITY CHANGES ON UNDERWRITING RESULTS CAN BE COMPUTED

SPECIAL CONSIDERATIONS:

* PARTIAL PAYMENTS

* REOPENINGS

* INTERPRETATION OF, AND ADJUSTMENT FOR, CHANGES IN THE RATE AT WHICH CASES ARE SETTLED

INTERMEDIATE TECHNIQUES I

METHOD: BORNHUETTER - FERGUSON

PANELIST: JIM ANDLER

Exhibit 1

Earned Premium and Incurred Loss
($000)

Earned Premium	Accident Year	Year of Development +1	+2	+3	+4	+5
2400	1981	670	760	950	1,040	1,090
2500	1982	730	990	1,140	1,240	
2975	1983	760	1,050	1,230		
3150	1984	900	1,200			
3200	1985	920				

Exhibit 2

Incurred Loss Ratio Development

Accident Year	Year of Development +1	+2	+3	+4	+5
1981	27.9	31.7	39.6	43.3	45.4
1982	29.2	39.6	45.6	49.6	
1983	25.5	35.3	41.3		
1984	28.6	38.1			
1985	28.8				

Exhibit 3

Loss Development Factor Calculation

Accident Year	Year of Development +1	+2	+3	+4	+5
1981	x	x	x C1	x	x
1982	x	x B1	B2 x	x	
1983	x A1	A2 x	x	C2	
1984	x	x			
1985	x				

LDF 1-2 $= \Sigma A2 / \Sigma A1 = 1.356$
2-3 $= \Sigma B2 / \Sigma B1 = 1.186$
3-ULT $= \Sigma C2 / \Sigma C1 = 1.115$

LDF 1-ULT $= 1.356 \times 1.186 \times 1.115 = 1.793$
2-ULT $= 1.186 \times 1.115 = 1.322$

Exhibit 4

Roughly Estimated Ultimate Loss Ratio

Accident Year	Diagonal LR	x	LDF	=	Ultimate LR
1981	45.4		1.000		45.4
1982	49.6		1.000		49.6
1983	41.3		1.115		46.0
1984	38.1		1.322		50.4
1985	28.8		1.793		51.6

Select 50.0% as normal ultimate loss ratio for each year.

Exhibit 5

Estimated IBNR
Using Bornhuetter/Ferguson
(with Earned Premium)

IBNR = Expected Loss x (1 - 1/LDF)

AY	EP ($000)	x	ELR	=	EXP Loss ($000)	LDF	(1-1/LDF)	IBNR ($000)
1981	2,400		.50		1,200	1.000	0	0
1982	2,500		.50		1,250	1.000	0	0
1983	2,975		.50		1,488	1.115	.103	153
1984	3,150		.50		1,575	1.322	.244	384
1985	3,200		.50		1,600	1.793	.442	707
Total								1,244

Note: LDF used is appropriate LDF to ultimate.

Exhibit 6

Exposure Units and Incurred Loss
(000) ($000)

Exposure Units	AY	Year of Development +1	+2	+3	+4	+5
13.675	1981	670	760	950	1,040	1,090
12.380	1982	730	990	1,140	1,240	
12.860	1983	760	1,050	1,230		
13.300	1984	900	1,200			
12.900	1985	920				

Exhibit 7

Pure Premium Development
($)

Accident Year	Year of Development +1	+2	+3	+4	+5
1981	49.0	55.6	69.5	76.1	79.7
1982	59.0	80.0	92.1	100.2	
1983	59.1	81.6	95.6		
1984	67.7	90.2			
1985	71.3				

Exhibit 8

Pure Premium Development Factors

(Using the technique on Exhibit III)

PPDF	1-2	1.355
	2-3	1.184
	3-ULT	1.113
PPDF	1-ULT	1.786
	2-ULT	1.318

Exhibit 9

Roughly Estimated Ultimate Pure Premiums

(Using the technique on Exhibit IV)

Accident Year	Ultimate Pure Premium
1981	$ 79.7
1982	100.2
1983	106.4
1984	118.9
1985	127.3

Note: graphing this data would not form approximately a straight line as did the ultimate LRs. This data is indicative of exposure units that are non-inflative (e.g. no. of vehicles) or where the loses are "inflating" more rapidly than the exposures (e.g. deteriorating underwriting selection of risk quality).

Selected ultimate pure premiums will increase by year and are as follows:

1983 - 109; 1984 - 119; 1985 - 130

Exhibit 10

Estimated IBNR
Using Bornhuetter/Ferguson
(with Exposures)

(Using the same technique as Exhibit 5 except that to develop Expected Loss one must multiply selected ultimate pure premiums by the number of exposure units for each accident year)

Accident Year	Ultimate Pure Premium	x	No. of Expos (000)	=	Exp. Loss ($000)	LDF	(1-1/LDF)	IBNR ($000)
1981	$ 79.7		13.675		1,090	1.000	0	0
1982	100.2		12.380		1,240	1.000	0	0
1983	109.0		12.860		1,402	1.113	.102	143
1984	119.0		13.300		1,583	1.318	.241	382
1985	130.0		12.900		1,677	1.786	.440	738
Total								1,263

vs. $1,244 for total IBNR on Exhibit 5.

Exhibit 11

Spreading IBNR by Emergence Year

Using the data for the 1985 Accident Year from Exhibit 10 we find expected losses ($000) are 1,677 and applying the 1 - 1/LDF factors give:

1-ULT	$1,677	x	.440	=	$738
2-ULT	1,677	x	.241	=	404
3-ULT	1,677	x	.102	-	171

1-2	=	(1-ULT)	-	(2-ULT)
	=	738	-	404
	=	334		

2-3	=	(2-ULT)	-	(3-ULT)
	=	404	-	171
	=	233		

NOTE: Summing 1-2 for accident year 1985 and 2-3 for accident year 1984 and 3-4 for accident year 1983 and etc., would give the estimated emerging IBNR in the 1986 calendar year.

Exhibit 12

Some Factors for Consider when IBNR Reserving

I. Internal Factors

A. Underwriting

1. Rate adequacy
2. Deductibles
3. Special pricing on some policies
4. New vs. renewal mix
5. Growth
6. Selection criteria
7. Limit profiles
8. Class
9. Claims-made vs. occurrence

B. Claims

1. Case reserving/settlement philosophy
2. AE included/excluded

C. Operations

1. Processing lags
2. AE included/excluded

D. Reinsurance Agreements

E. Premium Distortions

1. Retros
2. Audits

II. External Factors

A. Inflation effects

1. Exposures
2. Claims

B. Tort Reform

C. Catastrophic loss potential

Exhibit 13

When to Use Bornhuetter-Ferguson

I. Data is sparse

    A. Beginning of a program (no history)
    B. Severity line of business
    C. Low exposure

II. Policy year or (Fiscal) Accident Year (report year usually not applicable)

INTERMEDIATE TECHNIQUES I

METHOD: HINDSIGHT RESERVES

PANELIST: DAVID LEE BARCLAY

Exhibit 1

METHOD OF HINDSIGHT RESERVES

REQUIRED DATA

1. Cumulative paid loss triangle
2. Cumulative closed claim count triangle
3. Estimate of ultimate claim count for each period
4. Estimate of ultimate loss for one or more relatively mature periods

PROCEDURE

1. Recursive, beginning with earliest period
2. Estimate average outstanding reserve based on what "should have been" the average outstanding reserve for the preceding period at the same stage of development

VARIATIONS/ENHANCEMENTS

1. Apply severity trend factor to average outstanding amount
2. Use more than one prior year in each recursive calculation
3. Combine with other actuarial methods

Exhibit 2

ABC Insurance — Coverage XYZ
Cumulative Reported Claims
As of December 31, 1985

Accident Year	Months of Development 12	24	36	48	60
1981	414	465	490	498	504
1982	416	468	494	506	
1983	401	492	512		
1984	435	495			
1985	440				

Exhibit 3

ABC Insurance — Coverage XYZ
Reported Claim Development
As of December 31, 1985

Accident Year	Months of Development 12	24	36	48	60
1981	1.123	1.054	1.016	1.012	
1982	1.125	1.056	1.024		
1983	1.227	1.041			
1984	1.138				
1985					
Average	1.153	1.050	1.020	1.012	
Weighted Average	1.161	1.048	1.022	1.012	
Selected	1.160	1.050	1.020	1.010	1.000

Exhibit 4

ABC Insurance — Coverage XYZ
Ultimate Claims Based on
Reported Claim Development
As of December 31, 1985

Accident Year	Cumulative Claims	Selected Development Factor	Cumulative Development Factor	Ultimate Claims (1)x(3)
	(1)	(2)	(3)	(4)
1981	504	1.000	1.000	504
1982	506	1.010	1.010	511
1983	512	1.020	1.030	527
1984	495	1.050	1.082	536
1985	440	1.160	1.255	552
Total	2,457			2,630

Exhibit 5

ABC Insurance — Coverage XYZ
Cumulative Closed Claims
As of December 31, 1985

Accident Year	Months of Development 12	24	36	48	60
1981	202	358	429	450	472
1982	234	390	447	479	
1983	214	380	450		
1984	217	382			
1985	220				

Exhibit 6

ABC Insurance — Coverage XYZ
Number of Open and IBNR Claims
As of December 31, 1985

Accident Year	Months of Development 12	24	36	48	60
1981	302	146	75	54	32
1982	277	121	64	32	
1983	313	147	77		
1984	319	154			
1985	332				

Exhibit 7

ABC Insurance — Coverage XYZ
Cumulative Paid Loss
As of December 31, 1985

Accident Year	Months of Development 12	24	36	48	60
1981	230,000	500,000	720,000	850,000	975,000
1982	260,000	670,000	850,000	1,000,000	
1983	310,000	650,000	900,000		
1984	320,000	750,000			
1985	340,000				

Exhibit 8

Hindsight Reserve
Basic Example

		1982	1983	1984	1985
Accident Year		1982	1983	1984	1985
Months of Development		48	36	24	12
Prior Accident Year, Same Months of Development:					
Estimated Ultimate Loss		$\boxed{1,090,000}$	1,142,208	1,251,582	1,380,168
Cumulative Paid Loss	−	850,000	850,000	650,000	320,000
Indicated Reserve		240,000	292,208	601,582	1,060,168
Open and IBNR Claims	/	54	64	147	319
Indicated Average Reserve		4,444	4,566	4,092	3,323
Current Accident Year:					
Assumed Average Reserve		4,444	4,566	4,092	3,323
Open and IBNR Claims	x	32	77	154	332
Estimated Outstanding Loss		142,208	351,582	630,168	1,103,236
Cumulative Paid Loss	+	1,000,000	900,000	750,000	340,000
Estimated Ultimate Loss		1,142,208	1,251,582	1,380,168	1,443,236

Exhibit 9

ABC Insurance — Coverage XYZ
Ultimate Loss Based on Hindsight Reserves
As of December 31, 1985

Accident Year	Cumulative Paid Loss	Number of Claims Outstanding	Average Outstanding	Total Outstanding (2)x(3)	Ultimate Loss (1)+(4)
	(1)	(2)	(3)	(4)	(5)
1981	975,000	32	3,594	115,008	1,090,008
1982	1,000,000	32	4,444	142,208	1,142,208
1983	900,000	77	4,566	351,582	1,251,582
1984	750,000	154	4,092	630,168	1,380,168
1985	340,000	332	3,323	1,103,236	1,443,236
Total	3,965,000	627		2,342,202	6,307,202

Exhibit 10

ABC Insurance — Coverage XYZ
Indicated Loss Reserves
As of December 31, 1985

Accident Year	Months of Development 12	24	36	48	60
1981	860,000	590,000	370,000	240,000	115,000
1982	882,208	472,208	292,208	142,208	
1983	941,582	601,582	351,582		
1984	1,060,168	630,168			
1985	1,103,236				

Exhibit 11

ABC Insurance — Coverage XYZ
Indicated Loss Reserves per Open and IBNR Claims
As of December 31, 1985

Accident Year	Months of Development 12	24	36	48	60
1981	2,848	4,041	4,933	4,444	3,594
1982	3,185	3,903	4,566	4,444	
1983	3,008	4,092	4,566		
1984	3,323	4,092			
1985	3,323				

Exhibit 12

Hindsight Reserve
Example with Trend Factor

		1982	1983	1984	1985
Accident Year		1982	1983	1984	1985
Months of Development		48	36	24	12
Prior Accident Year, Same Months of Development:					
Estimated Ultimate Loss		1,090,000	1,153,600	1,294,471	1,479,190
Cumulative Paid Loss	–	850,000	850,000	650,000	320,000
Indicated Reserve		240,000	303,600	644,471	1,159,190
Open and IBNR Claims	/	54	64	147	319
Indicated Average Reserve		4,444	4,744	4,384	3,634
Trend Factor	x	1.08	1.08	1.08	1.08
Trended Average Reserve		4,800	5,123	4,735	3,925
Current Accident Year:					
Assumed Average Reserve		4,800	5,123	4,735	3,925
Open and IBNR Claims	x	32	77	154	332
Estimated Outstanding Loss		153,600	394,471	729,190	1,303,100
Cumulative Paid Loss	+	1,000,000	900,000	750,000	340,000
Estimated Ultimate Loss		1,153,600	1,294,471	1,479,190	1,643,100

Exhibit 13

ABC Insurance — Coverage XYZ
Ultimate Loss Based on Hindsight Reserves
As of December 31, 1985

Accident Year	Cumulative Paid Loss	Number of Claims Outstanding	Average Outstanding	Total Outstanding (2)x(3)	Ultimate Loss (1)+(4)
	(1)	(2)	(3)	(4)	(5)
1981	975,000	32	3,594	115,008	1,090,008
1982	1,000,000	32	4,800	153,600	1,153,600
1983	900,000	77	5,123	394,471	1,294,471
1984	750,000	154	4,735	729,190	1,479,190
1985	340,000	332	3,925	1,303,100	1,643,100
Total	3,965,000	627		2,695,369	6,660,369

Exhibit 14

ABC Insurance — Coverage XYZ
Cumulative Incurred Loss
As of December 31, 1985

Accident Year	Months of Development 12	24	36	48	60
1981	670,000	760,000	950,000	1,040,000	1,090,000
1982	730,000	990,000	1,140,000	1,240,000	
1983	760,000	1,050,000	1,230,000		
1984	900,000	1,200,000			
1985	920,000				

Exhibit 15

ABC Insurance — Coverage XYZ
Incurred Loss Development
As of December 31, 1985

Accident Year	Months of Development 12	24	36	48	60
1981	1.134	1.250	1.095	1.048	
1982	1.356	1.152	1.088		
1983	1.382	1.171			
1984	1.333				
1985					
Average	1.301	1.191	1.091	1.048	
Weighted Average	1.332	1.178	1.090	1.048	
Selected	1.350	1.180	1.090	1.050	1.000

Exhibit 16

ABC Insurance — Coverage XYZ
Ultimate Loss Based on
Incurred Loss Development
As of December 31, 1985

Accident Year	Cumulative Loss	Selected Development Factor	Cumulative Development Factor	Ultimate Loss (1)x(3)
	(1)	(2)	(3)	(4)
1981	1,090,000	1.000	1.000	1,090,000
1982	1,240,000	1.050	1.050	1,302,000
1983	1,230,000	1.090	1.145	1,408,350
1984	1,200,000	1.180	1.351	1,621,200
1985	920,000	1.350	1.823	1,677,160
Total	5,680,000			7,098,710

Exhibit 17

ABC Insurance — Coverage XYZ
Indicated Loss Reserves
As of December 31, 1985

Accident Year	Months of Development 12	24	36	48	60
1981	860,000	590,000	370,000	240,000	115,000
1982	1,042,000	632,000	452,000	302,000	
1983	1,098,350	758,350	508,350		
1984	1,301,200	871,200			
1985	1,337,160				

Exhibit 18

ABC Insurance — Coverage XYZ
Indicated Loss Reserves per Open and IBNR Claims
As of December 31, 1985

Accident Year	Months of Development 12	24	36	48	60
1981	2,848	4,041	4,933	4,444	3,594
1982	3,762	5,223	7,063	9,438	
1983	3,509	5,159	6,602		
1984	4,079	5,657			
1985	4,028				

Selected Average Outstanding for

1984: $(1.08)^2 \times (4{,}041+5{,}223+5{,}159)/3 = 5{,}608$
1985: $(1.08)^3 \times (2{,}848+3{,}762+3{,}509)/3 = 4{,}249$

Exhibit 19

ABC Insurance — Coverage XYZ
Ultimate Loss Based on Hindsight Reserves
As of December 31, 1985

Accident Year	Cumulative Paid Loss	Number of Claims Outstanding	Average Outstanding	Total Outstanding (2)x(3)	Ultimate Loss (1)+(4)
	(1)	(2)	(3)	(4)	(5)
1984	750,000	154	5,608	863,632	1,613,632
1985	340,000	332	4,249	1,410,668	1,750,668

Exhibit 20

METHOD OF HINDSIGHT RESERVES

CONSIDERATIONS

1. Ability to estimate ultimate number of claims
2. Sufficient numbers of outstanding claims — cannot have high variability of average outstanding amounts
3. Confidence in estimate for initial period(s)
4. Changes in claim settlement practices or procedures
5. Appropriateness of trend factors

   a. Good fit to data
   b. Potential difference between severity trend and outstanding severity trend (outstanding claims typically larger than average)

6. Sensitivity of alternative methods

Example: Leverage of high paid or incurred loss development factors applied to recent periods

1987 CASUALTY LOSS RESERVE SEMINAR

1D - TORT REFORM

Moderator: Jeffrey H. Mayer, Actuary
Milliman & Robertson, Inc.

Panel: Thomas F. Grillo, Asst. Vice President
& Sr. Regulatory Counsel
Continental Insurance Company

Philip D. Miller, Vice President & Actuary
Insurance Services Office, Inc.

Recorder: Malkie Mayer, Consulting Actuary

Good morning and welcome, at this somewhat early hour, to the 1987 Casualty Loss Reserve Seminar. In particular, welcome to the Tort Reform Session.

For the record, my name is Jeffrey H. Mayer, a consulting actuary with the firm of Milliman & Robertson. I will be your moderator for this morning's session.

We are privileged to have with us this morning two distinguished experts on the topic of Tort Reform. Thomas F. Grillo is Assistant Vice President and Senior Regulatory Counsel of P/C Companies for Continental Insurance Company. Philip D. Miller is Vice President and Actuary in charge of ISO's Data Management & Control Department and largely responsible for ISO's Studies with regard to Tort Reform.

Prior to joining Continental, Tom was Deputy Attorney General in New Jersey's Attorney General's Office, providing legal counsel to the Department of Insurance. Before that he was an attorney with the law firm Merlino & Andrew, which specialized in litigation.

Phil Began his career with the Insurance Rating Board in 1969 and occupied many positions until 1983 when he became Vice President and Actuary in charge of Personal Lines. In 1984 he attained his current position. Phil is an FCAS and MAAA and is a past president of CANY.

Tom will start us off this morning by introducing Tort Reform; How it works; How it doesn't work; Some of the legal perspectives of Tort Reform; and some of the future outlooks for quantifying Tort Reform.

Phil will then pick up and describe some of the recent studies conducted on Tort Reform, including ISO's studies, the Texas study and the HIRB study.

Finally, I will provide a brief and general description on how to attempt to consider Tort Reform when projecting loss reserves.

We are planning on leaving approximately 25 minutes for Q&A at the end of the session. We encourage you to jot down any questions or comments.

Let's begin, Tom, you're up!

THOMAS F. GRILLO: A large number of consumer activists were pushing the bounds of liability to expand liability -- to expand the concept of liability to also expand the dollar value of liability. I think a good example of that is product liability. In the 60's and the 70's you had a great number of innovative and creative trial lawyers, and expanding the concept of liability in products liability cases. Traditionally when you go back 40 or 50 years, the manufacturer of a defective product would be the only person liable in the event that product turned out to be defective. In the 60's and the 70's that concept was expanded. Tort reform then meant expanding liability and trying to place liability on virtually every entity involved in the chain of manufacturing from the design of the manufacturer, the wholesaler and the retailer. Oftentimes even the advertiser would be held liable on this expanding concept of tort reform. What has that tort reform in the 60's and the 70's generated? What it has really generated is a backlash, and now tort reform in the 80's really means a constriction of theories of liability. I think what we're looking for as an industry and what you're looking for as actuaries is some type of predictability in tort reform. I'm not sure if that predictability can ever really be achieved. Perhaps if the tort reform that we're looking at now ends up in the next several years restricting liability that in turn in 15 or 20 years may span another era of attempts to expand liability. I'm not sure we'll ever have a consistent long term theory of liability that we can all rely upon in all 51 jurisdictions. How does tort reform work? What are the various tort reforms measures that have been considered by state legislatures and what measures have been adopted? I guess now I haven't looked at my own chart lately, but I'm fairly certain that well over forty states -- probably closer to 43 or 44 have finally enacted tort reform measures in the states. Obviously, some states have adopted far fewer measures than others. And even among the states, for example, if one state were adopt or to abolish joint and several liability, that may mean something far different if one were to cross the border and go into a neighboring state that had adopted or had abolished joint and several liability. What is joint and several liability? Joint and several liability is a theory that permits recovery by the plaintiff from the deepest pocket in a multi-defendant case. That is all defendants in a multi-defendant case, regardless of their percentage of fault are jointly and severally liable to the plaintiff for the entire amount of the award. What's happened with that concept is the deep-pocket. The defendant with more assets and with more insurance could conceivably -- theoretically be responsible for the entire amount of any award, despite the fact that one or two of his co-defendants may have a larger or greater percentage of liability, if those other defendants have no assets or have no insurance. I think everyone can recognize the unfairness in that situation. As a tort reform measure the abolition of the theory of joint and several liability would mean that each defendant is only liable for his or her own percentage of fault. As I said earlier that's a nice abstract thought. However, the way its been adopted in states that have adopted it have thrown variations on that concept. I'll discuss those later, and I think in the ISO Report you'll see how those variations affect loss reserving.

Another popular tort reform measure, and probably an affective tort reform measure is the collateral source rule. The collateral source rule allows a judge or a jury to take into account funds that a plaintiff have received from other sources-- medical payments or what have you in terms of reducing the amount of the jury award. Another tort reform measure that has a great deal of popularity, but certainly is unpopular among trial lawyers, is a cap on jury awards. These caps run the gamut, not only in terms of dollar value but in the way they are imposed. In Virginia, they have enacted a cap of $1 million on all damages -- non economic and economic. Unfortunately, the capping portion of that statute was declared unconstitutional in Virginia by a Federal District Court. That ruling is now on appeal. Florida had enacted a $450,000 cap -- that cap was recently declared to be unconstitutional by the Florida Supreme Court.

Another popular tort reform measure is restrictions on punitive damages. I'm sure you've all read news accounts, maybe even been involved with punitive damage awards, where the actual damage is found by the jury or judge maybe an almost insignificant amount-- $5,000-10,000. The jury in an effort to punish a defendant or a group of defendants will impose a $2 million or $3 million punitive damage award. Often times a punitive damage award had no relation to the actual damages that were awarded by a judge or a jury. As I said, various states have adopted punitive damage restrictions, and again, they run the gamut. They can include absolute caps on punitive damages. One or two states have actually abolished punitive damages entirely recognizing the fact that oftentimes they don't bare any relationship with the actual damages that were suffered by a plaintiff. Other states have permitted punitive damages to exist, however, they've imposed more difficult proofs. For example, a plaintiff may have to prove a willfulness on the part of the defendant of wanton disregard of good business practices in order to enable a plaintiff to recover punitive damages.

A tort reform measure that has been generally overlooked in terms of its importance, at least in my opinion, are efforts to impose mandatory arbitration on certain types of cases. A popular arbitration issue is medical malpractice cases. I know in the state of New Jersey, medical malpractice cases have to go through a panel before they are allowed to proceed to a trial. Another popular form of mandatory arbitration is to force cases of a certain dollar amount or under a certain dollar amount to go to arbitration. There are also specialty reforms. I just group them together as specialty reforms. They are reforms such as liquor liability, social hosts. I'm sure you're aware from reading the newspaper that some states have imposed liability on social or party hosts for any damage that results from one of his guests becoming intoxicated and going out on the roads and being involved in an accident. The New Jersey legislature has attempted to retract that social host obligation by way of legislation. The New Jersey Supreme Court had imposed that expanding liability on social hosts. Other specialty reforms involve medical malpractice cases. As I said, Virginia attempted to do this by putting a $1 million cap. That was declared to be unconstitutional. Other reforms in the medical malpractice area may be to allow state of the art defenses. In other words, a doctor, hospital or nurse would be allowed to use as a defense the state of the art, state of the practice as it existed at the time that the alleged tort took place. Maryland passed a tort reform measure that deals primarily with medical malpractice cases. It's an odd type of reform. It limits expert witnesses. In other words, I think you're all familiar with the concept of expert witnesses. In order to prove a malpractice case, a plaintiff has to come up with an expert witness -- normally a doctor who will come in and testify that the defendant doctor or the defendant hospital did not exercise good judgment or acted negligently in its diagnoses or carrying out surgery or any other type of care. Of course, the defendant doctor or the defendant hospital trots out their expert witness to testify that the doctor's standard of care was certainly well within reason. Maryland has taken a pretty unique approach to that in that they have limited the amount of times an expert witness can testify during one calendar year, which could do one of two things -- cut down the number of malpractice cases or increase the number of doctors who will be called upon to testify. Then we come to the tort reforms that I don't even think are worth the time and effort it took to pass them. These are things like penalties for filing frivolous lawsuits or contingent fee limitations that are placed upon plaintiff's lawyers. I don't think there are many judges who are going to penalize a lawyer for filing a lawsuit no matter how frivolous it may seem to us or the judge. The contingent fee limitations may have some minor affect. I don't think it will really affect the number of lawsuits that are filed. Likewise, I don't think the potential for being penalized for filing a frivolous lawsuit will stem the tide of lawsuits that are being filed. Those are really the major tort reform measures that one will see fairly consistently from state to state. I think probably the first three or four are the most important and have the potential for having the most impact.

Whether they will actually have any impact is another question. That's an area that Jeffrey and Phil can address. How was tort reform in the 80's been sold. The arguments that have been typically used to pass tort reform are arguments that any half awake legislator can make. Those typically are insurance will become more available -- insurance will become more affordable-- rates will be reduced. Those are all arguments that were made by rote. I don't think a lot of thought went into making those arguments, but they just became good catch words or good symbolic statements that the industry made and legislators made in an attempt to pass tort reform.

Arguments that were typically used to oppose tort reform and are still typically used to oppose tort reform, and they're arguments that are not only made by trial lawyers, are that tort reform is a sneaky plot by insurers to eventually increase rates. And that plot by insurers can somehow take away fundamental constitutional rights from individuals who somehow end up with lower back strain by running into the back of a bus. Arguments that aren't typically heard in support of tort reform but should be heard, because these arguments make sense. The unreformed system-- this tort lottery system that we happen to be in right now has led to an immensely costly litigation system. I'm sure every state and jurisdiction has seen a mediocre growth in the number of lawsuits that have been filed in the last 15 to 20 years, and virtually every study bares that out. The hidden cost in that is the amount of taxpayers funds that have to go into supporting this judicial system. The expanding number of judges; the expanding number of courthouses; the expanding number of appellate courts that have to sit and review these cases. This system that has been built up has really been burdened by an enormous number of small cases -- insignificant cases -- slip and fall cases -- soft tissue injuries. What this has done is limit the ability of the judicial system to deal with important issues that face society. The judge has a calendar that's filled with $5,000 or $10,000 slip and fall cases, that detracts from his ability to handle cases that have a more important social impact. An argument that I think is fairly persuasive in terms of supporting tort reform, is that the system shouldn't punish an individual beyond that person's scope of liability. That's really a statement that directly addresses joint and several liability. The civil justice system really isn't designed to be a tort lottery where compensation should equal a person's injury. What it has really become in many jurisdictions is a lottery. I don't know how many jurisdictions in which you live allow lawyer advertising -- television advertising, radio advertising, or print advertising. I think the most outrageous examples of the tort lottery system are television ads for lawyers. I've seen them on Philadelphia and New York stations. It's almost like a Crazy Eddy commercial or I forget the name of the television show -- Monty Hall, Let's Make a Deal. There are lawyers who are literally waving people into his office. Lawyer advertising for Dalcon Shield cases or asbestos cases are really across the limit of ethics. That's come about because of this underlying tort lottery system that we now have, where everyone can be a winner and everyone has the potential to win big.

Arguments that aren't typically heard by opponents to tort reform -- these are arguments that you hear whispered in the hallways of state capitals -- is that any tort reform restricting liability or restricting a person's ability to file a lawsuit will lead to this little cottage industry that has grown up to support the tort lottery system -- plaintiff's lawyers, doctors, defendant's doctors, physical therapists. Perhaps the one industry that will be hurt the most by tort reform will be manufacturers of ultrasound equipment. Those little devices that people will go to physical therapists for 20-40 visits, and all it amounts to is a little deep heat treatment.

What affect, if any, will these tort reform measures have in the future? I guess from your perspective can these affects be quantified. The difficulty with judging what affect they'll have in the future is for one, we don't know how the future is going to be in terms of this little tort reform cycle. We had the tort reform cycle in the 60's and 70's. We have the tort reform cycle in the 80's. How long will this attempt to restrict liability go on? We may have a backlash in the 1990's, where liability will be expanded again. Tort reform measures are not consistent from state to state. I had a meeting with our branch manager outside of Minneapolis yesterday for Continental and his district area includes not only Minnesota but South Dakota and North Dakota. He was discussing the fact that a case in South Dakota that may be reserved for $5,000, will call for a $25,000 or $35,000 reserve if the same case were to exist in Minnesota. Just by simply having the geographical distinction, you can have this large variation in the reserving. Tort reform measures aren't consistent from state to state. I think that's one of the biggest drawbacks. The abolition of joint and several liability has taken an enormous number of variations where it's been completely abolished so that each defendant is only responsible for his own percentage of liability to a situation where its been abolished only for non-economic damages. It will still apply to economic damages. You will also have variations that will only allow or permit a defendant to be responsible for two times the percentage of his liability. They go on and on -- I don't recall New York specifically. But as I recall, the New York attempt to abolish joint and several liability has been meaningless.

Another impact on tort reform will be how it's judicially interpreted. That could be the biggest stumbling block in terms of predicting how tort reform will affect pricing in loss reserving. The two examples of that are the United States District Court of Virginia declaring the $1 million cap on medical malpractice awards to be unconstitutional. And also the Florida Supreme Court declaring that $450,000 cap on non economic damages to be unconstitutional. If you take Proposition 51 in California which abolished joint and several liability for non-economic damages, that measure has been upheld in several appellate courts in California. However, the courts have differed with respect to whether it would be applied retroactively or not. That's only one example of the court's interpreting tort reform measures. Over the next three to five years, the whole issue of tort reform will be unsettled because it will take that long for courts to come down with final interpretations and determinations with respect to how these various measures will last. Obviously, some tort reform measures are not, in my opinion, subject to a cap. It is a good likelihood that they will withstand judicial scrutiny. I think the area of tort reform that probably has a 50/50 chance of surviving will be the caps on awards.

The Virginia Federal District Court when it declared the cap to be unconstitutional relied on United States Constitution of the right to a trial by jury. I can predict other courts in other jurisdictions, when they're faced with this issue will try to extract that type of reasoning to impose in their own situations. However, be that as it may, all legislative acts or statutes that are adopted have a strong presumption of validity, so that anyone attacking any of these tort reforms measures is going to have a fairly tough road to hold if they're going to have them declared unconstitutional. What's going to happen in the future with respect to tort reform. Will it be a success or not? That's difficult to say because you have to have an understanding. You have to have the definition of what you want tort reform to accomplish in the first place before you can determine it's a success or not. What effect will it have on settlements in the future? It may not have any affect on settlements involving cases under a certain dollar value. You're a single defendant--a slip and fall, rear end motor vehicle case. You may not be affected at all. because those cases generally don't go to court -- they're settled out. The critical point in settling cases is going to encourage, enforce or in some way supervise the gestures in claims managers in the very use of these tort reform measures in negotiating cases. Will it reduce the number of losses that are filed? Probably not. You have a very large, strong, creative and aggressive trial bar in most jurisdictions. I don't think they're going to be dissuaded from violent claims and violent lawsuits on their clients behalf. That's all I really have at this point.

The one thing I want to leave you with is the dust really hasn't settled in tort reform, and it won't settle for a considerable number of years. Any attempt at this point in time to try an quantify the affect of tort reform or to come up with some type of price reflections based upon various tort reform measures, really I think could be an exercise in futility. Thank you.

PHILLIP D. MILLER: As Tom said the number of states which have enacted some form of tort reform, although it differs widely from state to state in terms of quality of the reforms that were implemented, are unprecedented in number. So too have been the demands for data and information. Data from state legislatures, regulators, trial lawyers, and others, either demanding an evaluation of the tort reforms which have been enacted. What are they worth and/or an evaluation of tort reforms which are being proposed in different jurisdictions. The question of what data is available has kind of a good news/bad news answer to companies or people interested in loss reserves and loss reserving. The good news is, the industry has been responsive by making available all the information that is out there to help in evaluating tort reform. ISO has undertaken two major studies, one of which is completed and one of which is well underway. There have been several other serious efforts in collecting information which would be valuable in assisting people in evaluating tort reform. That's some of the good news. The bad news is, of course, almost all of the effort to date has been focused on the issues of evaluating tort reform and reducing the number of judgments that have to be made. And virtually none of those efforts were specifically designed with loss reserving in mind or providing information that will be helpful to loss reserve analysts. More good news is, there is a great deal of similarity between the information that one needs to analyze loss reserves and some of the judgments that have to be made, and some of the pricing questions and judgments. More bad news is at the end of this session you're still not going to have a magic formula from me or Jeff, unless someone in the audience has one to volunteer. All that most of the studies that have been and are being conducted will accomplish, will be to help reduce the number of judgment elements that there are in either pricing or establishing reserves for tort reforms. I don't think any one of them can give you a single answer.

As I said my major focus will be on the two ISO studies. I will try and make you aware of other data which is available. There are two separate ISO studies. The first, the Claim Evaluation Project, is referred to as the HR&A study, which ISO used the consulting firm of Hamilton, Rabinowitz & Alshuer to assist in its completion, and the other will be referred to as the Claim File Data Analysts. Why did we undertake these studies? I think in a nutshell we covered some of this but first we wanted to provide assistance to those in the industry, those in the regulatory ranks, legislative ranks, and the public, who have been clamoring for information in helping to make some of the difficult judgments that are going to have to be made. Second, we wanted to be responsive to legislative demands and demands of the various states to gather all of the information that insurers had in those claim files. Surely it's not going to have everything that they could possibly want. Our third purpose was a very selfish one: Some sixteen or seventeen states had already enacted various data collection mechanisms. Each one different and each one not fully successful in accomplishing its purposes. None of them are combined -- all diverse, all expensive, and all difficult for the industry to comply with. We hoped to preclude other more onerous and frankly less useful studies by doing it once, and doing it the best way the industry can, by gathering all of the information that they could possibly get to help shed some light on the issues.

In the first study I mentioned the consulting firm of Hamilton, Rabinowitz & Alschuler provided assistance to us. They designed an approach which was somewhat unique and different than past studies. The study encompassed 1262 claim professionals from nine major insurers of general liability insurance, and two independent adjustment firms. It focused on tort reforms in twenty-four states. Fifteen of those states had actually enacted some type of tort reform during the 1986 legislative sessions, and nine of those states simply had tort reform in various stages of discussion in the legislative arena. They effectively defined six standardized claims. What do we mean by standardized claims? They made up the facts and they tried to come up with typical claim situations, every day run of the mill situations that would be realistic people. They did not create a case where somebody was hurt by a lawnmower while mowing a lawn. Rather they created things like a thirty year old woman who slips and falls in a supermarket because there's a piece of wet lettuce, breaks her hip and goes to the hospital and spends so many thousands of dollars in hospital bills -- takes six weeks to rehabilitate. It gave information on what her wage loss was during the period in time. Whether she was covered by group health insurance or not. The same kind of facts that claims adjusters receive in making their valuation to determine what kind of settlement to offer this person. They created six separate factual situations, and for each of those situations underwent successful evaluations. They said to the claims adjuster, prior to enacting the tort reform that was in fact enacted in the State of California, what would this factual situation be worth? What would you offer for settlement at this point? The number was entered and then they said we've kept all the facts the same in this case, except the one change in the law in California, as a result of the tort reform that was enacted now what would you offer in settlement? They did this for each of the enacted tort reforms in those states which had them enacted. They did it for what R&A determined to be the most popular set of tort reforms that was pending before the legislature in the nine states that had not yet enacted any changes. Additionally, they defined, and I'll get back to exactly what they are, but they defined a set of standardized tort law changes that they tested uniformly across all twenty-four states. They conducted it just like a CAS exam. They got all 1262 claims adjusters in 80 separate locations throughout the country. Each one handling the state that they're normally responsible for handling. They coordinated time zones and held it at 10:00 in the morning on Eastern Standard Time so there could be no communication from location to location. All questions were centrally answered so that they all received uniform instructions and uniform testing provisions, and they formed their evaluations.

I said there were several nationally tested changes -- what were they. The nationally tested changes were first what I characterize as the pure form of abolition of joint and several liability, unadulterated by considerations of only applying to the non-economic loss piece -- unadulterated by considerations of what specific percentage of fault the defendant had. If it were more than twenty five percent then under some enacted laws, you don't have to abolish it. All the various nooks and crannies, twists and variations taken out -- just a straight abolition of several liability. The second national tested change was complete relaxation of the collateral source rule. You're no longer barred from introducing collateral sources as evidence and having a direct offset dollar for dollar for collateral sources. So that if the injured victim had $100,000 is medical expenses but he had a group health policy covering for $50,000 of it, effectively he would only be compensated for the $50,000 the injured party had to pay out-of-pocket. There would be no exclusions to the offset except for legal entitlement. What is a legal entitlement? An example is workers' compensation. The third item that was uniformly tested was a$250,000 cap on non-economic losses. What kind of information can you get out of this analysis which has already been printed and published. By looking at the six individual cases, it gives you an understanding of the types of claims that are impacted by each of the different tort reforms and the types of claims that aren't. It helps give an understanding of the direction and relative magnitude of some of the changes. It's particularly useful for evaluating the different effects of a given tort reform on the same claims. That's the difference of each of the three nationally tested tort reforms on the same claims or perhaps more interesting you can see the impact of some of the variations of tort reforms. Some of the bells, whistles and exclusions that are thrown onto the various tort reform, you can see how that will impact the savings on a given claim.

Mr. Miller then presented the remaining material on Exhibits 7-17 attached.

Jeffrey H. Mayer:

What are the major considerations of Tort Reform on setting loss reserves?

Firstly, we may need to wait for emerging experience as our current data base may be too immature to reflect the effects of tort reform.

The impact of tort reform will depend on a number of things. As Tom previously mentioned, different states have different types of tort reform law. Since tort reform has different implications amongst states, the impact will vary by state. In addition, the impact will depend upon both the attorney's and plaintiff's behaviors and thus each particular claim will be impacted differently.

How should we account for Tort Reform law in our loss reserving methods?

Firstly, since tort reform effects differ by state, regardless of which loss reserving method you use, you must consider premium distribution by state.

If you are using the Loss Ratio Method, apply a loss ratio consistent with the assumptions used in the pricing end, making sure that it is reasonable.

If you are using the Counts & Average Method, note the following. Claim count projections will likely be unaffected. When determining average value, you must consider caps on non-economic awards, collateral source and other specific tort reform law changes.

The Development Technique requires adjusting factors for older accident years (up or down) to reflect the Tort Reform law changes. Most recent accident years will likely be based on counts/average approach.

And finally, using the Bornhuetter-Ferguson Approach, we require the a-priori loss ratio to be reasonable and the loss development factors tempered, as mentioned above.

One final note - since our current data base does not accurately reflect the impact of Tort Reform law, present adjustment to loss reserving methods are more judgmental rather than statistical.

Question: Tom says that more arbitration is a positive action in regard to Tort Reform. How will more arbitration reduce claim costs? Arbitration will increase the length of legal services needed and thus would seem to increase the costs of claims.

Tom Grillo: Yes, the length of legal services will be increased, yet, arbitration will cut out court time, freeing up the system for larger cases. Even if arbitration doesn't provide society with a monetary advantage (of reduced claim costs), it has an economic advantage, namely, court time can then be used for more important and larger cases.

Question: I feel Tort Reform is a community and society issue. Why is the insurance industry getting so heavily involved?

Tom Grillo: Opinion surveys have shown people to be more <u>pro</u> Tort Reform. They realize that these large awards are paid from taxpayers' dollars. It is true that the insurance industry should not have gotten so involved with this issue, but people are pro-Tort Reform and are pushing for it.

Jeffrey H. Mayer: <u>I will leave you with the following question</u>

As Tom stated earlier, Tort Reform in the 1960's - 70's resulted in loss reserves that were terribly deficient.

Will Tort Refrom in the 1980's result in loss reserves that are terribly redundant?

I don't think anyone at this time has an answer to that question.

DATA AVAILABILITY

- FOCUS HAS BEEN ON PRICING

- SAME DATA NEEDED FOR RESERVES & PRICING
  .. indemnity
  .. LAE

- RECENT STUDIES: HELPFUL TO ANALYZE TORT REFORM IMPACTS

  .. ISO/HR&A's Claim Evaluation Project

  .. ISO's Claim File Data Analysis

  .. Texas Closed Claim Survey- February 1987

  .. HIRB Study- July 1987

ISO CLAIM STUDIES

PURPOSE

- ASSIST IN MAKING DIFFICULT JUDGEMENTS
- GATHER ALL AVAILABLE INFORMATION
- PRECLUDE OTHER MORE ONEROUS, LESS USEFUL STUDIES

ISO/HR&A's CEP

METHODOLOGY

- CONDUCTED BY HR&A
- 1,262 CLAIM PROFESSIONALS
- 9 INSURERS; 2 ADJ. BUREAUS
- 24 STATES

ISO/HR&A's CEP

METHODOLOGY

- 6 STANDARDIZED CLAIMS
- SUCCESSIVE EVALUATIONS
  .. enacted changes
  .. proposed changes
  .. 'nationally tested' package
- SIMULTANEOUSLY ON JAN. 15

ISO/HR&A's CEP

NATIONALLY TESTED CHANGES

- **ABOLISH JOINT & SEVERAL LIABILITY**
- **RELAX COLLATERAL SOURCES RULE**
  - .. dollar for dollar offset
  - .. unless legal entitlement
- **$250,000 CAP ON NON-ECONOMIC DAMAGES**

ISO/HR&A's CEP

TYPES OF INFORMATION

- TYPES OF CLAIMS IMPACTED
- DIRECTION & RELATIVE MAGNITUDE OF IMPACT
- COMPARE IMPACT OF DIFFERENT REFORMS

ISO/HR&A's CEP

ADVANTAGES

- **CLAIM EVALUATION IS SUBJECTIVE**
  - .. intangible losses
  - .. perception of fault
  - .. shadow of the law

- **95% OF CLAIMS SETTLED VOLUNTARILY**

- **CONSTANT FACTUAL SITUATIONS**
  - .. isolate law change

- **ANALOGY: AUTO FUEL EFFICIENCY**

ISO/HR&A's CEP

LIMITATIONS

- 6 CLAIMS ONLY
  - .. BI only
  - .. larger than average
  - .. defendant 100% liable
  - .. against businesses
- INDEMNITY ONLY
- PRIMARY INSURER
- TYPICAL, NON-AVERAGE FACTS
  - .. e.g., collateral sources

ISO/HR&A's CEP

KEY CONCLUSIONS

- NARROW & SPECIALIZED IMPACT
- DIFFICULT TO PREDICT
  .. limitations, exclusions, uncertainties, etc.
- SIGNIFICANT IMPACT OF ALTERNATIVE CHANGES

ISO CLAIM FILE STUDY

OBJECTIVE

- PROVIDE A DATA BASE TO ASSIST IN EVALUATING TORT REFORM

ISO CLAIM FILE STUDY

OVERVIEW

- 27 STATES
- 24 COMPANIES
- BI CLAIMS ONLY
- COMMERCIAL LIABILITY
  .. general liability
  .. commercial auto
  .. businessowners

ISO CLAIM FILE STUDY

OVERVIEW

- LARGE CLAIMS
  - .. BI over $25,000
  - .. policy year 1983
  - .. open & closed claims
- CLOSED CLAIM SAMPLE
  - .. all sizes
  - .. August, 1987
- ALL GOVERNMENT CLAIMS
  - .. regardless of size
- -- OVER 12,000 CLAIMS --

ISO CLAIM FILE STUDY

TYPES OF INFORMATION

- **OBJECTIVE DATA ON**
  - .. claimant
  - .. insured
- **PUBLIC POLICY INFORMATION**
  - .. use of counsel
  - .. stage of legal process
- **SUBJECTIVE OPINION ON TORT REFORM IMPACT**

TEXAS CLOSED CLAIM

- BI: GL, CA, MPL
- INDEMNITY OVER $25,000
OR
ALAE OVER $10,000
- OVER 3,000 CLAIMS IN MOST OF THE ANALYSES
- SNAPSHOT OF SMALL CLAIMS

TEXAS CLOSED CLAIM

- **AREAS OF INTEREST**

  .. change in venue
  .. attorney involvement
  .. legal system
  .. joint & several liability
  .. collateral sources
  .. structured settlements
  .. non-economic damages
  .. prejudgement interest
  .. punitive damages
  .. ALAE
  .. large vs. small claims

HIRB STUDY

- ONLY 1 STATE

- METHODOLOGY
  .. template 1588 claims
  .. compiled information about 705 claims
  .. committee review
  .. majority ruled

- RESULT:
  .. order of magnitude & direction
  .. impact on indemnity & ALAE

CAVEATS

- CONSTITUTIONALITY
- COURT INTERPRETATIONS
- ATTITUDINAL CHANGES
  .. plaintiffs
  .. lawyers
  .. arbitrators
  .. judges, juries
- CLAIM VALUE IS SUBJECTIVE
- INFLATION
  .. wage
  .. medical
  .. social
- STILL A JUDGEMENT CALL

IMPLICATIONS TO THE VARIOUS LOSS RESERVING METHODS

METHOD	ISSUE
ALL METHODS	MUST CONSIDER THE PREMIUM DISTRIBUTION BY STATE.
LOSS RATIO	APPLY LOSS RATIO CONSISTENT WITH PRICING; (I.E., MANDATORY ADJUSTMENT, ... ETC.). BE SURE IT'S REASONABLE.
COUNTS/AVERAGE	CLAIM COUNTS PROJECTION LIKELY UNAFFECTED; AVERAGE VALUES MUST CONSIDER CAPS ON NON-ECONOMIC AWARDS, COLLATERAL SOURCE ... ETC.
DEVELOPMENT TECHNIQUES	FACTORS FOR OLDER ACCIDENT YEARS NEED TO BE ADJUSTED (UP OR DOWN) TO REFLECT THE CHANGES DISCUSSED. MOST RECENT ACCIDENT YEAR WILL LIKELY BE BASED ON COUNTS/AVERAGE APPROACH.
BORNHUETTER-FERGUSON	A - PRIORI RATIO AND TEMPERED FACTORS, AS ABOVE.

1987 CASUALTY LOSS RESERVE SEMINAR

1G - ADVANCED TECHNIQUES I

Moderator: Charles McClenahan, Partner
Coopers & Lybrand

Panel: Harry Panjer, Professor
University of Waterloo

S. PHILBRICK: My name is Steve Philbrick. I don't think my name for the discussion, but I've decided to butt in anyway. I'm here because we have an advanced track in which a number of sessions have something to do with one another and I wanted to give you a quick idea of how that weighs out, and then I'll turn it over to the distinguished panelists. Session 1G is where we are right now. Chuck McClenahan and Harry Panjer are going to give an introduction to mathematical models. We're going to follow that by Section 2G, which involves Jerry Miccolis, Roger Hayne, and myself. This will be some work on considerations regarding loss reserve margins. A lot of the outgrowth was work done by the Committee on Theory or Risk. This afternoon we'll follow-up with Session 3G and 4G. It's shown as a combined session, it will be given by Ben Zehnwirth and Greg Taylor. They're going to give us some real life examples. They're going to try and go beyond theory and show some actual applications of using mathematical, statistical models to measure what's going on in the actuarial world. Tomorrow morning in Session 5G we have what we're calling a workshop. The intention is that all of the panelists mentioned above will show up. We will leave it open in somewhat of a loose forum either for questions if you have questions. If any of the panelists find that they didn't complete all of the material they intended to complete, we use that as an excuse to finish that up. If all else fails I'm sure some of the panelists will come up with some relevant remarks. With that I'll turn the podium over to Chuck McClenahan, who will moderate this session and tell us about the rest of the session.

C. MCCLENAHAN: Good morning. I believe I was selected to moderate this introductory session because I'm basically non-threatening. I've done a great deal of work with reserve models. I've written two papers based upon a very simple exponential model. I've developed a model at mortgage guarantee on frequency and severity where if you're by some stretch of the imagination able to accurately predict unemployment, housing costs, and interest rates, I can tell you what the resulting frequency and severity will be of the mortgage guarantee default. Of course, if you can accurately predict unemployment, housing costs, and interest rates, you don't need me because you're going to be rich anyway. And we've developed a pretty good model of product liability exposure runoff. When I work with reserve models I feel only a need to understand about half of what Glenn Myers wrote, and about a quarter of what Steve Philbrick says. And that's why I was selected -- to provide a bridge between the hundreds of reserving actuaries out there who are mired in the process of clearing the triangle, and those few who are on the cutting edge of risk theory application. I was asked to present a kind of a light introduction to the topic of building models.

[SLIDE]

Some earlier lessons about what I've learned about building models. The first group of models generally doesn't involve Christie Brinkley, and the second group of Monte Carlo simulation is not merely so romantic as it might sound. We are a very short step from traditional loss reserving methods where you're trying your loss development patterns to deterministic mathematical models such as the very simply exponential model that underlies the general papers that I wrote. The work with models has certainly been enhanced by the development of the personal computer. I remember days when multiplication was time consuming and expensive, and now we can do just about anything very quickly. Sometimes, however, the models don't perform quite as well as they might, and I want to discuss just a few of the common problems that you run into in reserving modeling.

The first problem is over simplification. Retro reserves based upon loss ratio is probably an example of over simplification. Any of you who has worked in the area of reserving for retro return and additional will understand what I'm talking about. Those who have not ... of over simplification in reserving, and that can lead you down a primrose path very easily. And finally, allocated loss adjustment expense based upon calendar year paid ratios. Anyone who has spent much time with that knows the results. On the other hand, there's over complication or the William Golding syndrom -- taking something that is inherently simple and making it complex. Actuaries have really made a living doing this so I don't know if I should get into it too much. But examples might be unallocated loss adjustment expense based upon size of loss distributions, and any model where you have too many independent variables to contend with. Failure to retain essential elements. An example from the 60's is a portfolio selection model which was developed for the investment areas, which was applied to insurance lines of business to try and optimize the portfolio by line of business. It resulted in the finding that a specific company should emphasize auto BI and not write auto PD. That failed to retain the essential element that you can't write one without the other. Putting it together wrong -- having the right element and using it wrong. An example of this is a mortgage guarantee model that was used by a major mortgage guarantee insurance company, which based its frequency model on the absolute rate of unemployment rather than the change in the rate of unemployment. And finally, sometimes the model develops a life of its own, well beyond what was originally intended. An example of this would be the NAIC IRIS system.

Briefly, and not to take too much of your time this morning, I want to talk about why I like models. First, they give me the ability to look at things in new ways. For example, whether or not a reserve portfolio can self liquidate over time. We may know the reserves are deficient but if that deficient reserve portfolio can successfully liquidate over time. In dealing with regulatory situations we can advice the regulators that the proper course of action may not be liquidation but may be conservation. The impact of economic changes on reserve portfolios can be modeled. And things like confidence levels can be dealt with. Sometimes when you build a model and you reduce a process to its essentials, it results in some added elegance, at least to your understanding of the process. You can spend your time on what's important and ignore that which is not important. Models let me get into risky situations without taking any risk. I can model what can happen under various economic and underwriting scenarios. I don't have to go through and do it. Finally, they make me look good -- clients love them. They like to go back to their CEO and say -- look at this model they developed for me, this can do lots of neat things. That's why I like models, and those are some of the common pitfalls.

If you look at your programs you'll note that Bill Jewell, Professor at the University of California was originally supposed to be here today. When a conflict arose he was going to make a videotape of his presentation. We don't have a videotape for various reasons, so Harry Panjer is going to pick up the slack and be the panel this morning. Dr. Panjer is a Professor of Actuarial Science at the University of Waterloo, Canada, which is certainly one of the top actuarial schools in the world. He's a Ph.D., FSA, FCIA, and is Director of the New Insurance Research Institute. He's written many papers on stochastic modeling of insurance risk, and Dr. Panjer has served on many committees of the Society of Actuaries and was elected to the Society of Actuaries' Board of Governors for the 1987 through 1990 term. He has a book scheduled to be published next year on insurance risk models, which will contain heavy emphasis on property and casualty. Please join me in welcoming this morning's panelists, Harry Panjer.

INTRODUCTION: I'll just make a few introductory remarks before I begin. Bill Jewell is unable to be here. He sent me a copy of a paper which I will mention later, as well a letter to the members of this loss reserve seminar. I will read that letter at the end, and it will serve as a summary for my remarks. I originally had planned a few jokes but Chuck McClenahan has used them all up. There aren't too many puns you can play in the word modeling. Chuck's done it all very well.

It gives me a great honor to be here. As Chuck mentioned I'm an academic actuary. I'm really not a loss reserver but I have spent a lot of times playing with models. Not Chuck's kind of models but my own kinds of models. I'm going to make a number of remarks regarding modeling of risk processes and loss reserves in particular. I'm going to be making a number of criticisms of current methodologies. Those criticisms are really meant to be constructive self-criticism, and I hope you will take the criticism in the way in which they are intended. This is not the organization that I'm used to. I'll have to hold my transparencies.

In 1980 Bill Jewell wrote a wonderful paper for the International Congress of Actuaries. If any of you have not read this paper I would urge you to read it. It discusses very extensively mathematical modeling in insurance, and various paradigms that are used in insurance and other related fields. I won't be drawing directly from that paper but a lot of the things that I will be mentioning today are also reflected, probably much more coherently in Bill's paper of 1980.

TRADITIONAL MODELS: The subject today is loss reserving. Is it an art or is it a science? We often characterize art as informal and science as found in nature. As actuaries we cherish the ability to use so called professional judgment in coming up with estimates for various quantities, whether they be for the purposes of pricing, reserving, or setting up surplus for an insurance company. In a sense, loss reserving lies somewhere between art and science, at least insofar it is practiced by actuaries. We first consider the scientific method as it applies to loss reserving.

The scientific approach to model building really follows a number of steps. First we hypothesize a certain relationship between variables. In a traditional scientific context, we conduct some experiments in order to obtain observations of the relationship between the variables under consideration. We don't have to conduct the experiments in the loss reserving context -- that's done for us. Then we obtain some measurements based on that experience. In loss reserving we traditionally collect the data in the form of a runoff triangle in terms of aggregate losses, or in terms of numbers of claims paid or incurred -- perhaps cumulative. Then we construct a model which we believe represents reality. We calibrate the model next by taking the data and in statistical terms, estimating the parameters of the model. Finally, we validate the model. If we hypothesize a model; we build a model; we estimate the parameters of the model; we somehow have to then determine whether the model is valid relative to the information we have. So the validation is a very important part of the process. Once we've shown that the model is reasonable, we implement the model. I'll be talking a little bit more about calibration and validation and model construction with respect to loss reserving in the next hour.

Loss reserving as an art. We might paraphrase the old adage "Beauty is in the eye of the beholder". If we think loss reserving is really an art form then "Accuracy is in the eye of the reserver." We often judge methods of loss reserving by the reasonableness of the answers we get. And what is reasonableness? That's a function of our own general knowledge-- our own intuition about the underlying process. In theory at least, science attempts to deal with things objectively. We have hard facts -- we develop rigorous methods, and we come up with objective solutions. But the apparent cost of a scientific method is that in the loss reserving process we may lose some control of that process. There are generally no simple mechanism for input of subjective elements; hence, no potential for using professional judgment. In what follows I will also discuss the world of professional judgment and subjective inputs within a scientific framework. Let's take a typical runoff triangle (Table 1). This data is taken from another source which I won't identify but and my comment are not intended to be critical the author's working in any way.

TABLE 1

Insurance -- Coverage
Cumulative Incurred Loss
As of December 31

Accident Year	Months of Development 12	24	36	48	60	72	84	96
1978	540000	690000	840000	890000	920000	950000	950000	950000
1979	550000	750000	900000	950000	980000	1000000	1000000	
1980	660000	790000	970000	1020000	1050000	1090000		
1981	670000	760000	950000	1040000	1090000			
1982	730000	990000	1140000	1240000				
1983	760000	1050000	1230000					
1984	900000	1200000						
1985	920000							

This is a typical incurred loss triangle. In this we see numbers are pretty stable. Things increase by accident year -- if we look over years of development, again we get the normal kind of increase that we expect. As loss reservers what do we do with this data? Well, the first thing we usually do is look at development factors. We look at development factors. We look at age-to-age development factors and try to figure out what's really going on in these numbers. First of all, why do we even do this? We do it because we believe that there is some kind of

TABLE 2

A DEVELOPMENT FACTOR METHOD

Insurance
Incurred Loss Development
As of December 31st

Accident Year	Months of Development 12	24	36	48	60	72	84	96
1978	1.278	1.217	1.060	1.034	1.033	1.000	1.000	
1979	1.364	1.200	1.056	1.032	1.020	1.000		
1980	1.197	1.228	1.052	1.029	1.038			
1981	1.134	1.250	1.095	1.048				
1982	1.356	1.152	1.088					
1983	1.382	1.171						
1984	1.333							
1985								
Average	1.292	1.203	1.070	1.036	1.030	1.000	1.000	
Average Excluding High/Low	1.306	1.204	1.068	1.033	1.033			
Weighted Average	1.305	1.195	1.076	1.038	1.031	1.000	1.000	
3 Year Average	1.357	1.191	1.078	1.036	1.030	1.000	1.000	
Linear Trend								
Slope	0.013	-0.010	0.010	0.004	0.003			
Intercept	1.240	1.238	1.041	1.025	1.025	1.000		
R Squared	0.088	0.266	0.576	0.392	0.092			
Projected	1.344	1.168	1.098	1.046	1.036	1.000		
Exponential Curve								
Slope %	1.000	-0.849	0.894	0.394	0.265			
Intercept	1.239	1.239	1.041	1.026	1.025			
R Squared	0.083	0.273	0.575	0.391	0.091			
Projected	1.341	1.167	1.099	1.046	1.036			
Selected	1.330	1.185	1.085	1.042	1.034	1.000	1.010	1.000

*Judgment was used in reviewing historical experience and choosing selected factors.

inherent stability between successive development years. We haven't talked about a model yet. There is an underlying model related to this (development factor) method. According to the scientific method what we really should do first is propose a model reflecting relationships that we believe to be true and then develope a method based on the model. We look at the development factors in Table 2. Most of you would have done this before, computed things like the average or a weighted average using some arbitrary weights. When you see that these numbers vary a bit, you might put a linear curve through them you might put an exponential curve through them to come up with some projected values. Then finally, the normal sequence of events has us select some number from those. But we really have no basis on which to select these numbers. For instance, if we look at the amount of variation explained by the linear trend we now see it's now 9% in this case. That really tells us this projected number is worthless. This raises the question of how valuable the projections that we make based on these numbers really are. We use these numbers in a very subjective way in coming up with a final estimate. I could list a number of other estimates. For instance, a simple geometric mean might be more appropriate. This development factor method is not scientific and I will discuss a bit more during this talk about more scientific approaches to this kind of problem.

One might ask a variety of questions about this method that we've all been taught. Why do we fit these linear or exponential curves to developmental factors? Why not put them to the raw data themselves? We could have done that, the data were very stable and could have easily fit curves and done projections. One of the answers is that perhaps the volume of business, that is our accident year numbers have more inherent instability in them than the ratios from development year to development year. We believe there is some stability. If it's not clear, when I put the runoff triangle up, that any kind of stability exists in the ratios. It appears that the actuarial losses were quite stable, but when we look at the ratios they jump around a bit. What we have done traditionally in actuarial circles is attempted to adapt the basic method, which says we have stability, by trending the development factors. One underlying question is that once we've done this adaptation, what really is the underlying model? How many parameters are we estimating? How many parameters are we introducing? Other related questions might be how does this adaptation in trending affect the reliability of our ultimate estimates? We don't have answers to those questions based on simple development factor methods. There is an underlying model of course in the development factor method and that is, of course, somehow the observations for accident year "i" and development year "j" is related to the initial value for accident year "i", that's development year zero and a set of development factors. Our job then when we use this model is to estimate these factors. This is essentially the model that underlies the development factor method. How do we estimate this value? There are several ways of estimating the initial value. We could simply pull the number from the runoff table, that's our initial value or we could do it in several different ways. One would be to trend the losses in the first year and use the fitted value for the "__" year for the estimate of this initial quantity. Ultimately the question that we should try and answer is -- is this model appropriate? What we need to do after we do the estimation is to validate the model.

For those of you who have worked with development factor methods, we know that the method breaks down when the data gets very noisy. That is when we have lines of business where we have a lot of bouncing around. How do we know that? Well we eye-ball the development factors and saw that they weren't very stable. How do we know what stability means in this context? Once we realize that this model doesn't work in data that are noisy, the traditional approach is to come up with some other method that gives results that are closer to what we expect. We come back to the basic question -- is this science or is this art?

I would like to refer to a couple of very well known books that have been published in the area of loss reserving dealing with methods and models. One by Jacob van Eeghen of National-Nederlanden entitled "Loss Resolving Methods". It is a survey of a variety of loss reserving methods, including the well-known McClenahan method. The second book is by Greg Taylor of Australia -- "A Survey of Claims Analysis in Non-life Insurance," who will be one of the speakers this afternoon. His book contains a wealth of information dealing with a variety of stochastic and non-stochastic micro and macro models for loss reserving. There's been a flurry a papers in the last few years in the area of loss reserving in the international literature. If you're interested in looking for those papers a very good place to look would be in the journal "Insurance Abstracts and Reviews", which abstracts and reviews insurance and actuarial science journals around the world. All you have to do there is look under the key word "loss reserving" and it will reference all of the papers that have been published since about 1980 in the area.

So much for the basic criticism of other development factor method. Let's get back to basics. What is the purpose of building a model in the loss reserving context? The ultimate model is to forecast. We have information about the past and we also have ancillary information, and it's our job as actuaries to forecast what is going to happen in the future so that we can set up an appropriate liability. A related objective might be to attempt to understand the behavior of the underlying random process which generates claim delays and size of claim. In a sense other scientists might say that one of the intermediate objectives is to separate the signal from the noise. To extract the useful information from the data that we have. We're interested in separating the signal from the noise for the purpose of a better understanding of the basic underlying process. Why are we interested in understanding the behavior? If we can understand the underlying behavior, that may lead us to develop better methods which will give us in turn better forecasts. When I say better forecasts I mean not necessarily a forecast that is good in a single year. In the long run our forecasting method will be more stable and give more accurate results over a large number of years. In statistical terms when we discuss accuracy of forecast, one very important quantity is a standard error of the forecast. We're not only interested in whether a particular year the forecast is on, but we should also be interested in how accurate the forecast is -- and we measure that accuracy in terms of the standard error.

In the forecasting process there are a number of sources of error. In other words, the number that we forecast may be different from the actual outcome of the random process for a variety of reasons. If we forecast a certain number of claims over the next payment year for all accident years separately or combined, one year later we can look at the results and compare them with the forecast that we made the last year. They will be different for a variety of reasons. First, there are natural fluctuations - a storm in a particular city during the year may mean that there are a whole lot of losses that we didn't anticipate. We have no control over the weather. On average, we expect certain numbers and sizes of claims. We will always get random fluctuation by the very nature of the claim generation process. In casualty actuarial circles we often talk about parameter uncertainty as well. That is lack of knowledge about the true value of some underlying parameter which is part of the model. I'm not going to spend a lot of time talking about parameter uncertainty but it is reflected in the random fluctuation portion as well. The variance of that random fluctuation can be decomposed into two parts, that which is purely random for fixed parameters and that which is due to parameter uncertainty. Parameter uncertainty is discussed in many papers in the proceedings of the Casualty Actuarial Society. The second source of error in forecasting is the estimation error. In other words, once we choose a model and we calibrate it, the estimates that we come up with based on our data will have some inherent error in them. The estimates have errors associated with them, this will induce an error component on our forecast.

Finally, it is possible to choose the wrong model. When we select models we never go through the range of all possible models, we restrict ourselves to what we believe to be a reasonable subset of models. We attempt to find the model that is best. There will naturally be a model specification error.

What kinds of models can we use in loss reserving. Greg Taylor, in his book, discusses a taxonomy of loss reserving methods. One important way of distinguishing between two types of models is micro models versus macro models. Most actuaries are accustomed to dealing with macro models -- that is we model the total claims en masse. We lump all our claims together, either claim numbers or claim payments in a runoff triangle summary. We have no information about the individual losses themselves -- that's a macro model. Micro modeling is a little different, and a lot of people in other fields use micro modeling to model what we would call the claim generation process in the loss reserving environment. A micro model would be one that is based on generation of the individual claims all the way from occurrence to final settlement.

A lot of people have been working in the micro modeling area. A lot of people as well are working in the macro modeling area as well. These can be rationalized in many cases. The models are not necessarily competing models. In the micro model context, typically the kind of information that we might have is for each claim we have an occurrence date, a reporting date, a settlement date, and finally an amount. We could have other intermediate dates as well, but this is a typical situation. These are the typical dates that we're interested in. In the macro model we have data in the runoff form -- accident year, development year, and we have aggregate numbers. In a micro model we have much more information than we do in the macro model because a lot of the information that is in the micro model is combined and aggregated. We have traditionally been accustomed to dealing with macro models and one of the reasons that we've been accustomed to dealing with macro models is really tradition. Tradition relates of course to the tools that are available to us. With the macro model we can easily develop development factors using desk top calculators. There's no need, in my view, to be restricted to considering only macro models theoretically at least, we could study micro models as well, as long as the data is available to us. And that's kind of a separate issue.

<u>STOCHASTIC vs. NON-STOCHASTIC MODELS</u>: There's been a lot of talk in the loss reserving area about stochastic and non-stochastic models. Another way of looking at models or methods is to look at whether they are stochastic or non-stochastic. Stochastic models explicitly recognize some kind of random component. In

other words, what we try to do in stochastic models is model some underlying basic structure but recognize that the numbers that come out of the process will not follow that structure religiously -- there will be some "error term". What we might do in this kind of development factor context is add some error term. It's probably more appropriate to use a multiplicative error so the error is in percentage terms. Secondly, when you take logarithms from the mathematical point of view, we can set up a nice simple linear model. An additive or multiplicative model each attempt to recognize some random component. This is what we call in statistics an "error term". It's certainly not a mistake term. It's a term that is intended to represent the noise or the randomness in the process, whereas the other portion is the signal. Most of the traditional methods based on ratios might be described as non-stochastic models. We assume that there is some structure, and then what we do is try to figure out what all of these development factors are, but we also know that we have to estimate them from data because these do not turn out to be exactly stable. There is an inherent internal contradiction here because once we get to the estimation stage, we're implicitly recognizing that there is variation from this non-stochastic model!! So the conclusion is simple. All models are stochastic -- it's the question of whether we recognize that they are or not. Generally in model building, we should attempt to build models that explicitly recognize the stochastic component.

PRINCIPLES IN MODEL SELECTION: What are some basic principles in model building or model selection? One word that you'll hear a lot today is parsimony. The idea of parsimony is, in a traditional curve fitting jargon, to obtain a balance between the "fit" and "smoothens" in the model. If we have more parameters in our model we can we typically have a better fit. The model behaves better as far as the data are concerned. On the other hand, if we're interested in doing prediction and we have fewer parameters will give us better predictive power in general. I'm not going to define any of these terms mathematically.

The purpose of my talk is to broaden the introduction to some of the basic concepts that will be discussed in the next three sessions. To paraphrase Einstein, he said "every model should be made as simple as possible, but not more so". We attempt to simplify our model as much as possible to get a lot of predictive power, but we run the risk of oversimplifying, and oversimplifying also means that our results become meaningless. We try to make things as simple as possible but no more so.

FIGURE 1

EXAMPLE:

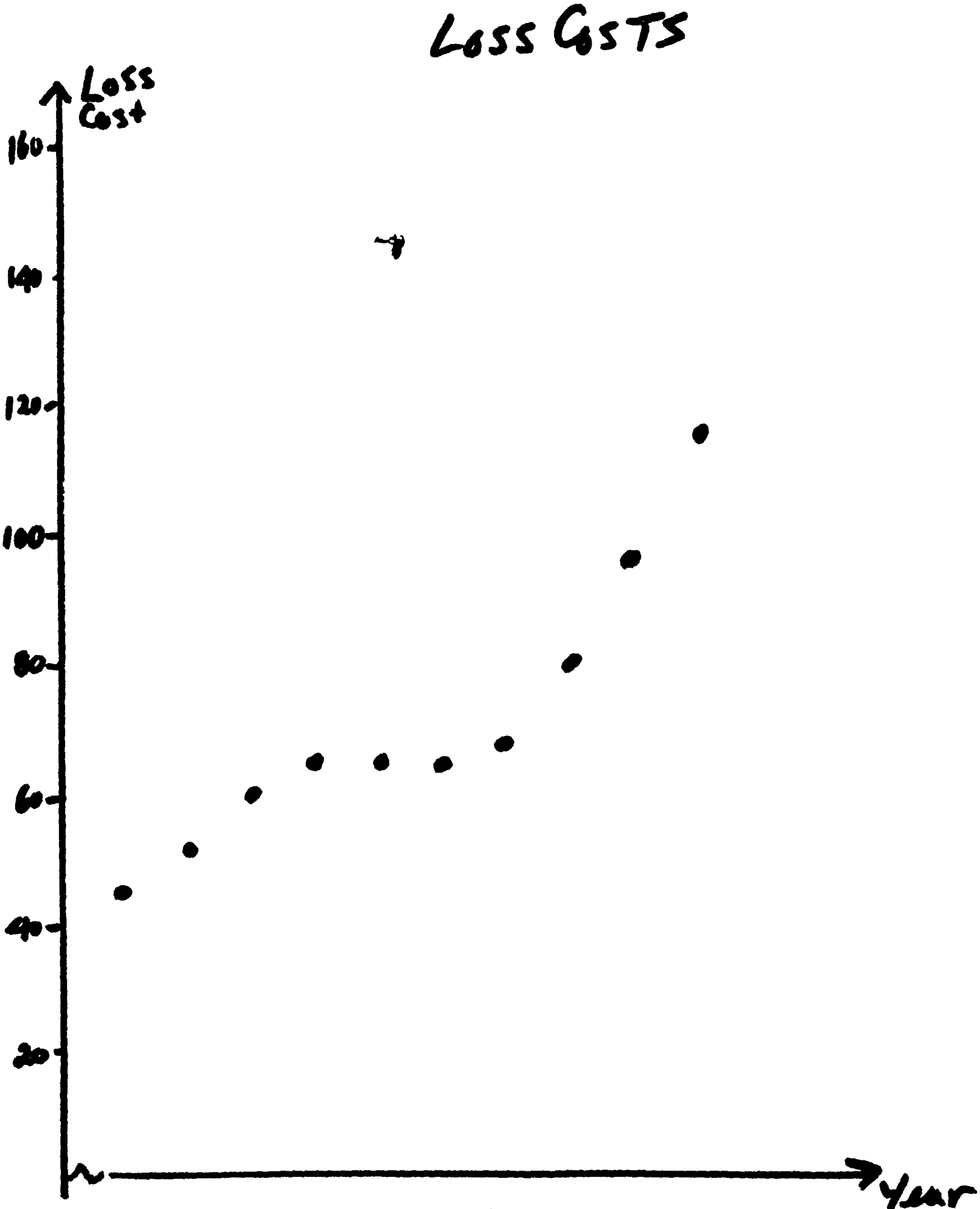


FIGURE 2

Polynomial Fits to Loss Costs for
Private Passenger Collision Insurance

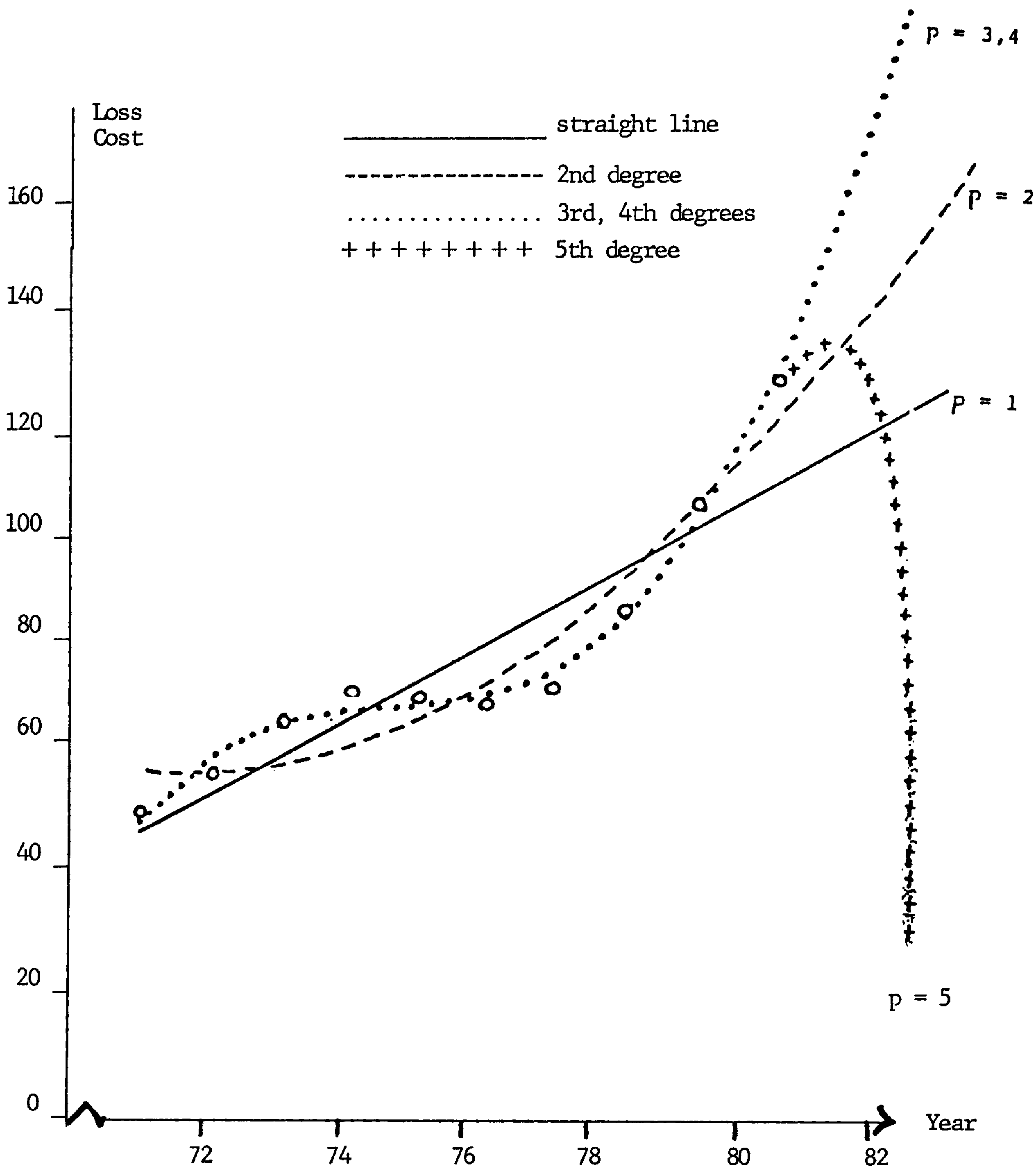
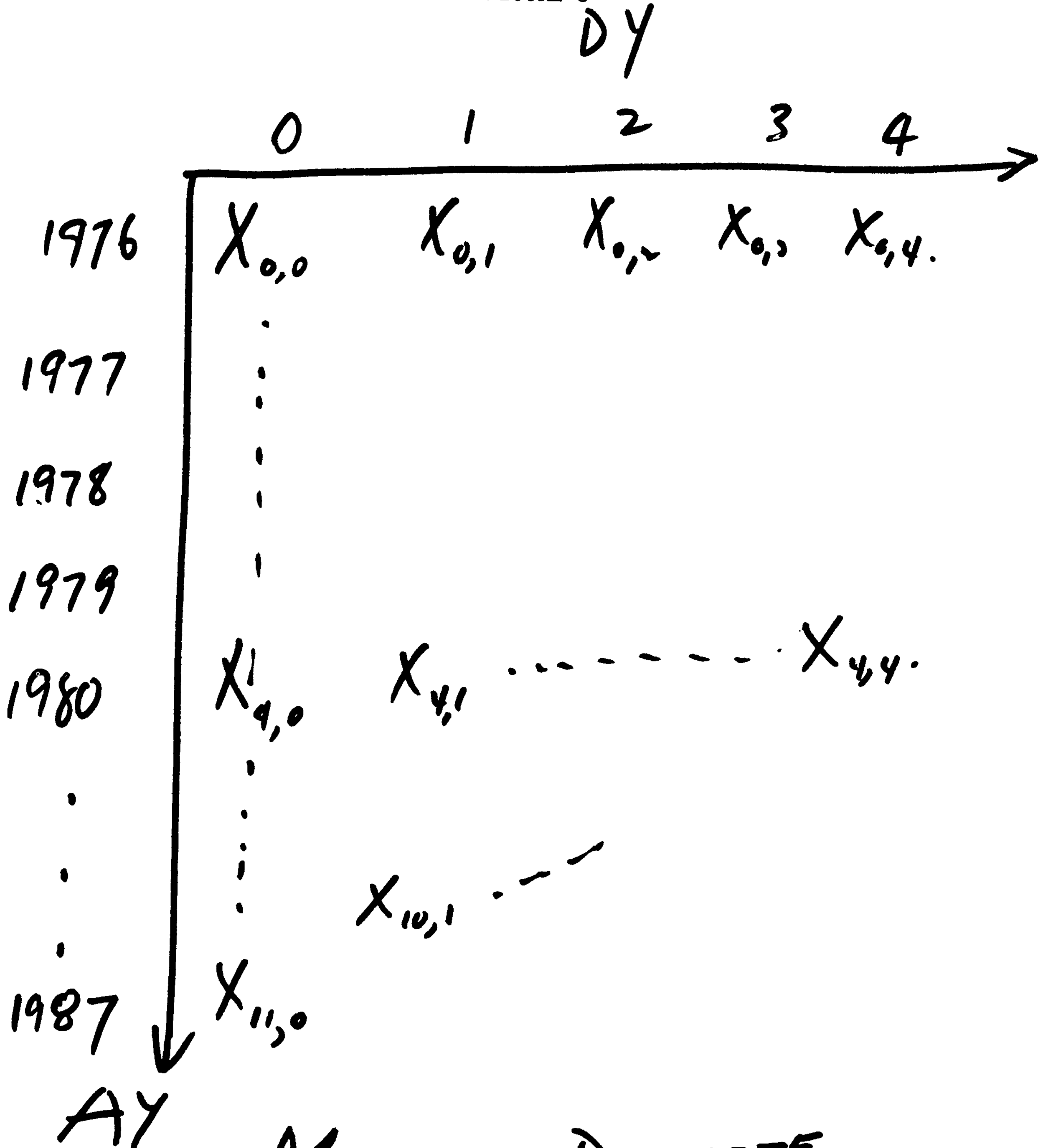
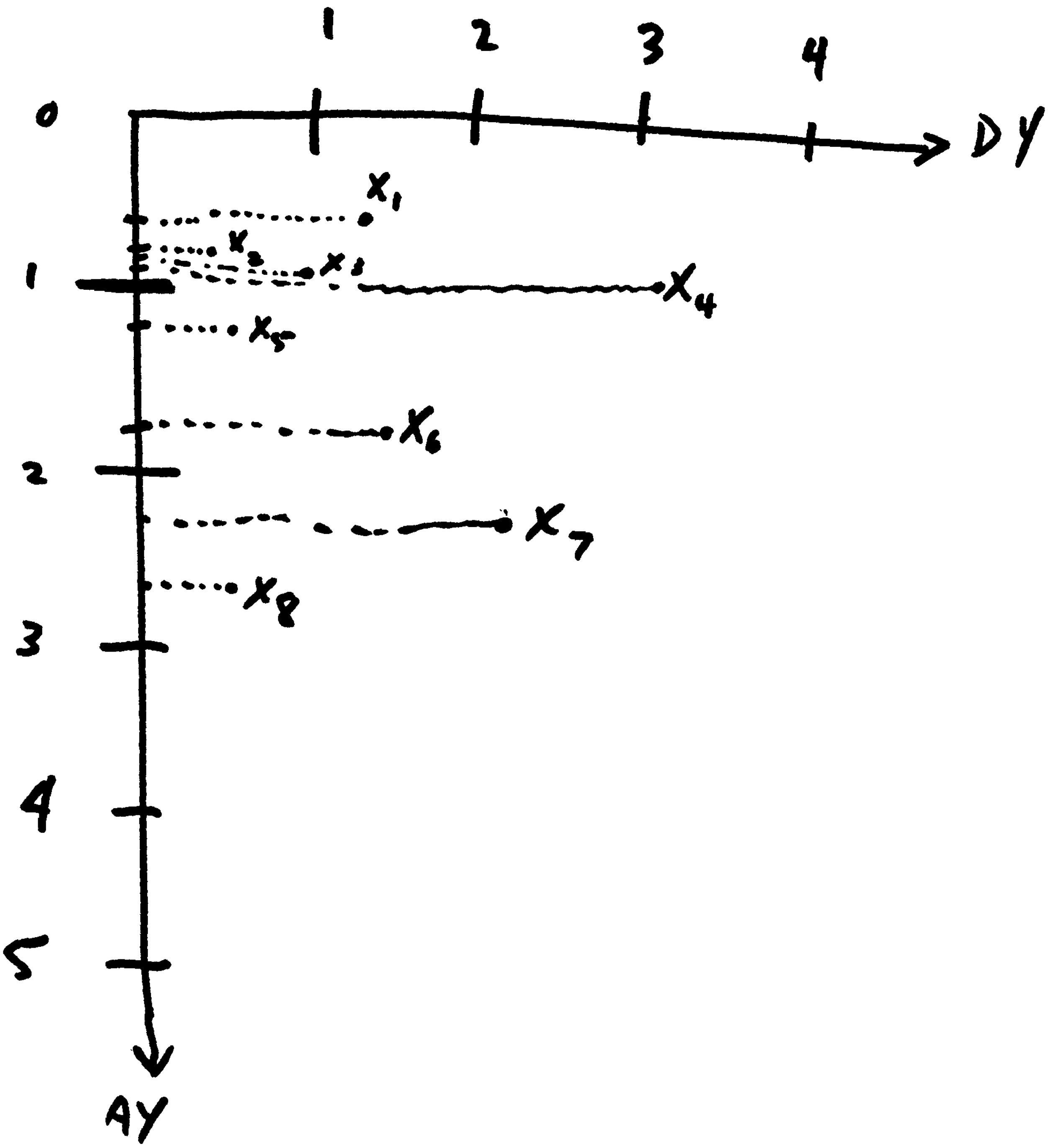


FIGURE 3



MACRO – DISCRETE
– AGGREGATE
– COUNTS POSSIBLY AS WELL.

FIGURE 4



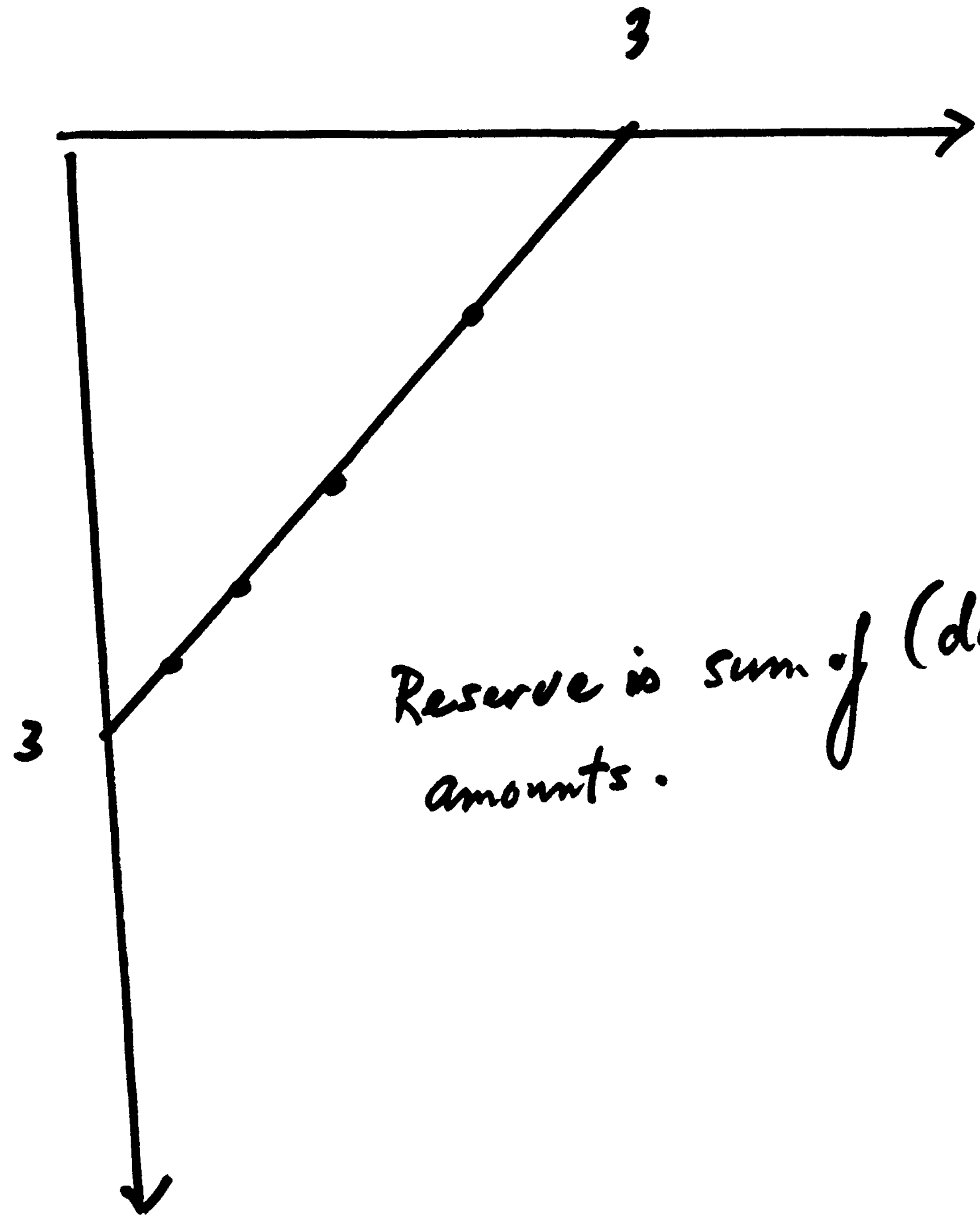
MICRO – CONTINUOUS

– INDIVIDUAL CLAIM DATA
- DATE OF ACCIDENT
- DATE OF SETTLEMENT
- AMOUNT PAID (INCL. LAE)

Let me give you a quick example taken from a paper. This is not in a reserving context but it is in a ratemaking context. Here we have loss costs over years -- these numbers don't matter very much. (See Figure 1) The only things that matter in this picture are the dots. These are the loss costs over a number of years. What we're interested in doing is predicting a loss cost in the later years. What can we do to this data to predict the next value? The typical thing would be to fit some sort of curve. The basic data points are given by the circles here. (See Figure 2) Here the casualty actuary was using a polynomial to forecast claims. This is a real case taken from some data given in a rate regulation hearing context. There are ten points, and of course, we can see that the predicted value for the fifth degree polynomial is down here. We have far too many parameters given the data we have, so the predicted values become ridiculous. It would make much more sense to use one of these other curves or perhaps some kind of auto regressive moving average kind of simple model. The warning is that too many parameters mean that our predictive values become very instable by becoming over-sensitive to small changes in the data. Later speakers will be talking about this particular problem in the context of some of the traditional actuarial methods. Incidentally, when you here later speakers discussing the chain-ladder method they will be discussing what we call the development factor method, so don't be frightened off by the term.

I'd like to just go back and discuss macro and micro models again. This is the typical macro situation (see Figure 3). We have three data points, that is quantities on a discreet time scale both by accident year and development year. Our data is aggregated, and we may have counts as well as amounts. We can use development factors just for projecting the numbers of claims as easily as we can for aggregate claims. That's a typical macro situation. I'd like to contrast that with the micro situation. In the micro situation we might set up a similar diagram except that we now consider a continuous time scale down the accident year axis. We might also have a continuous time scale. In this very simple diagram at another way of looking at a claim generation process would be to follow claims first through time by accident year, and then through the settlement lag period--according to the development year axis. (See Figure 4) If we start at year zero and we follow a portfolio through time, the first claim may be generated here and it may be settled out here somewhere for some amount x. Hypothetically at least we could construct this kind of diagram for all the claims in an insurance portfolio. In most portfolios there are far too many claims to set up this kind of diagram, but we can tabulate this information

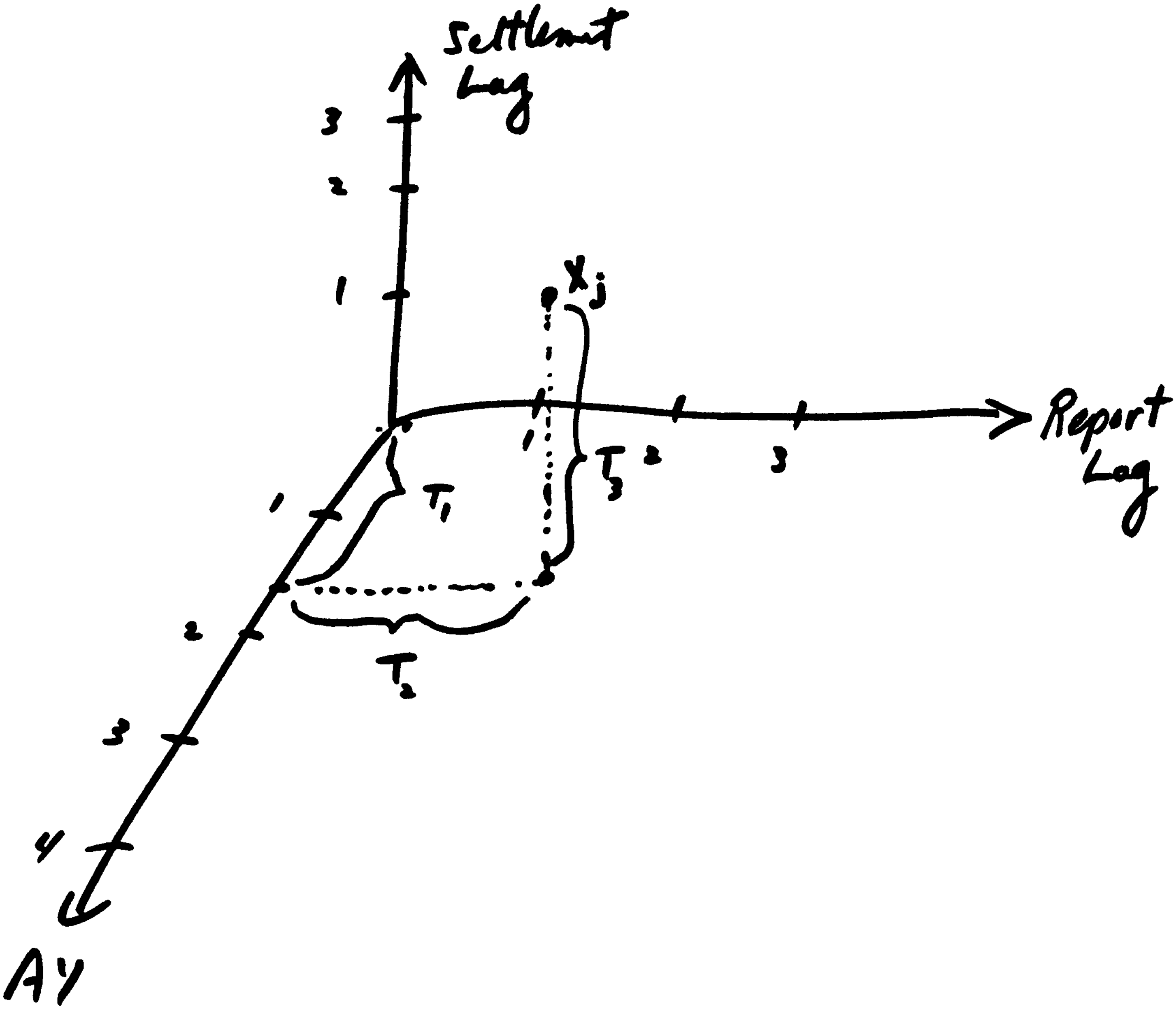
FIGURE 5



Reserve is sum of (discounted)
amounts.

FIGURE 6

WHAT ABOUT IBNR?



and the variables that we would have would be the time of the accident, the time of the settlement, and the amount. A lot of these claim occurrences may actually be unreported at some time. The current time is represented by a diagonal time. (See Figure 5) The reserve for outstanding claims including IBNR would essentially the (present) value of all of those claims be on the right-hand side of this diagonal. (I will not be discussing discounting.) This is kind of the continuous micro approach to modeling in contrast to the aggregate approach. In the aggregate approach essentially we just aggregate the information in each little square, and we add all the claims together in the first square and the total becomes a number that appears here in our runoff triangle. We may include loss adjustment expenses. Again, those are details in application rather than basic principle.

What if we introduce a reporting lag? We're in three dimensions. (See Figure 6) If we follow the claim generation process along the accident year axis as we did before, and now instead of having a simple development year lag to final settlement, we break the total lag into two portions. We can follow claims through time along this axis, and let's call that Time "T1". Then secondly parallel along the report year axis "T2", that would be the random variable representing the report lag. Thirdly, we would move in the direction of the settlement lag axis. This would give us some variable "T3". This random variable representing the time of lag from the point of report to the ultimate point of settlement. Then, of course, we're in the fourth dimension, because when we're in the fourth dimension we can have the amount. Rather than work with a fourth dimension pictorially (I find it difficult to draw pictures in four dimensions!!), we could imagine the sizes of the claims being represented by dots of different colors.

What about outstanding claims in this context? Rather than looking at a triangle what are we looking at? We're looking at a runoff simplex because that's the generalization of the triangle. The reserve that we're interested in now, it might be separately from the total. The total reserve would be the amounts in the three-year slice running this way through our diagram. That corresponds to the first three accident years where "T1" is less than 3 but not including the portion where "T1 + T2 + T3" is less than 3, in other words, those that are already settled. The portion would be this portion of the same slice -- those are the claims which are already incurred. But the time of occurrence plus the time of reporting is greater than 3 -- those are unreported.

This may look hairy and I'm sure it does but in statistical modeling might be to attempt to model these lags separately by doing an independent study. It's difficult to do it from a runoff triangle because the data is so crude. You would want to do any kind of study for settlement lags. There are some analytic results that one can get in this context, which I will mention in a few minutes.

A natural approach to micro modeling is to model the claim occurrence process as some sort of function of time. This process describes what goes on down the accident year axis first. Secondly, we model the report lag -- and this report lag would depend on the nature of the insurance coverage. Thirdly, we would model the settlement lag following reporting. It may be conditional on reporting and time, we can model it in some very complex way. Fourthly, we would model the losses (possibly including the loss adjustment expenses) as possibly a function of the report lag, the settlement lag, the time of accident and so on. We can produce a model in a very natural conditional way. In mathematical terms ultimately what we end up with a probability density function, which is a function of a variety of random variables. The theoretical question then is how do we obtain loss reserves for this kind of model?

This is a micro-approach that contrasts very much to the traditional macro approach, which is used with the development factor method. These kinds of models are used by lots of people not in the insurance area. We can think in terms of queing theory models in which we have some kind of claim generation process, then the claims arrive at some report desk for reporting and there's some kind of service time for reporting to settlement. Then ultimately it comes out as being settled. In a queing theory context what you would do is model these inter-occurrences time as well as the claim generation process. If we're interested in looking at micro models in other fields, a natural place to go is to the queing theory literature.

Another interesting problem that I've been working on which may be viewed from the same kind of theoretical paradigm, is a problem in AIDS. I have been doing work with people in the life insurance industry on AIDS and attempting to predict the risk of AIDS in the population, and how to reserve for that risk. We have a similar kind of model. We have various lags. We can think of the occurrence date as the time a person becomes HIV positive. Those aren't exactly the same terms -- infection and becoming HIV positive are actually different dates but we'll call the time a person becoming HIV positive as the occurrence date and thus the claim. In the AIDS model, we have a number of lags. A person who is HIV positive and asymptomatic is in the initial

TRADITIONAL RISK THEORY

Total losses as a function of occurence dates <u>only</u>.

$$(T_1, X_1), (T_2, X_2), \ldots, (T_n, X_n)$$

Time Amount.

Total losses in $(0, t]$ is

$$S(t) = \sum_{T_k \le t} X_k .$$

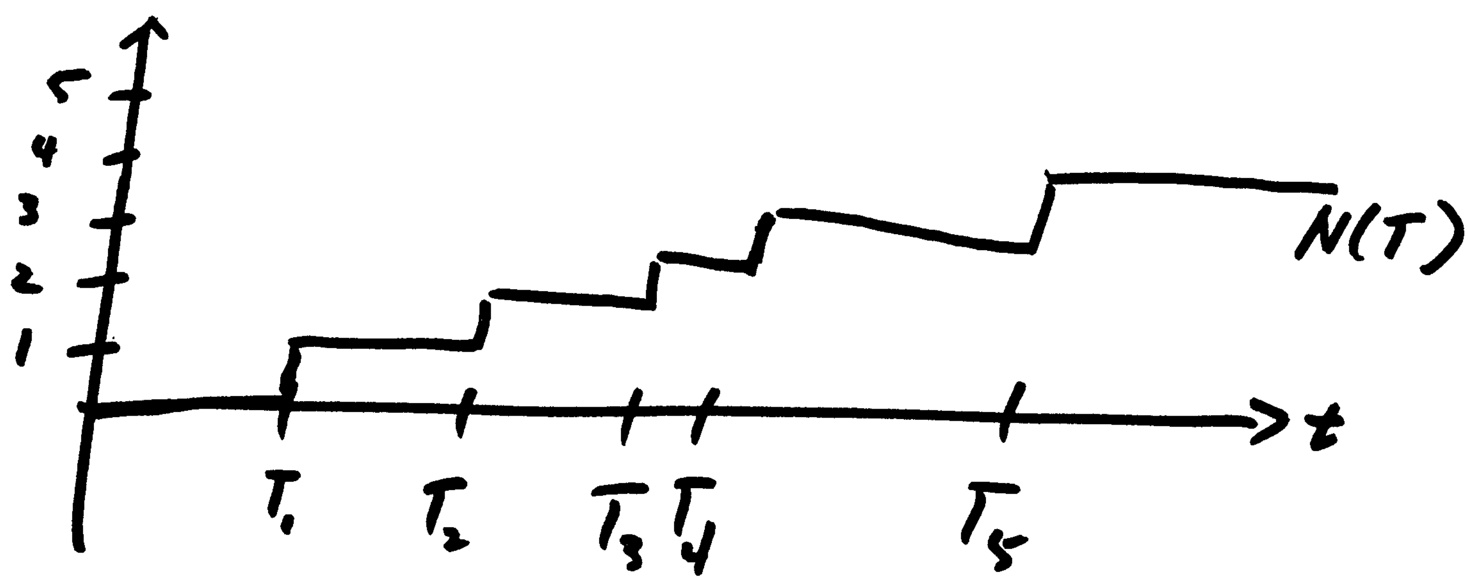
Numbers of losses in $(0, t]$ is

$$N(t) = \sum_{T_k \le t} I(X_k) . \qquad \boxed{\begin{aligned} I(x) &= 0, \quad x = 0 \\ &= 1, \end{aligned}}$$

Typically:

$N(t)$ follows some stochastic process.

- Poisson process
- renewal process
- birth process
- mixed poisson Process



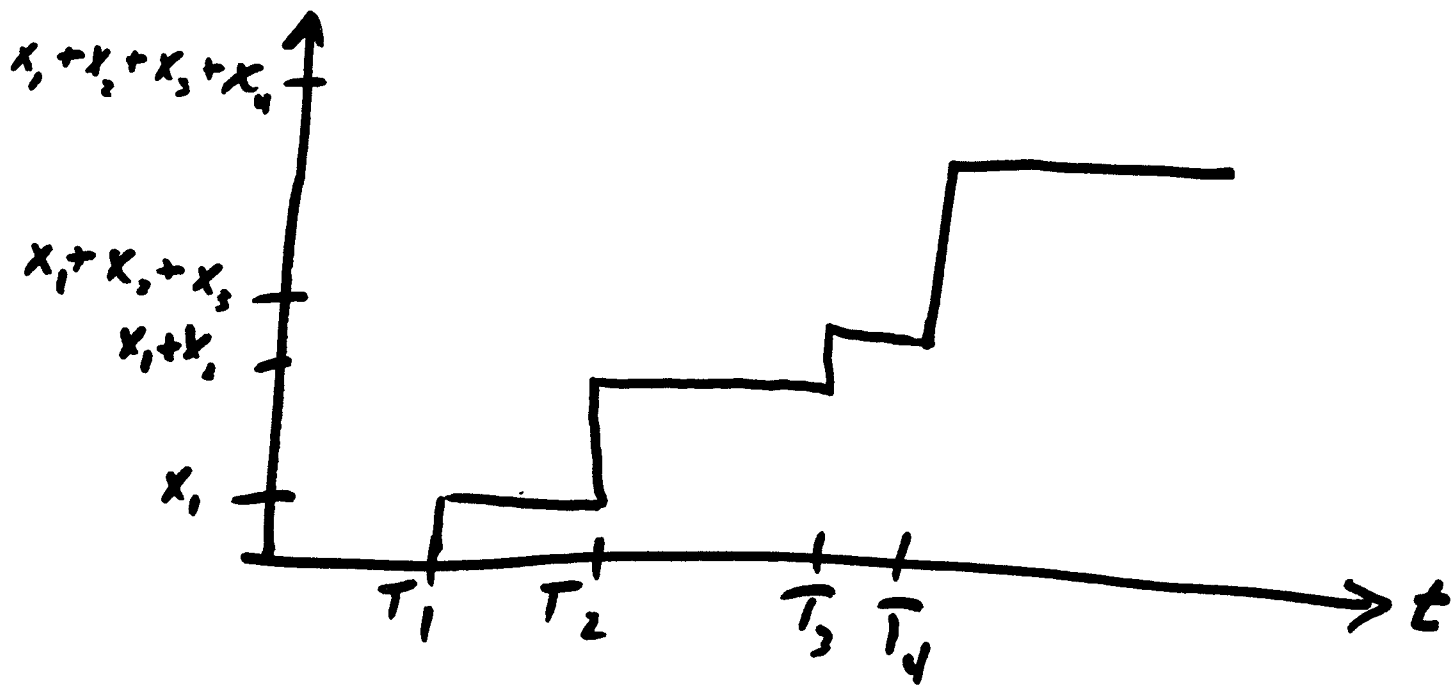
The model can be studied by looking at $N(t)$ process; or, by looking at

$T_1, T_2 - T_1, T_3 - T_2, \ldots$ etc.

state. When the person develops certain symptoms the person moves to the LAS state. And then there's another lag to moving to the state called ARC. Then a person moves on to AIDS and then ultimately death typically due to AIDS. We can think of this in the same framework. We have an occurrence date, we have a report date. This report date is actually the report date of when a person has AIDS. The problem that I have been working on is modeling these lags. I have some data that is based on longitudinal studies of persons who are HIV positive. We can model the total lag from HIV positive to developing AIDS. Information that we have from insurers as well as from organizations like the CDC is the number of reported cases of persons who have AIDS. We're interested in the unreported claims. We're interested in the people who are HIV positive in the population now. They have insurance and may ultimately become AIDS claims. Since they are at risk now, it's reasonable that the insurers reserve for this AIDS risk. The framework is essentially the same as the framework that I mentioned to you--micro modeling of the claim generation process. In this case we obtained the lag distribution information from a very different source than we obtained the report information. In summary, what I'm trying to do is present to you the claim generation process in loss reserving.

RISK THEORY AND LOSS RESERVING: At least theoretically, there should be a strong connection between risk theory models and models used in loss reserving. In traditional risk theory we consider losses as a function of the occurrence dates only. We don't generally consider reporting lags. We're interested in pairs of random variables, and each pair of random variables is the time of occurrence of the claim and the amount. So there's no additional lag here. In traditional risk theory we're interested in looking at the aggregate losses, that is the total losses in a particular time period. That would simply be the loss for all claims occurring in the time period. Similarly, if we're interested in modeling the numbers of losses we have simply the sum of the number of the indicator variable (which just a number 1 for each claim that occurs), the number of claims that occurs by time t (see slide 27). How do we do modeling in that case? We can model the micro level -- the stochastic process that generates claims. In actuarial circles, we generally use a Poisson process. But we can use and many other process. People in actuarial science around the world have used other processes which are related or generalizations of the process (see slide 28). This is some kind of mathematical model that generates numbers of claims. For the purpose of doing that is that if we have an appropriate process for the number of claims, we can then discuss the variability of that number of claim in that accident year. We set up a model of this stochastic process which counts claims so it simply jumps up by one at the time of each claim, and it's called the claim counting process. One way of modeling

$X_1, X_2, \ldots$ the amounts of successive claims are independent and identically distributed.



Distribution of total claims in $[0,t]$ is

$$F_{S(t)}(x) = \sum_{n=0}^{\infty} p_n(t) F_X^{*n}(x)$$

where $p_n(t) = \Pr\{N(t)=n\}$.

the N(t) process is by looking at what we call the claim inter-occurrence times. That's the times between claims. If you try to model the numbers of claims this way, you'll find that you'll run into trouble quickly because insurance companies pay claims everyday. These are in effect zeros unless you measure them in minutes. (Slide 29) That's not a very useful way of looking at this number of claim process.

In one study one of my students was looking at not the times of the occurrence of the claims, but the times of payments of successive claims and found that the time between successive claim payments was one of 0, 1, 28, 29, 30, or 61. It was one case of 61. When he obtained this information from a company actuary who really didn't know this, but discovered that the claims department paid all the claims on this line of business on the last couple of days at the end of the month. So the time between claims was either zero then thirty days and so on. One month when they were changing the computer system and they didn't pay any claims. They delayed all those claims, so in one month there's a sixty-one day lag. Studying the process that way is clearly not very useful. What we can do is study the actual numbers of claims made. For instance, in automobile insurance we might study the number of accidents per driver, per year. That will in effect generate the process when t is equal to one. In that case you might end up with a Poisson distribution or a negative binomial distribution or some other distribution.

In the traditional risk theory context we also model separately the sizes of the separate claims. So rather than talking about average claim sizes we model the claim sizes separately. Usually to get analytic results, we assume that the claims are independent and identically distributed, and they're independent of the number of claims. You may wish to impose some dependency in this model -- it makes it much more cumbersome. But this is a real good starting point for doing analysis. The risk process is the process s(t) -- the total claims process over time. At each of the points our loss is the size of the claim. Again, I mentioned we don't have reporting lags for this model. In the traditional risk theory context we then come up with some kind of distribution describing the distribution of the total losses up to a certain point in time. If we modeled the claim frequency and the claim severity separately we can combine them and come up with a model for total losses over time.

One application that's kind of interesting that an actuary in Wisconsin is doing is the value, pricing, and reserving of product warranties. One can study the times for a particular automobiles and the times at which they come in with defects for repairs, and the cost of those defects. This is a very simple application of a risk theory model (with delays). You can think of many others depending on your line of business.

The next session is going to deal with risk theory, and so I've provided this as an introduction. I would like to point out one thing and that is if one sets up a risk theory model and one introduces delays, it is sometimes possible to come up with analytic result for the distribution of total outstanding claims. I think that's an interesting result, it's generally not well known but the mathematics really comes from the field of queing theory. I'm simply going to state this result to give you an idea of another way in which one can attack the loss reserving problem. Suppose the NFT's are generated by some kind of Poisson or mixed Poisson process. These are the kind of processes as we as casualty actuaries work with on a regular basis. Supposed we have some delay of settlement. We'll just have a single delay covering the time from the occurrence to the time of settlement. The question is what is the exact distribution of outstanding claims. It turns out that for this model that is essentially of the same form as I gave you before (i.e., Poisson or mixed Poisson) with an adjustment for the lag distribution. The basic risk theory model induces a probability distribution on outstanding claims.

I'm going to skip forward because I seem to be running short of time.

Another approach to modeling is the macro model which can be rationalized with the micro model. What we often do is approximate that with some sort of simple curve that attempts to pick up most of the inherent variability. The popular choices for these curves are gamma distribution to model total claims, or translated gamma, another popular one. Gary Venter, who is a member of the CAS, has proposed using a transformed Beta distribution which is a distribution with four parameters in which the gamma is a special case, and which is a very flexible tool for modeling total losses. This same approach can also be applied in loss reserving. One approach might be to attempt to model the lag and the payments together in order to take into account partial payments. We can model the paid claims for each accident year in some way. We can do it according to payment year or by development year as well, but it makes general sense to do it by accident year. The approach that Ben Zehnwirth will be taking in his talk will be to use some fairly general curve to fit each accident year, but to relate these curves between years. A technique that he will use for that is called the filtering theory, in which the parameters of the curve change slightly to reflect the changes inherent in the data. So the model adapts over time according to the data. Rather than fitting curves separately to each accident year one recognizes that there is a relationship between successive accident years and related curves are fitted for each accident year using regression methods. If we're interested in the outstandings we look at the portion of the curve beyond the diagonal. That's Ben Zehnwirth's approach.

Greg Taylor will also be talking this afternoon. He will also be using regression techniques but from a somewhat different point of view. He will be introducing some more variables and attempting to model the relationships between the outstanding claims with other regressor variables. He will discuss how one chooses as few independent variables as possible. He will be talking about choosing the regression variables, and then ultimately forecasting based on the regression variables, the axis beyond the diagonal. In each case they will be talking about the errors involved using these kind of techniques.

SUMMARY: Bill Jewell in his talk in Switzerland discussed some of the thoughts of Thomas Kuhn in his book "Structure of the Scientific Revolution." In discussing scientific thought he discussed various states of scientific thought. I have mentioned a few of them here when we discussed model building.

Model building is essentially building an appropriate paradigm of reality. We build paradigms and once those paradigms become accepted, according to Kuhn's terminology, they become what we call normal science. They become the accepted way of thinking about things. In loss reserving the accepted way of thinking about things is currently is in terms of development factors. Development factors are in a sense normal science. Then of course, what happens is puzzles and issues arise which are not explained by the normal science. Those are communicated, a crisis arises because we have important issues that cannot be handled by the normal science, and ultimately we have some kind of scientific revolution where we develop new paradigms. Once those become accepted until when we run into more crises that precipitate another revolution. I really believe in the area of loss reserving that we're in a state of revolution. There's a huge amount of work that has gone on by researchers in the last few years. I believe that the way in which we think about loss reserves will change particularly in the last next years.

I would like to end my talk by reading a letter from Bill Jewell.

To the 1987 Casualty Loss Reserve Seminar:

I am sorry that I cannot be with you to discuss statistical modeling of loss reserves due to prior commitments overseas. Instead, I'm sending this memo with a copy of my "hot of the press" paper predicting the IBNYR events and delays to which I would have referred had I been able to attend. In this you will find references at the end of the paper useful and our will refer to them in my remarks below.

It seems to me that modern statistical IBNR theory begins with a prize-winning paper of Irwin Straub, 1972, who constructed the first truly polarity based model which work was carried on in Kramreiter and Straub (1973) and in other important papers. These papers are summarized, rationalized, and explained in the book by Van Eeghan, that I mentioned earlier. You definitely ought to obtain a copy of this excellent summary to understand the modern approach to IBNR reserves. Unfortunately the book is out of print so you'll have to borrow a copy. Since 1981 the theoretical contributions have become more specialized and it's difficult to assess their practical importance at this time. The most sophisticated approach to date is the difficult paper of Norberg (1986), which needs further application. However, his basic statistical model I believe is correct and the paper is worth reading. I am also in full agreement with his remarks that the first step to build a good model of the basic processes and then to use established principles of mathematical statistics to determine the correct method. Too often, it seems to me, actuaries begin to fiddle with chain ladder, Cape Cod and other procedures without setting down clearly their modeling assumptions and the purpose of calculating a given reserve. I've only recently begun to look at IBNR estimation and prediction problems. I confess to having them put off by the ad hockery of many earlier papers. As I explain in the introduction to my paper, it seems to me that there are still unexplored interactions between the claim generation process and the continuous time delay process, not to mention the various possibilities for reporting the associated dates of occurrence in reporting. To start with a model in which the observations are already quantitized but counts in each development year and cohort our triangular data, in which that data is already present, it seems to me to obscure and not clarify the underlying estimation and prediction problems. This is or IBNYR counts only. As of today I am unconvinced that we have sufficiently powerful models of long-term claim cost evolution to build accurate, all in one models of both counts and severities. This is an important area in which I hope many actuaries will contribute from their practical experience. Therefore, in the enclosed paper I have concentrated simply on modeling the occurrence delay reporting process for IBNYR counts, assuming that observations can be made in continuous time. Other papers in progress will examine the affect of quantitized reporting, which must affect the estimates obtained, and the availability of cohort data, which may prove the results ... but I am obviously progressing much more slowly and I hope more transparently than they do.

My main divergence from past efforts is the use of Bazian modeling to obtain full predictive distributions for unreported claim counts. As my point of view on Bazian modeling is quite known (his paper in 1980), I will mention here simply that in my opinion the IBNR los reserves must include risk fluctuation practice in addition to mean values. And that these occur because of uncertainty about the parameters, and about both IBNYR count and ultimate cost results. I hope my numerical example will reveal to you that the variance in predicting unreported counts is rather substantial, even with large amounts of data, and depends critically upon getting good information about delay parameters. In my later papers I will argue the usual IBNYR triangle of yearly counts is much too coarse to predict the variance, and thus to set IBNR risk reserves correctly. Case by case delay data is much preferred, and eventually must be corrected with claim cost development curves. I welcome your comments or criticisms of my paper and will be happy to send you other papers on IBNYR if you will write to me. (See attached letter)

UNIVERSITY OF CALIFORNIA

Engineering Systems Research Center
3115 Etcheverry Hall
Berkeley, California 94720

To the 1987 Casualty Loss Reserve Seminar:

I am sorry that I cannot be with you to discuss statistical modelling of loss reserves, due to prior committments overseas. Instead, I am sending this memo and a copy of my hot-off-the-press paper, "Predicting IBNYR Events and Delays", to which I would have referred had I been able to attend. In any case, you will find the References at the end of the paper useful, and I will refer to them in my remarks below.

It seems to me that modern statistical IBNR theory begins with the prize-winning paper of E. Straub (1972), who constructed the first truly probability-based model, which work was carried on in Kramreiter & Straub (1973), Bühlmann, Schneiper, & Straub (1980), and in other important papers. These are summarized, rationalized, and explained in Van Eeghen (1981); you definitely should obtain a copy of this excellent summary to understand the modern approach to IBNR reserves.

Since 1981, the theoretical contributions have become more specialized, and it is difficult to assess their practical importance at this time. The most sophisticated approach to date is the difficult paper of Norberg (1986), which needs further application; however, his basic statistical model is correct and worth reading. I am also in full agreement with his remarks that the first step is to build a good *model* of the basic processes and then to use established principles of mathematical statistics to determine the correct *method*. To often, it seems to me, actuaries begin to fiddle with "chain-ladder", "Cape Cod", and other procedures without setting down clearly their modelling *assumptions* and the *purpose* of calculating a given reserve.

I have only recently begun looking at IBNR estimation and prediction problems; I confess to having been put off by the "ad-hockery" of many early papers. As I explain in the introduction to my paper, it seems to me that there are still unexplored interactions between the claim generation process and the continuous-time delay process, not to mention various possibilities for reporting the asociated dates of occurence and reporting. To start with a model in which the observations are already quantized (counts in each development year) and cohort (triangular) data is always present seems to me to obscure, not clarify, the underlying estimation and prediction problems. And this is for IBNYR *counts* only; as of today, I am unconvinced that we have sufficiently powerful models of *long-term claim cost evolution* to build accurate, all-in-one models of both counts and severities. This is an important area to which I hope many actuaries will contribute from their practical experience.

Therefore, in the enclosed paper, I have concentrated simply on modelling the occurence-delay-reporting process for IBNYR counts, assuming that observations can be made in *continuous time*. Other papers in progress will examine the effect of quantized reporting (which *must* degrade the estimates obtained) and the availability of cohort data (which *may* improve the results). My models are much like Kaminsky (1987) and the counts portions of Bühlmann, Schnieper, & Straub (1980) or Norberg (1986), but I am obviously progressing much more slowly and, I hope, more transparently, than they do.

My main divergence from past efforts is the use of Bayesian modelling to obtain full predictive distributions for unreported claim counts. As my point of view on Bayesian modelling is well-known (Jewell(1980)), I will mention here simply that, in my opinion, IBNR loss reserves must include *risk (fluctuation) factors* in addition to mean values, and that these occur because of uncertainty about parameters and about both IBNYR count and ultimate cost results. I hope my numerical example will reveal to you that the variance in predicting unreported counts is rather substantial, even with large amounts of data, and depends critically upon getting good information about delay parameters. In my later papers, I will argue that the usual IBNYR triangle of yearly counts is much too coarse to predict the variance, and thus to set IBNR risk reserves correctly. Case-by-case delay data is much preferred, and eventually must be correlated with claim cost development curves---another important task for practicing actuaries !

I welcome your comments or criticisms on my paper, and will be happy to send you the remaining papers on IBNYR if you will write me.

With best wishes for a successful Seminar !

William S. Jewell

William S. Jewell

Berkeley, California
August 24, 1987

Predicting IBNYR Events and Delays

William S. Jewell

Engineering Systems Research Center
University of California, Berkeley

ABSTRACT

An IBNYR event is one which occurs randomly during some fixed exposure interval and incurs a random delay before it is reported. Both the rate at which such events occur and the parameters of the delay distribution are unknown random quantities. Given the number of events that have been reported during some observation interval, plus various secondary data on the dates of the events, the problem is to estimate the true values of the unknown parameters and to predict the number of events that are still unreported. A full-distributional Bayesian model is used.

KEYWORDS: Observation delays, Incurred But Not Reported (IBNR) models, Bayesian estimation and prediction.

1. Introduction

An IBNYR (Incurred But Not Yet Reported) claim in insurance is an event whose occurrence in some fixed *exposure interval* is not known until some later date because of random reporting delays. These delays may be administrative in nature, or may be due to the type of the covered contingency, as in the case of occupational illness. With these claims whose existence is not yet known are usually grouped IBNFR (Incurred But Not Fully Reported) claims, whose existence is known but whose cost development is incomplete, as in long-term illnesses or rehabilitation following accidents. Together these claims make up the *IBNR portfolio* of a given exposure year. The correct prediction of the total number of such claims and their ultimate total cost are of critical importance to insurance companies in the continuing process of setting up and modifying their "loss reserves" for each of their policy coverage exposure years. Improper estimation leads to fluctuations in financial results, missed opportunities for loss control, increased regulatory scrutiny, and other problems; thus, there are many pressures for making and maintaining correct IBNR forecasts as new information becomes available.

This paper considers the problem of estimating the *total number* of IBNYR claims arising in a given exposure interval, when only an incomplete number of such claims have been reported by some point in time. In addition to being uncertain about the rate at which events occur, we suppose that the law which governs the random reporting delays is also not known with certainty. When a claim actually "surfaces", we consider various cases of *additional information* about the event occurrence and reporting dates that may become available. We shall see that the problem of predicting the number of as-yet-unreported events cannot be easily separated from the problem of estimating the unknown delay parameter(s). Similar problems arise in other fields, such as survey sampling by mail, and estimating undetected bugs in computer software (Jewell [1985a] [1985b]).

The IBNR problem has been studied extensively in the actuarial literature, primarily with models where the "developed costs" are reported periodically after the exposure year is over. (Straub [1972], Kramreiter and Straub [1973], Bühlmann, Schnieper, and Straub [1980]. Many other references and a convenient summary through 1980 may be found in Van Eeghen [1981]). IBNYR claims are often called "pure IBNR"; other names for IBNFR are: IBN-Enough-R and Reported-But-Not-Settled. The simultaneous availability of several exposure years' data (over varying development intervals) leads to the infamous "IBNR triangle" of data, from which the total ultimate costs of all exposure years are to be forecast simultaneously. Bühlmann, Schnieper, & Straub [1980] were the first to emphasize the additional predictive power available in reporting both quantized counts and costs for the various development years, as has Nuberg [1986] in his comprehensive model. Kaminsky [1987] focuses exclusively on count prediction problems. With these exceptions, one could characterize the field as one in which the solutions are more notable for their ingenuity than for the light they shed on the underlying processes.

We believe the inherent difficulty of estimating just counts and delays simultaneously has been underrated in these "all-in-one", cost-oriented, discretized models. Therefore, in this paper, we have chosen to examine in great detail only the single exposure-year, continuous-time prediction of unreported events. Later papers will explore the additional complexities introduced by quantized time, multiple data-sources, and simultaneous prediction. Currently, the development of a good model for cost evolution over continuous time appears to require a long-term research effort, one that we believe will use the basic understanding of the event generation and reporting processes considered here, but will need much additional understanding of cost-generating mechanisms.

Finally, for reasons that will become apparent as we progress, we believe that the *point estimators* developed in previous papers, either by classical MLE methods or by credibility approximations, can only reveal part of the difficulty in IBNYR estimation. Accordingly, we have here adopted an exact, full-distributional Bayesian approach, at least until various approximations become computationally desirable. Admittedly, this approach leaves us open to the criticism that our answers depend upon our prior and model distributional assumptions; as we have remarked before (Jewell [1980]), this is not a conceptual stumbling block in the actuarial field, as data and experience from related problems often support such assumptions. Furthermore, anyone who wishes to modify these Bayesian assumptions can then easily implement the necessary changes, thus separating modelling complexity and computational difficulties, which are always open to compromise and tradeoff.

2. The Model

Our basic assumption is that the events of interest are generated by a homogeneous Poisson process with *rate parameter* λ (events/year). In some fixed interval (0,T] (the *exposure interval*) an unknown number, $\tilde{n}=\tilde{n}(T)$, of events of interest happen at unknown *occurrence epochs* (*accident dates*) $\tilde{x}_1, \tilde{x}_2, \ldots, \tilde{x}_n$, given $\tilde{n}=n$. It is a consequence of the Poisson assumption that $\tilde{n}$ has a Poisson distribution with parameter λT, and that these epochs (with arbitrary numbering) are, a priori, mutually independent rvs, uniformly distributed over (0,T].

Each event i is assumed to have associated with it a random *waiting time* (*reporting delay*), $\tilde{w}_i$, such that its *observation epoch* (*reporting date*) is $\tilde{y}_i = \tilde{x}_i + \tilde{w}_i$ $(i=1,2,\ldots,n)$. We assume that the $(\tilde{w}_i)$ are iid rvs, with common density $f(w|\theta)$ and cdf $F(w|\theta)$, where θ is an unknown *delay parameter*.

Our Bayesian assumption is that $\tilde{\lambda}$ and $\tilde{\theta}$ are random quantities that are *a priori* independent, with known prior densities, $p(\lambda)$ and $p(\theta)$, respectively. We learn about these parameters through an *experiment* that consists of observing all *reported events* in some *observation interval* (0,t], where t is continuous in nature, and may or may not have any relation to T. As shown in Figure 1 (with t>T), this will lead to a random number of *reported events*, say $\tilde{r}(t)$, consisting of all events j=1,2,...,n for which $\tilde{y}_j<t$; the remaining *unreported events*, $\tilde{u}(t)=\tilde{n}(T)-\tilde{r}(t)$ in number, will be those for which $\tilde{y}_j>t$. (Where there is no confusion and t is fixed, we shall write simply u=n-r.) Section 3 will consider various possibilities for reporting *secondary data*, D_j, that might be associated with each observed event j.

Given the above assumptions, the observed *total data*, $D = \{r;D_1,D_2,\ldots,D_r\}$, and the prior densities $p(\lambda)$ and $p(\theta)$, the basic *parameter estimation* problem is to determine $p(\lambda,\theta|D)$, and the *event prediction* problem is to determine $p(u|D)$, and hence the distribution for $\tilde{n} = r+\tilde{u}$.

3. Occurrence, Reporting, and Delay

Let us examine in more detail the relationship between occurrence and reporting dates, the delays, and the exposure and observation intervals. From the above assumptions, it can be seen that, given θ, every epoch r.v. pair $(\tilde{x}_i,\tilde{y}_i)$ is statistically independent of every other such pair, with common joint density:

$$(3.1) \qquad p(x,y|\theta) = \frac{1}{T} f(y-x|\theta), \qquad (0\leq x\leq T) \ (x\leq y<\infty)$$

zero otherwise, as shown in the cross-hatched region in Figure 2. Let R_t be

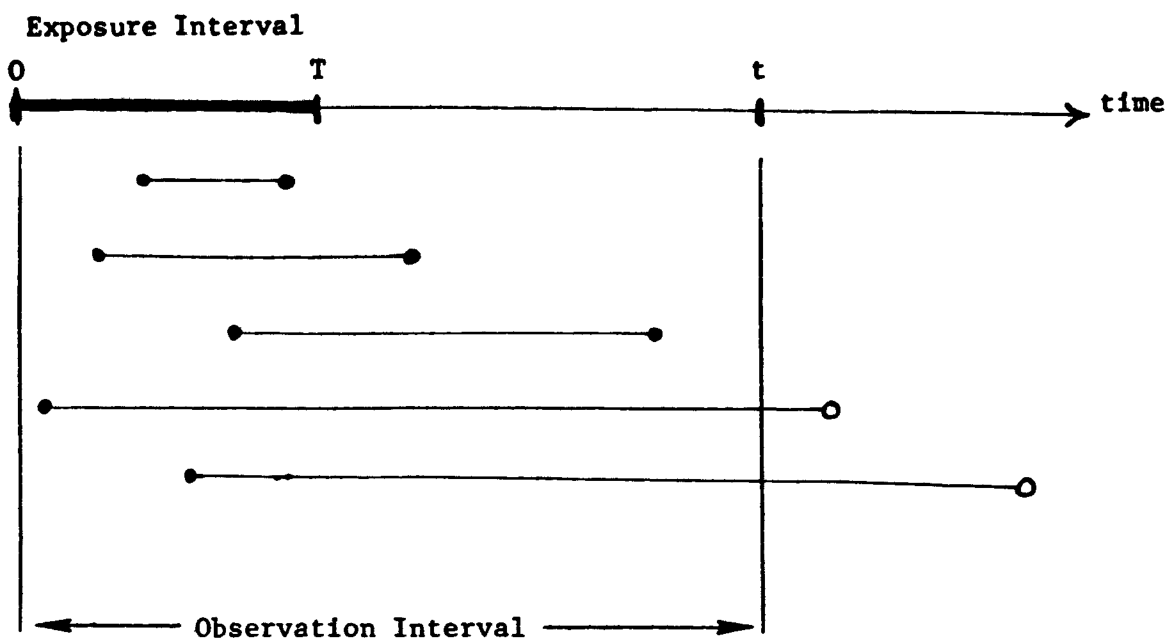


Figure 1. IBNYR process with n=5, r=3, and t>T.

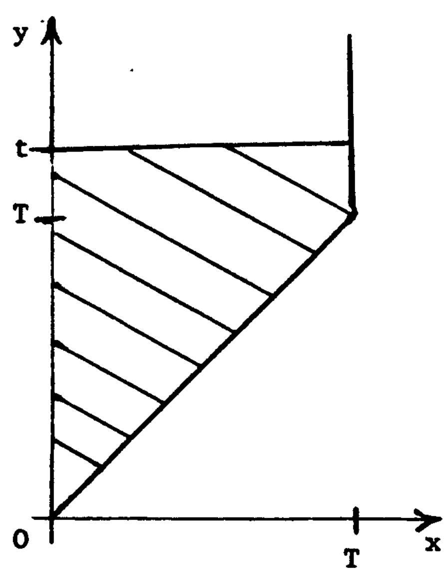


Figure 2. Region of definition of $p(x,y|\theta)$.

the random outcome that *this* event is reported, i.e., that (x,y) are a pair for which $x \leq y \leq t$. Then, $p(x,y,R_t|\theta)$ would be (3.1) limited to that portion of the cross-hatched area below the dotted line(s) in Figure 2. Thus, the marginal densities of reported epochs depend upon whether $t<T$ or $t \geq T$, viz:

$$(3.2) \qquad p(y,R_t|\theta) = \begin{Bmatrix} \frac{1}{T} F(y|\theta) & (0 \leq t \leq T) \\ \frac{1}{T} [F(y|\theta)-F(y-T|\theta] & (t \geq T) \end{Bmatrix}, \quad (0 \leq y \leq \infty)$$

and

$$(3.3) \qquad p(x,R_t|\theta) = \frac{1}{T} F(t-x|\theta). \qquad (0 \leq x \leq \min(t,T))$$

Overall, the probability that a pair $(\tilde{x}_i,\tilde{y}_i)$ will be reported, without regard to the actual dates, is just:

$$(3.4) \qquad p(R_t|\theta) = \begin{Bmatrix} \frac{1}{T}\int_0^t F(w|\theta)dw & (0 \leq t \leq T) \\ \frac{1}{T}\int_{t-T}^t F(w|\theta)dw & (t \geq T) \end{Bmatrix}$$

Now consider again the experiment illustrated in Figure 1. When an event j is reported, it is, of course, included in the count $\tilde{r}(t)=r$. There are four possibilities for observing *secondary data*, D_j, about this event, creating individual *secondary data likelihoods*, $p(D_j|\theta)$:

<u>Type I Data. Observe Both Occurrence and Reporting Dates</u> (x_j,y_j)

$$(3.1') \qquad p(D_j|\theta) = \frac{1}{T} f(y_j-x_j|\theta) = \frac{1}{T} f(w_j|\theta)$$

(i.e., observing (x_j,y_j) is equivalent to observing only w_j);

Type II Data. Observe Only Reporting Date (y_j)

$$p(D_j|\theta) = \frac{1}{T}[F(y_j|\theta) - F((y_j-T)^+|\theta)] \quad ((x)^+=\max(x,0)); \tag{3.2'}$$

Type III Data. Observe Only Occurrence Date (x_j)

$$p(D_j|\theta) = \frac{1}{T} F(t-x_j|\theta) \quad ; \tag{3.3'}$$

Type IV Data. Observe Event Reported But No Dates

$$p(D_j|\theta) = \frac{1}{T}\int_{(t-T)^+}^{t} F(w|\theta)\, dw = \Pi(t|\theta), \text{ say.} \tag{3.4'}$$

We shall later see that decreasing information about θ is provided as we go from Type I to Type IV data. In practice, of course, there could be a mixture of different types of data from different events. Remember also that t is considered fixed, so that knowing $r=r(t)$ means knowing *one number*; if we know in fact *the curve* $r(s)$ $(0\leq s\leq t)$, that is tantamount to knowing all the Type II data. Finally, note that information of the type "an event has occurred but we have not received the paperwork" would have a likelihood $1-\Pi(t|\theta)$, and would be included in the count r!

4. The Data Likelihood

Assume temporarily that $t\geq T$, and suppose that $\tilde{n}(t)=n$. Then the conditional likelihood for the total data D will be:

$$p(D|\lambda,\theta,n) = \frac{n!}{1!1!\ldots1!\,(n-r)!}\left[\prod_{j=1}^{r} p(D_j|\theta)\right]\left[1-\Pi(t|\theta)\right]^{n-r}. \tag{4.1}$$

(If any of the D_j were from Type IV, then the multinomial coefficients

(1!1!...1!) would be modified here and in (4.2); however, only the ratio (n!)/(n-r)! is of importance). (Since Type IV occurs for every reported pair, one could also make explicit a term in Π^r, and normalize (3.1')(3.2')(3.3'); however, our choice leads to simpler notation.)

Now, given λ, the distribution of $\tilde{n}(T)$ is Poisson (λT), and forming the product to give $p(D,n|\lambda,\theta)$ results in a fortuitous cancellation of n!, leaving only terms in n-r=u. Marginalizing over all values of u≥0, we obtain the final *data likelihood*:

$$(4.2) \qquad p(D|\lambda,\theta) = \left[\prod_{j=1}^{r} p(D_j|\theta)\right] (\lambda T)^r \, e^{-\lambda T \Pi(t|\theta)} \,. \qquad (t \geq T)$$

If the observation interval is smaller than the exposure interval, the above argument is still correct with regard to r=r(t) and the (D_j) (there will be less data with smaller t, on average), but we must consider that n now represents only the events from (o,t], which have Poisson parameter (λt). Repeating the above analysis, we find that T is simply replaced everywhere by t in (4.2) when t<T. For convenience in the sequel, we define $\tau=\min(t,T)$ and rewrite (4.2) with T replaced by τ to give a correct formula for any observation interval.

5. MLE Estimates

It is worthwhile to examine the maximum likelihood point estimators for $\tilde{\lambda}$, $\tilde{\theta}$, and $\tilde{n}$, so that they may be later compared with our Bayesian results.

Assume first that θ and hence the delay distribution are *perfectly known*. From (4.2), we obtain the MLE for $\tilde{\lambda}$:

$$\hat{\lambda} = \frac{r(t)}{\tau \Pi(t|\theta)} \tag{5.1}$$

so that a point estimate for $\tilde{n}(T)$ would be:

$$\hat{n}(T) = \left[\frac{T}{\tau}\right] \frac{r(t)}{\Pi(t|\theta)} \tag{5.2}$$

If $t \geq T$ so that $\tau = T$, (5.2) says simply that a point estimate of the number of events inflates the observed counts by the known factor $\Pi(t|\theta)$; if $t < T$, then one must additionally inflate by T/t to take care of the smaller observation interval. Clearly, such estimates will be unreliable when t is small because of these inflation factors; on the other hand, the estimate will be good when t is large primarily because nearly all events will be reported!

Conversely, suppose that λ is known exactly, but that we wish to estimate a scalar parameter θ in the delay distribution. Let $\mathcal{L}_j(\theta) = ln\ p(D_j|\theta)$ be the appropriate log-likelihood of secondary data for each reported event. From (4.2), the necessary condition for the MLE of $\tilde{\theta}$ is:

$$\sum_{j=1}^{r(t)} \frac{d\mathcal{L}_j(\theta)}{d\theta} = (\lambda\tau) \frac{\partial \Pi(t|\theta)}{\partial \theta} \qquad (\text{at } \theta = \hat{\theta}) \ . \tag{5.3}$$

Clearly the actual solution depends in a complicated way upon the form of the delay distribution and the different possibilities for secondary data. If no dates are given with each reporting (Type IV), we find the trivial estimate:

(5.4) $$\Pi(t|\hat{\theta}) = \frac{r(t)}{\lambda\tau}$$

Other secondary data will generally provide a more interesting estimate; for example, for Type I, $\frac{d\mathcal{L}_j(\theta)}{d\theta}$ becomes $\partial\ ln\ f(w_j|\theta)/\partial\theta$, thus introducing the samples (w_j).

When both $\tilde{\lambda}$ and $\tilde{\theta}$ are assumed to be unknown parameters, both (5.1) and (5.3) are necessary conditions to determine the joint MLE $(\hat{\lambda},\hat{\theta})$, i.e., we require the simultaneous solution of:

(5.5) $$\hat{\lambda}\tau = \frac{r(t)}{\Pi(t|\hat{\theta})} \quad ; \quad \frac{1}{r(t)} \Sigma \frac{d\mathcal{L}_j(\hat{\theta})}{d\theta} = \frac{\partial ln\Pi(t|\hat{\theta})}{\partial\theta} .$$

Now, if we assume that no dates are reported we find this second equation is redundant! In other words, with all Type IV data, $\hat{\lambda}$ and $\hat{\theta}$ cannot be determined separately, and there is no estimator $\hat{u}$! Other secondary data will give usable separable estimates, but, as usual, these are dependable only for large r. For example, with Type I data, if $\bar{w} = (\Sigma w_j/r)$ is sufficient for θ, one can show that the RHS of the second equation in (5.5) is neglible when r is very large, and one obtains the usual full-sample MLE from $\Pi f(w_j|\theta)$, even though not all events have been observed. But Type IV remains untractable; we have also tried using the "maximum likelihood predictor" of Kaminsky [1987] without success.

In short, the MLE approach is not very trustworthy when the observation interval is short, when only a few events have been recorded, or when no dates have been observed. These are precisely the conditions under which a

Bayesian model is useful, as we can then compute the variability associated with any point estimate or prediction.

6. Bayesian Formulation

In a Bayesian formulation, we must specify our prior information about $\tilde{\lambda}$ and $\tilde{\theta}$, here assumed to be independent, *a priori*. One can, of course, use numerical methods with any empirical priors, but we shall use various analytical priors in an attempt to show the general behaviour of our model under reasonable assumptions. A Gamma (a,b) density[1] for $\tilde{\lambda}$ is a convenient model for unimodal information, and, in view of the form of (4.2), is almost a natural conjugate prior. One can select a and b, for example, from the first two moments, $\mathcal{E}\{\tilde{\lambda}\} = a/b$ and $\mathcal{V}\{\tilde{\lambda}\} = a/b^2$.

Now, given λ, $\tilde{n}(T)$ is Poisson (λT) and independent of $\tilde{\theta}$, so that, prior to the experiment, our opinion is that the number of events generated in the observation will follow a Pascal (a,(T/b+T)) density.[2] In other words, without any data, our predictive density has moments:

$$\mathcal{E}\{\tilde{n}(T)\} = \left[\frac{aT}{b}\right] \; ; \; \mathcal{V}\{\tilde{n}(T)\} = \left[\frac{aT}{b}\right]\left[1+\left[\frac{aT}{b}\right]\frac{1}{a}\right] . \tag{6.1}$$

If the mean count is held fixed, then a is a shape parameter that adjusts the prior variance, which is naturally always larger than that of a Poisson distribution because of the uncertainty about $\tilde{\lambda}$.

---

1 $\tilde{x}$ is Gamma (a,b) means $p(x|a,b) = \dfrac{b^a x^{a-1} e^{-bx}}{\Gamma(a)}$.

2 $\tilde{x} \sim$ Pascal (α,π) means $p(x|\alpha,\pi| = \dfrac{\Gamma(\alpha+x)}{\Gamma(\alpha)x!}\,(1-\pi)^{\alpha}\pi^{x}$.

The choice of $p(\theta)$ is more difficult, as θ may enter $f(w|\theta)$ and the $p(D_j|\theta)$ in a variety of different ways; in fact, θ may stand for a vector of delay parameters that must be estimated! For the moment, we will leave $p(\theta)$ arbitrary, and later specialize to Gamma and Binomial forms to show typical results.

As the *posterior parameter density*, $p(\lambda,\theta|D)$ is not very revealing for any choice of priors, we pass to the central problem of concern, the *prediction* of the *unreported event count*, $\tilde{u}(t) = \tilde{n}(T) - r(t)$, which is Poisson if the parameters are given. If $t \geq T$, then the parameter will be $\lambda T[1-\Pi(t|\theta)]$, due to the usual decomposition independence of the Poisson process. On the other hand, if $t<T$, then the unrecorded events in $(0,t]$ will have the parameter $\lambda t[1-\Pi(t|\theta)]$, to which must be added the unobservable events in $(t,T]$ with parameter $\lambda(t-T)$, giving a total Poisson parameter for all unreported events generated in $(0,T]$ of $\lambda[T-t\Pi(t|\theta)]$. Combining these two different forms for $p(u|\lambda,D)$ with appropriate versions of (4.2), we obtain:

$$p(u|D) \propto h_\lambda(u|D)\, h_\theta(u|D) \, , \tag{6.2}$$

with

$$h_\lambda(u|D) = \frac{1}{u!}\int(\lambda T)^{r+u}\, e^{-\lambda T} p(\lambda)d\lambda \, , \tag{6.3}$$

and

$$h_\theta(u|D) = \int\left[\prod_{j=1}^{r} p(D_j|\theta)\right]\left[1 - \left(\frac{T}{T}\right)\Pi(t|\theta)\right]^u p(\theta)d\theta \, , \tag{6.4}$$

where $\propto$, "proportional to", indicates that only terms that vary with u need be retained. Note, in particular, that there has been a fortuitous cancellation in the term $\exp(-\lambda T\Pi(t|\theta))$ from the likelihood, so that the predictive density can be represented as the product of two factors:

- one which depends upon $r=r(t)$ and the prior $p(\lambda)$;
- the second which depends upon r, the secondary data types and the dates reported, and the prior $p(\theta)$.

This decomposition occurs in other models where one predicts unreported Poisson events (Jewell [1985a] [1985b]).

With the choice of the Gamma(a,b) prior for $\tilde{\lambda}$, we obtain:

$$h_\lambda(u|D) = \frac{\Gamma(a+r+u)}{u!}\left[\frac{T}{b+T}\right]^u \, , \tag{6.5}$$

that is, of the form of a Pascal(a+r;(T/b+T)) distribution. Of course, there is further "shaping" of $p(u|D)$ to come from $h_\theta(u|D)$.

For later convenience, we note that, with (6.5), the predictive density can be written in recursive form:

$$\frac{p(u+1|D)}{p(u|D)} = \left[\frac{a+r+u}{u+1}\right]\left[\frac{T}{b+T}\right]\left[\frac{h_\theta(u+1|D)}{h_\theta(u|D)}\right] . \tag{6.6}$$

7. Prediction with Known Delay Parameters

As preparation for more complicated cases, we first examine the prediction problem when θ is assumed to be known exactly. Only the term involving $\Pi(t|\theta)$ is then contributed by $h_\theta(u|D)$, and we have:

(7.1) $$p(u|D) \propto \frac{\Gamma(a+r+u)}{u!}\left[\frac{T-\tau\Pi(t|\theta)}{b+T}\right]^u ,$$

which is a Pascal predictive density, with first two moments:

(7.2) $$\mathcal{E}(\tilde{u}|D) = \frac{(a+r)T}{b}\left[\frac{1-(\tau/T)\Pi(t|\theta)}{1+(\tau/b)\Pi(t|\theta)}\right] ;$$

(7.3) $$\mathcal{V}\{\tilde{u}|D\} = E\{\tilde{u}|D\}\left[\frac{b+T}{b+\tau\Pi(t|\theta)}\right] .$$

With no data (t=0), $\mathcal{E}\{\tilde{u}\}=(aT/b)$ and $\mathcal{V}\{\tilde{u}\}=(aT/b)[(b+T)/b]$, which are of course the moments of the original no-data marginal density for $\tilde{n}$ with a $Ga(a,b)$ prior.

If the observation interval is small, (τ/T), $r(t)$, and $\Pi(t|\theta)$ will also be small, so that:

(7.4) $$\mathcal{E}\{\tilde{u}|D\} \approx \frac{(a+r)T}{b}\left[1-t\left[\frac{bT}{b+T}\right]\Pi(t|\theta)\right] , \qquad (t \longrightarrow 0)$$

showing that our initial estimate of u is at first increased by the initial reports r, before being diminished by the second-order effects due to increasing t and $\Pi(t|\theta)$.

If the observation interval is large, τ=T and Π will be near unity, so that:

(7.5) $$\mathcal{E}\{\tilde{u}|D\} \approx \left[\frac{(a+r)T}{(b+T)}\right]\left[1-\Pi(t|\theta)\right] . \qquad (t \longrightarrow \infty)$$

The first term is T times the usual *credibility updating*:

(7.6) $$\mathcal{E}\{\tilde{\lambda}|r\} = (1 - z)(a/b) + z(r/T) ; \quad z = (T/b+T) ;$$

of a Poisson process parameter with a Gamma prior, given a number r of ordinary *undelayed* samples from (0,T]. This estimate is then diminished by the probability $1-\Pi$ of unreported events outside (0,t]. The first term stabilizes towards the correct value of $\tilde{\lambda}T$ with increasing samples, but it is the second term that makes the predictive mean of $\tilde{u}$ decrease with increasing t. Note also that the second term in (7.3) approaches unity with increasing t, so that, in the limit, $\tilde{u}$ is asymptotically (small-mean) Poisson!

8. Exponential Delay Likelihood Factors

In addition to the above results, we must consider the additional variation due to uncertainty in the delay parameter(s), and the "learning" effects which occur with various secondary data. For simplicity in what follows, we use mostly the over-familiar exponential density, $f(w|\theta) = \theta \exp(-\theta w)$. However, we expect the phenomena described below to be representative of results obtained with more general delay distributions; only the computational details will differ. A somewhat different approach for Type IV secondary data only is described in Appendix C.

From (3.1), the likelihood for a Type I datum, $D_j=\left\{x_j,y_j\right\}$, is:

$$(8.1) \qquad p(D_j|\theta) = L_j(\theta) = \tfrac{1}{T}\theta e^{-\theta w_j} \qquad (w_j = y_j - x_j) \quad ,$$

where the new notation $L(\theta)$ emphasizes that it is variation in $\tilde{\theta}$ that shapes $h_\theta(u|D)$ (so that, for example, the term T^{-1} here and below can be deleted as uninformative). It can easily be seen that this likelihood is unimodal, with mode $\hat{\theta}=w_j^{-1}$. Data from r such delays would lead to a "Gammoid" likelihood, peaked with very small "variance" at $\hat{\theta}=(\Sigma w_j/r)^{-1}$. Thus, very large amounts of Type I data would force h_θ into a form giving the Pascal predictive density (7.1), with θ replaced by $\hat{\theta}$. In this sense, Type I data is very strong in learning about $\tilde{\theta}$ and in reducing the predictive uncertainty of $\tilde{u}$.

For a Type II datum, $D_j=\left\{y_j\right\}$, (3.2) shows there are two cases:

$$L_j(\theta) = \begin{Bmatrix} \frac{1}{T}\left[1-e^{-\theta y_j}\right] & (y_j \leq T) \\ \frac{1}{T}\left[e^{-\theta(y_j-T)}-e^{-\theta y_j}\right] & (y_j \geq T) \end{Bmatrix}. \tag{8.2}$$

Small y_j give a monotone likelihood, leading to a weak shift in θ towards higher values. However, a $y_j>T$ gives again a unimodal likelihood with mode at $\hat{\theta} = -ln[1-(T/y_j)]$. If $y_j>>T$, one can show that $\hat{\theta} \approx [y_j-(T/2)]^{-1}$, so the effect is similar to that of Type I data, using a guess of $x_j=(T/2)$; with comparable $\hat{\theta}$, however, one can show that the mode of the likelihood is broader (less "information") for Type II data. Thus, with large amounts of Type II data, and many samples greater than T, the secondary data term in h_θ will also be tightly concentrated around the mode, but less so than if Type I information were available. On the other hand, if most or all of the reporting dates are less than T, then the likelihood will have a very broad peak or no peak at all. In this sense, then, Type II data is not as informative about $\tilde{\theta}$, and hence about $\tilde{u}$, as Type I data.

For a Type III datum, $D_j=\{x_j\}$, (3.3) gives:

$$L_j(\theta) = \frac{1}{T}\left[1-e^{-\theta(t-x_j)}\right]. \tag{8.3}$$

Note that this likelihood is monotone, and depends upon the length of observation period. Because this datum is equivalent to $\{\tilde{w}_j \leq t - x_j\}$ it provides rather weak information about $\tilde{\theta}$, especially as t increases; with many such samples, we shall see that the main effect is to spread out the prior density.

Every Type IV event gives the same likelihood:

$$\Pi(t|\theta) = (\tfrac{\tau}{T}) - \frac{1}{\theta T}\left[e^{-\theta(t-T)} - e^{-\theta t}\right] , \tag{8.4}$$

which is also monotone increasing in θ. If $t \leq T$, the initial slope is $(t^2/2T)$ and the asymptote is (t/T); for $t \geq T$, the initial slope is $t-(T/2)$ and the asymptote is unity. In either case, the curve approaches the asymptote more slowly than any exponential. With many samples, we shall see that this likelihoood is very uniformative, and its main effect is broaden the mode of the prior density.

9. Computational Strategies for Delay Integral

We now consider various strategies for computing the delay integral (6.4), which, for simplicity, we rewrite as:

$$h_\theta(u|D) = \int L(\theta)\ [K(\theta)]^u\ p(\theta)d\theta\ , \tag{9.1}$$

assuming that the appropriate forms (7.1)-(7.4) are used to calculate $L(\theta) = \Pi L_j(\theta)$, and the *kernel* $K(\theta) = [1-(\tau/T)\Pi(t|\theta)]$. The first remark is that (9.1) is a rather easy numerical integration for arbitrary $p(\theta)$, even when many values of u are required. However, this does not give any analytic insight into the shaping of $p(u|D)$ from various data types.

For the rest of this section, we shall assume that the delays are exponential with unknown parameter $\tilde{\theta}$, which is Gamma(c_o,d_o); that is, our prior opinion is that $\mathcal{E}\{\tilde{\theta}\}=(c_o/d_o)$, $\mathcal{V}\{\tilde{\theta}\}=(\mathcal{E}\{\tilde{\theta}\})^2/d_o$, and the density is unimodal, with the prior mode at $\theta_o=(c_o-1)/d_o$. This is not only a reasonable prior for unimodal information, but is also conjugate to $L(\theta)$ for Type I observations. We shall then *approximate* the remaining factors in (9.1) by a *Gammoid function*:

$$g(\theta) = A\theta^{\Gamma} e^{-\Delta\theta} \quad , \tag{9.2}$$

in the region of the *current* mode of the integrand (which will initially be θ_o, but perhaps modified as we add terms from $L(\theta)$). This strategy will convert the entire integrand into a Gamma integral with a convenient analytic dependence on u. These approximations will, of course, be better and better the more precise is our prior knowledge about $\tilde{\theta}$; however, the method is surprisingly good with c_o = 3 or 4 and Type I or II data, for reasons that will become clearer as we proceed. Full details on the Gammoid approximation method will appear in a forthcoming paper.

To retain full generality, we shall proceed as if all four data types are present, with the total reported number r being broken down into r_1, r_2, r_3, and r_4 events. It turns out that the Gammoid coefficients Γ and Δ are approximately linear in the number of samples, so that we shall set $\Gamma=r\gamma$ and $\Delta=r\delta$ for each data type, and concentrate on the calculation of the *unit* coefficients, γ and δ. Only basic results are given below; complete formulae and computational details may be found in Appendices A and B.

9.1. Type I Secondary Data

Type I data is the easiest to deal with, as $L(\theta)$ from (8.1) is *exactly* Gamma. We recommend that the prior coefficients be updated as follows:

$$c_o \leftarrow c_o + r_1 \quad ; \quad d_o \leftarrow d_o + r_1\bar{w} \quad . \tag{9.3}$$

where $\bar{w}$ is the average of the (w_j) for all type I data. The *current* mode should be redefined in terms of the new coefficients as $\theta_o=(c_o-1)/d_o$. If there is no other secondary data, continue with Section 9.5.

9.2. Type II Secondary Data

Data of Type II must be further subdivided into two groups: Type IIa consists of the r_{2a} events with $\{y_j|y_j\leq T\}$, and Type IIb consists of of the r_{2b} events with $\{y_j|y_j>T\}$.

Considering the IIb data first, Appendix A shows that the likelihood for this data is unimodal and well-fitted by a Gamma with unit parameters given by (A.4). To a first approximation, one can take:

$$\gamma_{2b} \approx 1 \quad ; \quad \delta_{2b} \approx \left[\bar{y}^b - \frac{T}{2}\right] - \frac{T}{6}\,(\theta_o T) \quad , \tag{9.4}$$

where $\bar{y}^b$ is the average of the r_{2b} Type IIb data values (y_j). Therefore, our strategy with this data is to compute updated coefficients:

$$c_o \leftarrow c_o + r_{2b}\gamma_{2b} \quad ; \quad d_o \leftarrow d_o + r_{2b}\delta_{2b} \quad . \tag{9.5}$$

using either the exact approximating coefficients, or (9.4). As before, the *current* mode, θ_o, should be redefined. From this point on, the Gammoid approximation coefficients will still depend upon the value of θ_o, although usually in a weak way. Therefore, we recommend that, until Section 9.6, we consider that θ_o is fixed. Further iterations may improve the following approximations, but it is better to wait until after the "final" data-based coefficients are determined in Section 9.4 to make any more changes.

The likelihood factor for Type IIa is monotone increasing, with no mode of its own. However, Appendix A argues that a Gammoid approximation is still reasonable, and (A.8) gives exact formulae for determining the unit coefficients. To a good approximation:

$$\gamma_{2a} \approx 1 \quad ; \quad \delta_{2a} \approx \frac{1}{2}\bar{y}^a - \frac{1}{6T}m_2\theta_o \quad . \tag{9.6}$$

where $\bar{y}^a$ and m_2 are the first and second moments of the r_{2a} data points (y_j), both small by definition of Type IIa.

9.3. Type III Secondary Data

Type III data is very uninformative, especially for large values of t. As $L(\theta)$ is similar to that of Type IIa data, the exact approximating coeffficients are given also by (A.8), but with all terms in y_j replaced by $t-x_j$. (9.6) still gives an initial approximation for the unit coefficients:

$$\gamma_3 \approx 1 \quad ; \quad \delta_3 \approx \frac{1}{2}(t-\bar{x}) - \frac{1}{6T}m_2\theta_o \quad . \tag{9.7}$$

where m_2 is now the second moment of $(t-x_j)$. Both coefficients become smaller as t increases, reflecting the uninformative nature of the knowledge $\{\tilde{x}_j=x_j \le \tilde{y}_j \le t\}$, and it is necessary to use the exact formulae.

9.4. Type IV Secondary Data

With this minimal information $\{\tilde{y}_j \leq t\}$, $L(\theta)$ is monotone increasing, and depends only on r and t. The exact Gammoid unit coefficients are found using (B.4) or (B.6), but, to a first approximation:

$$\gamma_4 \approx 1 \quad ; \quad \delta_4 \approx \begin{Bmatrix} \frac{1}{3}t - \frac{t}{9}(\theta t) & (0 \leq t \leq T) \\ \frac{1}{3}\mu_3 - \left[\frac{\mu_4}{6} - \frac{\mu_3^2}{9}\right]\theta & (t \geq T) \end{Bmatrix}. \tag{9.8}$$

where the coefficients μ_3 and μ_4 are defined in Appendix B. These approximations are not good for large t, and it is better to use the exact formulae. It is even possible to have $\delta_4 < 0$, in which case we recommend setting $\delta_4 = 0$, and using (B.6) to find a local polynomial approximation.

9.5. The Kernel $K(\theta)$

As discussed in Appendix B, the kernel is monotone decreasing, much like a negative exponential. Therefore, a reasonable approximating procedure is to set $\gamma_K = 0$, and find δ_K from (B.9) at the current mode. For a quick approximation:

$$\delta_K \approx \begin{Bmatrix} \frac{t^3}{2T^2} & (t \leq T) \\ t - \frac{T}{2} & (t \geq T) \end{Bmatrix}. \tag{9.9}$$

with an additional term given in (B.11). δ_K gives the important dependence of h_θ upon u, since d_o will be updated by $\Delta_K = \delta_K u$, and c_o will not change with a.

9.6. Completing the Computations

With all of the above approximations completed, the final coefficients of the Gammoid form $\theta^{c-1}e^{-\theta d}$ will be:

$$
\begin{aligned}
&c = c_o + \Gamma \;;\; d = d_o + \Delta + \delta_K u \;; \\
(9.10)\qquad &\Gamma = r_1 + r_{2a}\gamma_{2a} + r_{2b}\gamma_{2b} + r_3\gamma_3 + r_4\gamma_4 \;; \\
&\Delta = r_1\bar{w} + r_{2a}\delta_{2a} + r_{2b}\delta_{2b} + r_3\delta_3 + r_4\delta_4 \,.
\end{aligned}
$$

If desired one can now make a second pass through all of the approximating formulae using the "final" data only mode, $\theta_o=[(c-1)/(d_o+\Delta)]$, to see if there is a significant change in the unit coefficients, and hence in (9.10). In our limited experience, the coefficients will be little modified if the mode of the prior density or the mode of the Type I or Type IIb data is reasonably concentrated; in other cases, several iterations may be required. The integral of (9.1) is now $\Gamma(c)/d^c$, but only the denominator is informative for u, so we may just as well take:

$$(9.11)\qquad h_\theta(u|D) = d^{-c} = (d_o+\Delta+\delta_K u)^{-(c_o+\Gamma)}$$

For a quick approximation, one can use the initial terms of all the approximations:

$$\Gamma = \quad r; \quad \delta_K = (t - \tfrac{T}{2}) \;;$$

$$(9.12)\qquad \Delta = \Sigma w_j + \frac{1}{2}\sum_{II_a} y_j + \sum_{II_b} (y_j - \tfrac{T}{2}) + \tfrac{1}{2}(r_3 t - \Sigma x_j) + \mu_3 r_4.$$

As these are easy to compute, one could also use these values in an *initial* guess for the mode, making no modifications in θ_o until the "final" calculations (9.10) were made.

If all the data is of Type IV and t>T, a different approach to calculating h_θ is possible using a Beta prior; full details are in Appendix C.

10. Calculating the Predictive Distribution

From (6.6) and (9.11), we obtain finally a recursive relationship for the predictive density:

$$\frac{p(u+1|D)}{p(u|D)} = \left[\frac{a+r+u}{u+1}\right]\left[\frac{t}{b+T}\right]\left[\frac{d_o+\Delta+\delta_K u}{d_o+\Delta+\delta_K+\delta_K u}\right]^{c_o+\Gamma} , \tag{10.1}$$

whose values are calculated by setting $p(0|D)=1$, "bootstrapping" up through "sufficient" values of u, and then renormalizing. Moments and the tail distribution are then obtained numerically. As this recursive method is very efficient, it is easy to explore the full-distributional implications for different parameter and data values.

If one still insists on a *point* estimator for the number of unreported events, the *predictive mode* can be obtained analytically. Let u^* be the (usually non-integral) solution to:

$$u^* + 1 = \left[\frac{a+r+u^*}{b+1}\right]T\left[\frac{d_o+\Delta+\delta_K u^*}{d_o+\Delta+\delta_K+\delta_K u^*}\right]^{c_o+\Gamma} ; \tag{10.2}$$

this solution always exists, and usually converges rapidly using an iterative approach, starting with an arbitrary guess on the RHS. The predictive mode, $\hat{u}(D)$, is then *the integer greater than or equal to* u^*.

This type of point estimation is related to an old and well-known formula in population biology, associated with LaPlace, Petersen, and others (Jewell [1985a]). In Section 12, we shall see that (10.2) also has an interesting interpretation in terms of credibility predictors.

Of course, the great advantage of (10.1) is that it provides the *complete* predictive distribution for $\tilde{u}$. As we shall see in the numerical examples following, the variance in the unreported events remains quite substantial with even a fair amount of data. This knowledge is crucial in making a proper risk assessment of IBNR reserves.

11. Numerical Example

To illustrate the above theory, we consider a numerical example which assumes that our prior knowledge is correct in the means, but is not especially precise. Based on these results, the reader can easily extrapolate to cases where initial knowledge is different from reality, or, conversely, is very accurate.

Specifically, we assume that $\tilde{\lambda}$ has a Gamma(2, 0.02) prior density, which makes $\mathcal{E}\{\tilde{\lambda}\}=100$, $\mathcal{V}\{\tilde{\lambda}\}=5000$; for convenience, we take T=1 year, which makes the mean total rate of IBNYR events 100 per year. This leads to a Pascal(2, 1.02^{-1}) density for $\tilde{n}$, with $\mathcal{E}\{\tilde{n}\}=100$, $\mathcal{V}\{\tilde{n}\}=5100$, and a mode $\hat{n}=49$; the 5%, 25%, 75%, and 95% fractiles are: $n_{.05}=16.5$, $n_{.25}=47.0$, $n_{.75}=134.5$, and $n_{.95}=238.1$, respectively, which is quite a broad range, *a priori*. We assume that $\tilde{\theta}$ has a Gamma(4,6) prior density, so the prior mean delay is $\mathcal{E}\{\tilde{\theta}^{-1}\}=2.0$ years, and $\mathcal{V}\{\tilde{\theta}^{-1}\}=8.0$ years^2.

For the purpose of simulation, we further "stacked the deck" by assuming that the true value of the delay parameter was $\theta=0.5$ per year, and, whatever the true value of λ was, that exactly n=100 IBNYR events were generated during the exposure year. Table I shows a few of the simulated values, arranged in order of increasing (y_j), and hence approximately increasing in (w_j). In the 100 samples, the mean delay is 2.35 years, with sample variance 5.35 years, so the coefficient of variation is about right, but the delays are a little long, on average. Figure 3 shows the curves of $\Pi(t|\theta)$ and $K(\theta) = [1-(\tau/T)\Pi(t|\theta)]$ versus t, for the true value θ=0.5. The simulated count history for reported events, r(t), is the ragged curve.

11.1. Type I Data Analysis

In the first analysis, we assumed that all data was of Type I, and we examined observation intervals of t=0(0.5)10.0 years (remember T=1 year, and the mean delay is 2.0 years). The results are summarized in Figure 4, which shows r(t), $\mathcal{E}\{\tilde{n}|D\}=r(t)+\mathcal{E}\{\tilde{u}(t)|D\}$, $\hat{n}(D)=\hat{u}(D)+r(t)$, plus the four fractiles of $(\tilde{n}|D)$ mentioned previously, all versus t. (Continuous curves are shown for convenience). Of course, these calculations were carried out by first finding the complete predictive densities, $p(u|D)$, (over the range [0,1000]) using the appropriate sifted data for the current value of t, and then finding the summary statistics; this took about 10 seconds on a PC-AT for each value of t ! All results were translated from predicting $\tilde{u}$ to predicting $\tilde{n}$ for ease in making comparisons.

From the figure, it can be seen that the point estimators, the mean and the mode, both wander around the true (and ultimate) value of 100, although, for reasons we do not completely understand, the mode seems to be less "tricked" by intermediate fluctuations in r(t), once the mode has risen from its initial low value of 49 until after, say, t>T. It is extremely satisfying to see how the Bayesian confidence intervals decrease with

x	y	w
.043	.206	.163
.022	.234	.213
.095	.267	.172
.330	.527	.198
.112	.629	.517
....	....	....
....	.....	.....
.570	1.412	.841
.390	1.430	1.040
.600	1.483	.883
.902	1.493	.590
.118	1.558	1.440
....	.....	.....
....	.....	.....
.269	2.820	2.551
.728	2.823	2.095
.282	2.872	2.590
.055	2.985	2.929
.862	3.055	2.173
....	.....	.....
....	.....	.....
.036	9.128	9.092
.933	9.408	8.475
.311	9.616	9.305
.349	11.194	10.845
.563	12.967	12.403

Table I. Extract of 20 of the simulated values for numerical example (θ=0.5).

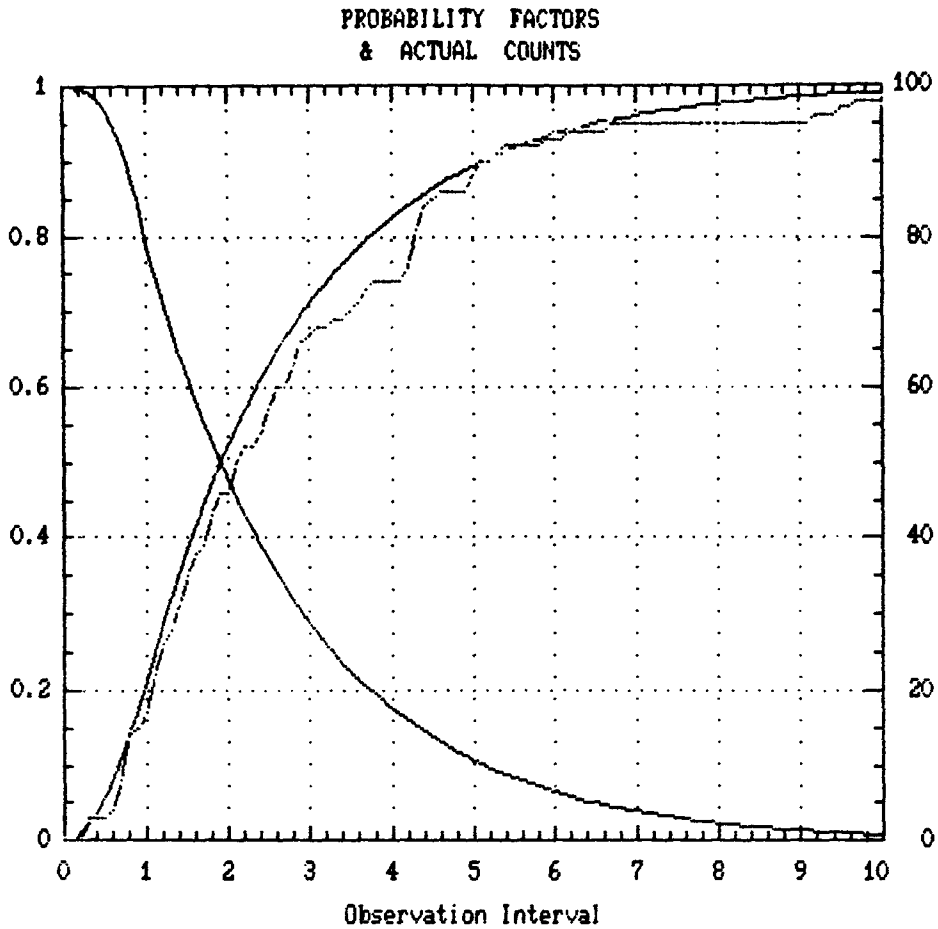


Figure 3. Observation probability, Kernel, and simulated count history versus t/T.

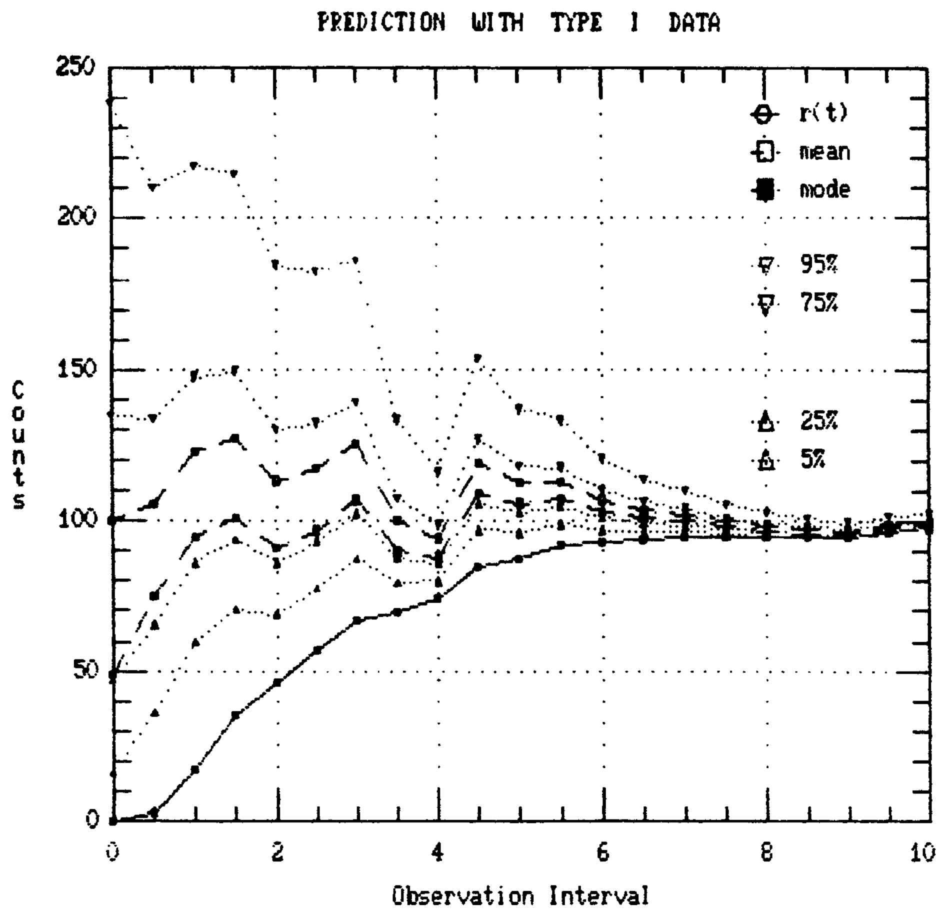


Figure 4. Predictive mean, mode and fractiles versus t/T for Type I data.

increasing t, although it must be remembered that much of this is due to the decrease in $1-\Pi(t|\theta)$, and not just the learning due to D !

Specific details for t=4 years (Π=0.824) are as follows: the data gives r=74 reported events, plus secondary information leading to parameters Γ=74, Δ=94.509, so that c=78, d=100.509, and the new (and final) mode is θ_o=0.7661, from which δ_K=3.4368. The resulting $p(u|D)$ is shown in Figure 5, with $\mathcal{E}\{\tilde{u}|D\}$=20.28, $\mathcal{V}\{\tilde{u}|D\}$=143.6, and $\hat{u}(D)$=14 (there are, in fact, 22 events outstanding). If we increase the observations to four time constants at t=8 years, (Π=0.976), there are now r=98 reported events ,the parameters are Γ=95, Δ=184.436, so c=97, d=190.436, and the new mode is θ_o=0.515, from which δ_K=7.4573. $p(u|D)$ is shown in Figure 6, and $\mathcal{E}\{\tilde{u}|D\}$=3.55, $\mathcal{V}\{\tilde{u}|D\}$=6.6, and $\hat{u}(D)$=2, which is exactly the number of unreported claims. We found $\tilde{u}(D)$ directly and then using u^* in (10.2), and in all cases, the latter value converged accurately to the former after 5-15 iterations, starting with initial estimates of u^*=100.

11.2. Type II Data Analysis

In the second analysis, we assumed that all data was of Type II, but otherwise used the same values as above. Figure 7 summarizes the results, which should be compared with Figure 4 for Type I data. Roughly speaking, the results are similar for $t \lesssim T$ and $t > 4T$ (twice the mean delay), but are much more variable in the intermediate region; note particularly how small fluctuations near t=0.5 and t=4.5 "jolt" the predictors more in Type II than in Type I. This poorer behaviour is, of course, due to the missing (x_j) in Type II, which makes the estimation of $\tilde{\theta}$ quite unstable in this region. For $t<T$, there is little learning anyway, and for $t>5T$, the approximation $w_j \approx y_j-0.5T$ is good enough.

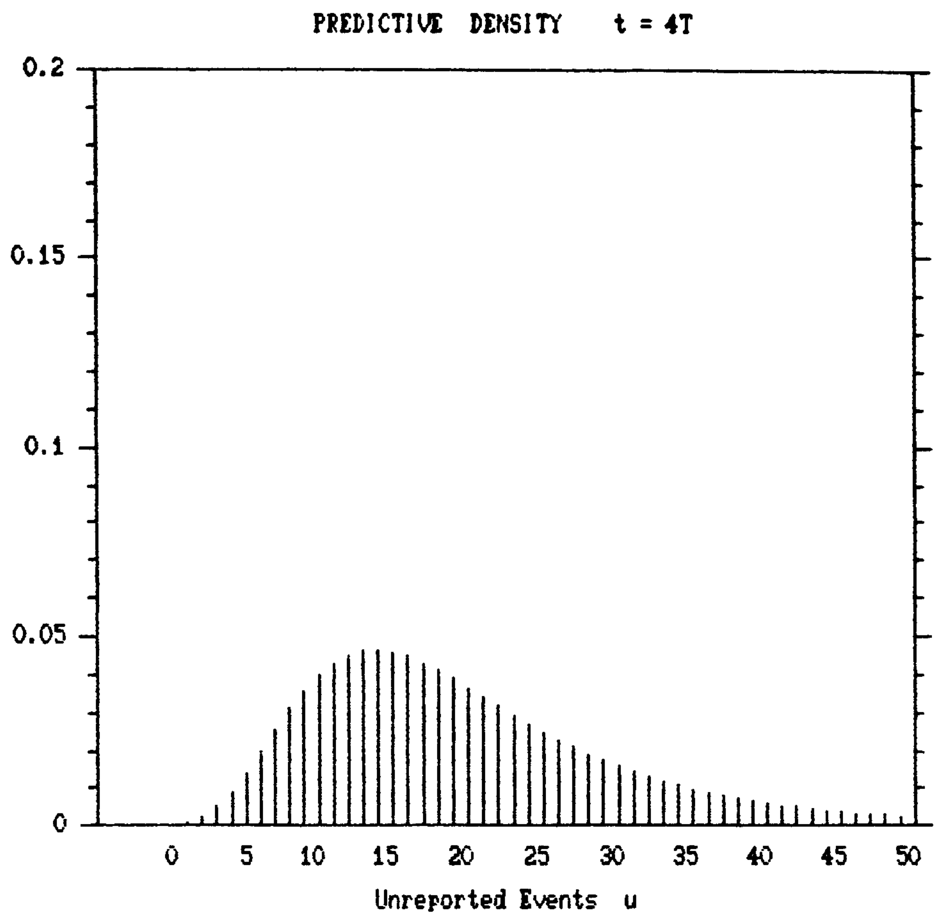


Figure 5. Predictive density, t=4T, for Type I data.

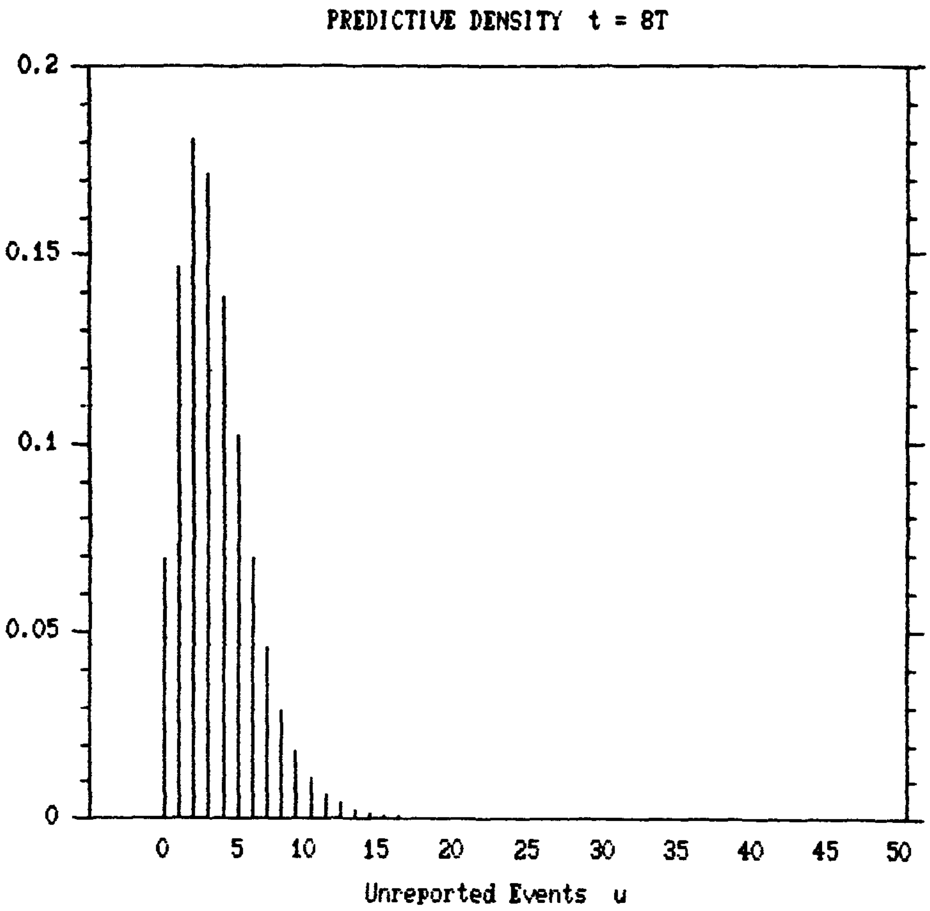


Figure 6. Predictive density, t=8T, for Type I data.

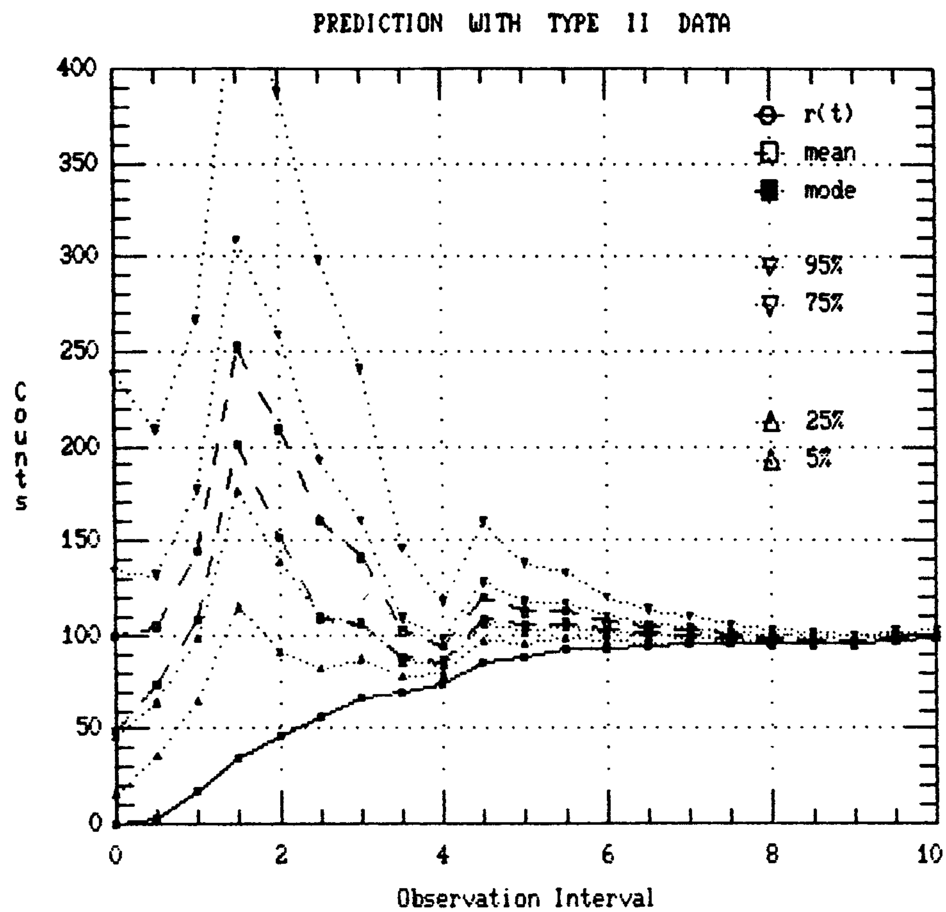


Figure 7. Predictive mean, mode and fractiles versus t/T for Type II data.

The main change in computational details with Type II data is that it is desirable to iterate a few times to find the correct mode, θ_o. For t=4 years, four iterations stabilized at θ_o=0.7998, giving c=74.639, d=92.054, and δ_K=3.4340, from which $\mathcal{E}\{\tilde{u}|D\}$=19.69, $\mathcal{V}\{\tilde{u}|D\}$=183.4, and $\hat{u}(D)$=12. For t=8 years, two iterations are enough to give θ_o=0.5240, c=97.055, d=183.298, and δ_K=7.4565, from which $\mathcal{E}\{\tilde{u}|D\}$=3.29, $\mathcal{V}\{\tilde{u}|D\}$=6.06, and $\hat{u}(D)$=2. The forms of the predictive densities are similar to those shown for Type I data. Again, u^* always converged rapidly to the true answer.

11.3. Types III and IV Data Analysis

The computations with Type III and IV data are much more difficult, and give completely different behaviour than that described above. Considering first that we have only Type IV data (counts only), we obtain the summary results shown in Table 2. At first, with t small, we get the modest improvements in the Pascal marginal density that were observed above. However, as soon as t becomes larger than T, there is a steady and dramatic increase in all the predictors as r increases, and our point estimators *grow without bound* ! (In fact the need for evaluation over an increasingly wide range of u-values soon exceeds computer memory, which is the reason for the ? beside the larger numbers in the table.)

Why does this happen? As before, there is at first some instability in finding the current mode, which may require 5 or 10 "assisted" iterations. Then, beginning about t=2T, δ_4 becomes negative, and we must change to γ-only modelling, as described in Appendix B. And, admittedly, the Gammoid approximations for u small are also not as good as in previous cases. But these are second-order effects.

The real reason for the behaviour shown in Table 2 is that *there is less and less information in Type IV sampling as t increases!* As r increases with t, the likelihood $[\Pi(t|\theta)]^r$ "destabilizes" the prior $p(\theta)$ by diffusing the mode of g, while at the same time h_λ is increasing. This loss of information about $\tilde{\theta}$ and increase in the estimate of $\tilde{\lambda}$ can be seen most clearly in (10.2); there is no technical difficulty in converging to the correct mode, but it is clear from the magnitude of the parameters that the mode must move to larger and larger values as r increases. (But remember that only r is known for each t; knowing the history of r(t) brings us back to Type II).

Besides the lack of information in the likelihood, the behaviour is greater influenced by our prior certainty about the value of $\tilde{\theta}$. To see this, let us keep t=4T fixed, and increase both c_o and d_o so that the prior mode of $\tilde{\theta}$ (which is the prior mean of $\tilde{\theta}^{-1}$) is kept fixed at its true value of 0.5. As shown in Table 3, as the prior precision increases, the mode of the integrand shrinks slowly towards θ=0.5 (of course!), and the various predictors are pulled in towards more reasonable numerical values. But notice also that values of, say, $c_o>60$ are needed to make the values comparable to those obtained with Type II or II additional supplementary data; this is an extraordinary amount of precision, corresponding to a prior standard deviation for $\tilde{\theta}^{-1}$ of less than 0.25 years, when the mean is 2.0 years !

Finally, we can also see what is happening mathematically by examining the details involved in computing the ratio $h(u+1|\mathcal{D})/h(u|\mathcal{D})$ in (6.6)(10.1). For t=4 years and the original parameters, we find θ_o=1.237 after t iterations, giving values of Γ=4.4257,Δ=0 (we use polynomial-only approximation), and δ_K=3.3994. If we compare these with values found previously, we see that it is much easier for the ratio to approach unity more quickly than before. In other words, because the Pascal $\pi=(T/(b+t))=1.02^{-1}$ is already very close to one, there is little chance to shape the density downward while it is growing due to increased r. So, while $p(u|D)$ is increasing, the ratio is quickly becoming unity, so that the tails of the predictive density must look much like a Pascal($a+r(t),\pi$) density. In fact, the means of that Pascal density are 3800 and 4850 for t=4T and t=8T, respectively, which are comparable to those in Table 2.

In contrast, from the analytic form of the shaping ratio, we see that if $(c_0-1)/d_o$ is fixed at θ_o, then, as the parameters increase to large and larger values (with moderate values of u), the ratio approaches $\exp(-\theta_o\delta_K)$, thus accounting for the convergence shown at the end of Table 3. Convergence is also improved with strong prior knowledge about the parameter $\tilde{\lambda}$, as this makes the first ratio, $\Pi=(T/(b+T))$ smaller for the same $\mathcal{E}\{\tilde{\lambda}\}$.

Turning now to Type III data, we see that similar convergence problems will be encountered because of the shape of the likelihood. Results are analogous to those in Table 2. Although the growth is postponed somewhat, the increases in r and t inevitably lead to large increases in the estimators, unless we have very strong prior assumptions.

In summary, we see that not having at least the date of occurrence of the IBNYR events leads to Bayesian predictions that, while mathematically correct, are operationally useless. This is *not* a result of using Bayesian analysis, but due to a more fundamental problem, namely, that Type III and Type IV data are *uninformative* (some might say, anti-informative) when the priors on $\tilde{\lambda}$ and $\tilde{\theta}$ are not sufficiently precise. In a sense, this behaviour is the analogue of the non-existence of MLE's for Type IV data discussed in Section 5.

t/T	$r(t)$	θ_o	$\mathcal{E}\{\tilde{u}\|D\}$	$\hat{u}(D)$	$\mathcal{V}\{\tilde{u}\|D\}$
0	0	0.000	100.0	49	5100
0.5	3	0.938	102.2	72	2975
1.0	17	1.990	132.6	96	4144
1.1	22	2.178	259.0	209	12290 ?
1.2	26	2.246	450.5	400	23280 ?
1.5	35	2.177	1038	987	53760 ?
2.0	46	1.905	1766	1715	89490 ?
4.0	74	1.237	3370 ?	3320 ?	172300 ?
8.0	95	0.777	4561 ?	4511 ?	232900 ?

Table 2. Results for Type IV data versus t/T.

c_o	d_o	θ_o	$\mathcal{E}\{\tilde{u}\|D\}$	$\hat{u}(D)$	$\mathcal{V}\{\tilde{u}\|D$
4	6	1.237	3370 ?	3320 ?	172300 ?
8	14	1.036	3008 ?	2958 ?	154300 ?
16	30	0.875	2407 ?	2356 ?	124100 ?
32	62	0.747	1373	1323	73050 ?
40	78	0.714	890	839	49370 ?
50	98	0.683	270.0	212	19760 ?
64	126	0.653	32.9	25	248
128	258	0.583	18.3	17	38
inf	inf	0.500	16.0	15	19

Table 3. Results for Type IV data and t=4T, showing effect of increased precision in Gamma prior density.

12. Interpretation of the Predictive Mode

There is an interesting interpretation of the predictive mode (10.2) in terms of posterior parameter means that holds even for arbitrary $p(\theta)$ and data types. First note that the predictive mean of u is:

$$(12.1) \qquad \mathcal{E}\{\tilde{u}|D\} = \mathcal{E}\left\{\tilde{\lambda}T[1-\tfrac{\tau}{T}\Pi(t|\tilde{\theta})]\,|D\right\} ,$$

and that, because of the factorization (6.2), we might expect the dependence on $\tilde{\lambda}$ and $\tilde{\theta}$ to be somehow separable. Recall also that, with a Gamma(a,b) prior on $\tilde{\lambda}$, a measurement of r Poisson events with parameter $(\tilde{\lambda}T)$ gave in (7.6) a posterior parameter mean $\mathcal{E}\{\tilde{\lambda}|r\}=(a+r)/(b+T)$, which is in credibility form.

Now, rewrite the expression (10.2) for general $p(\theta)$ as:

$$(12.2) \quad \hat{u}(D) \approx u^{*}+1=\left[\frac{a+r+u^{*}}{b+T}\right]T\left\{\frac{\int[1-\frac{\tau}{T}\Pi(t|\theta)]\;[K(\theta)]^{u^{*}}L(\theta)p(\theta)d\theta}{\int[K(\theta)]^{u^{*}}L(\theta)p(\theta)d\theta}\right\} .$$

We see that the first term is, in fact, $\mathcal{E}\{\tilde{\lambda}|r+u^{*}\}$, the posterior mean for $\tilde{\lambda}$ *under the observation of* $r+u^{*}$ *samples* ! Similarly, the measure $[K(\theta)]^{u^{*}}L(\theta)p(\theta)$ is essentially $p(\theta|D,u^{*})$, the density of $\tilde{\theta}$ posterior to the usual data D *plus the "look-ahead" observation of* u^{*} *events after the observation interval is over* ! Thus, the second term on the RHS may be thought of as $\mathcal{E}\{[1-(\tau/T)\Pi(t|\tilde{\theta})]\,|D,u^{*}\}$.

We admit that a direct argument that $\hat{u}(D)$ should be approximately like a separated version of (12.1) using anticipatory data (D,u^{*}) is very slippery indeed. But this type of result for the predictive mode seems to occur over and over in filtered Poisson predictions (Jewell [1985a] [1985b]).

(12.2) also reveals why simple approximations to h_θ are likely to work well in calculating $p(u|D)$. Because only the *ratios* of the integrals are used in the calculations, there is an automatic improvement in the effective accuracy of the approximation. This fact has already been made explicit in more general approaches to Bayesian prediction, see e.g., Tierney and Kadane [1986].

13. Summary

The main points of this paper are:

(1) The natural formulation of the IBNYR problem is in continuous time because of the underlying Poisson generation of claims and the continuous nature of reporting delays.

(2) In addition to observing the number of events, r, that are reported during the observation period, it is important to record secondary data consisting of the dates associated with each event in order to improve estimation of the unknown delay parameter $\tilde{\theta}$; the maximal improvement occurs when the exact delays are recorded.

(3) The data likelihood reveals that r is used primarily to estimate the unknown Poisson parameter, $\tilde{\lambda}$, and the secondary is used primarily to estimate $\tilde{\theta}$; however there is an important coupling term between $\tilde{\lambda}$ and $\Pi(t|\tilde{\theta})$, the probability that an event is reported during $(0,t]$. The maximum-likelihood estimators of the parameters and of $\tilde{u}$, the number of events still unreported by time t, are either trivial or non-existent.

(4) Therefore, a Bayesian formulation, with prior densities on $\tilde{\lambda}$ and $\tilde{\theta}$, assumed *a priori* independent, is: (a) a more natural

formulation, since prior information about claim rates and reporting delays is always available in practice; and (b) gives more useful results, since it provides a complete predictive density, $p(u|D)$, for any observed data. In fact, emphasizing $p(u|D)$, rather than $p(\lambda,\theta|D)$, results in a computational simplification, as it eliminates the coupling term in the likelihood and gives $p(u|D)$ as the product of two factors that depend upon $p(\lambda)$ and $p(\theta)$, respectively.

(5) The predictive density can easily be calculated for arbitrary priors. With a Gamma(a,b) prior on $\tilde{\lambda}$, the essential work is the calculation of the ratio of two integrals depending upon $p(\theta)$. This ratio can be easily and accurately approximated for any type of secondary data, as shown by an example with an exponential delay law and a Gamma prior on $\tilde{\theta}$. The numerical computation of $p(u|D)$ then proceeds rapidly using a simple recursion, from which the mean, variance, tail distribution, etc., of $\tilde{u}$ can be found. If a quick point estimator is needed, the predictive mode $\hat{u}(D)$ can also be found from a simple iterative formula that always converges rapidly.

(6) A numerical example reveals that there is substantial residual variance in $p(u|D)$, even with a large volume of data. This is because, with r large, $\tilde{\theta}$ is estimated as well as it will ever be, especially with good secondary data; $\tilde{u}$ is then approximately Pascal distributed, with mean and variance decreasing as $1-\Pi(t|\hat{\theta})$ with increasing time. This effect is due to the underlying assumption of Poisson events, is common to all stochastic IBNR models, and emphasizes the inadequacy of point estimation procedures. On the positive side, availability of the complete density $p(u|D)$ enables the direct calculation of risk factors and their incorporation into IBNYR reserves on a sound actuarial basis.

(7) The numerical example also reveals how uninformative and useless are Types III and IV secondary data. Satisfactory stability in estimating the parameters and predicting the unreported events requires the observation of at least the reporting dates, i.e., the time history of $r(t)$.

In the sequel to this paper, we shall show how this basic model is modified when IBNYR reporting only occurs periodically (a quantized form of Type II data), and how the availability of collateral data from other exposure years (the IBNR triangle) influences our predictions.

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Appendix A. Gammoid Approximations

As discussed in Section 9, the strategy in evaluating integrals like (9.1) is to approximate the non-Gamma part of the integrand by a *Gammoid function*:

$$g(\theta) = A\theta^{\Gamma} e^{-\Delta\theta} \quad , \tag{A.1}$$

in the region of the mode θ_o of the Gamma part of the integrand; the location of the mode can be recalculated, if necessary. The final integral is then easily evaluated.

The constant A is usually not of interest in our models. Beginning with the obvious:

$$\frac{d\ln g(\theta)}{d\theta} = \frac{\Gamma}{\theta} - \Delta \quad ; \quad \frac{d^2 \ln g(\theta)}{d\theta^2} = -\frac{\Gamma}{\theta^2} \quad , \tag{A.2}$$

we see that a function $L(\theta)$ can be approximated by (A.1) near θ_o by using coefficients:

$$\Gamma = -\theta_o^2 \left.\frac{d^2 \ln L(\theta)}{d\theta^2}\right|_{\theta_o} \quad ; \quad \Delta = \frac{\Gamma}{\theta_o} - \left.\frac{d\ln L(\theta)}{d\theta}\right|_{\theta_o} \tag{A.3}$$

If only a negative exponential approximation is desired, we set $\Gamma=0$ and find Δ from the first derivative; similarly, for a polynomial-only approximation, we set $\Delta = 0$ in the second formula in (A.3).

The success of the method depends on several factors. First of all, it is desirable to have a concentrated mode to begin with; we have found that even $c_o=3$ or 4 in the prior density is adequate. Secondly, if a portion of $L(\theta)$ is already unimodal in the range of interest, we have found it desirable to update the coefficients c_o and d_o immediately and to redefine the shifted mode θ_o for use with the rest of $L(\theta)$ which is locally monotone. Usually, these latter coefficients will be slowly varying in the region of interest (we will make this more precise for our factors) and so the mode does not need continuing redefinition. If desired, after all the Gammoid coefficients have been determined, one can calculate a "final" mode for the integrand, and make one or two more passes to correct the coefficients found from (A.3). In our experience, such iterations lead to minor corrections and usually need to be repeated only a few times; this is essentially because we are only interested in the *ratios* of such integrals, as in (10.2). More details on Gammoid approximations will appear in a forthcoming paper.

As mentioned in Section 9, we consider that $L(\theta)$ is broken up into various factors, corresponding to the different data types. All of the limiting forms for the approximation coefficients determined below are linear in the number of observations, so we shall emphasize the approximation in terms of *unit coefficients* γ and δ. The final updating within each category will then be in terms of $\Gamma = r\gamma$ and $\Delta = r\delta$.

It should be clear from (8.1) that $L_j(\theta)$ for the r_1 Type I samples will lead to an *exact* Gamma form, with unit coefficients $\gamma_1 = 1$ and $\delta_1 = \bar{w} = (\Sigma w_j / r_1)$. For obvious reasons, these should be combined with the Gamma coefficients in the prior, and the *current* mode, θ_o, redefined.

As mentioned before, the two different formulae (8.2) for $(y_j \le T)$ and $(y_j > T)$ require splitting up the Type II data into Types IIa and IIb for approximation purposes. Type IIb data has a definite Gammoid shape already, with its own well-defined mode $\hat{\theta} = -ln[1-(T/\bar{y}^b)]$, where $\bar{y}^b = (\Sigma y_j / r_{2b})$ is the average over IIb data points only. If we approximate the likelihood at an arbitrary point θ_o, we obtain unit coefficients:

$$\text{(A.4)} \qquad \gamma_{2b} = \frac{\left[\theta_o T\right]^2 e^{\theta_o T}}{\left[e^{\theta_o T} - 1\right]^2} \quad ; \quad \delta_{2b} = \frac{\gamma_{2b}}{\theta_o} + (\bar{y}^b - T) - \frac{T}{\left[e^{\theta_o T} - 1\right]} \quad ,$$

whereas, if we approximate at the mode of the data, we obtain:

$$\text{(A.5)} \qquad \gamma_{2b} = \bar{y}^b(\bar{y}^b - T)\,(\hat{\theta})^2 \quad ; \quad \delta_{2b} = \bar{y}^b(\bar{y}^b - T)\,\hat{\theta} \quad .$$

We recommend using (A.4) unless r_{2b} is very large compared to c_o+r_1, in which case (A.5) may be better. One can, of course, iterate until the current mode has stabilized. Table A.1 shows how little sensitive the unit coefficients are to various choices of θ_o over the range of interest. Since only the leading term of the coefficient δ_{2b} in (A.4) actually depends upon the data (y_j), we have calculated $\delta^*_{2b} = \delta_{2b} - (y^{-b}-T)$, which is then data-independent with δ_{2b}.

$\theta_o T$	γ	δ^*/T
0.1	.9992	⁻.0167
0.2	.9967	⁻.0333
0.3	.9925	⁻.0499
0.4	.9868	⁻.0663
0.5	.9794	⁻.0826
0.6	.9705	⁻.0988
0.7	.9601	⁻.1148
0.8	.9483	⁻.1306
0.9	.9351	⁻.1461
1.0	.9207	⁻.1613

Table A.1. Unit Coefficients for Type IIb data $\delta^* = \gamma - (\bar{y} - T)$

In fact, expansion of (A.4) shows that:

(A.6) $$\gamma_{2b} \approx 1 - \frac{1}{12}(\theta_o T)^2 + O\left[(\theta_o T)^4\right] \quad ;$$

(A.7) $$\delta_{2b} \approx (\bar{y}^{b} - \frac{T}{2}) - \frac{T}{6}(\theta_o T) + O\left[(\theta_o T)^3\right] \quad .$$

The leading terms are still independent of the location of the mode, and are often a good approximation.

Type IIa data gives an $L(\theta)$ that is monotone increasing, with no mode of its own. From (8.2) we find formally the unit approximation coefficients:

$$\text{(A.8)}\quad \gamma_{2a} = \frac{1}{r_{2a}} \sum \frac{(\theta_o y_j)^2\, e^{\theta_o y_j}}{\left[e^{\theta y_j} - 1\right]^2} \quad ; \quad \delta_{2a} = \frac{1}{\theta_o}\left[\gamma_{2a} - \frac{1}{r_{2a}} \sum \frac{\left[\theta_o y_j\right]}{\left[e^{\theta_o y_j} - 1\right]}\right].$$

These represent a Gammoid with a mode that is usually at a much larger value of θ than the current mode of the integrand. Thus, although conceptually a bad fit, the failure of the approximation is in a region where there is little mass. If we expand (A.8), we find:

$$\text{(A.9)}\qquad \gamma_{2a} \approx 1 - \frac{1}{12}\, m_2 \theta_o^2 + O\left[(\theta_o T)^4\right];$$

$$\text{(A.10)}\qquad \delta_{2a} \approx \frac{1-a}{2}\bar{y} - \frac{1}{6T} m_2 \theta_o + O\left[(\theta_o T)^3\right].$$

where $m_2 = (\Sigma y_j^2 / r_{2a})$, over the Type IIa data only. Since the values of these (y_j) are always chosen from $(0,T]$, it is clear that the leading terms of (A.9) and (A.10) are already excellent approximations. Table A.2 shows the behaviour of these coefficients for the 17 possible Type IIa samples from the example of Section 11, where $\bar{y}^a = 0.6563$ and $m_2 = 0.4789$.

$\theta_o T$	γ	δ^*/T
0.1	.9996	.3202
0.2	.9984	.3122
0.3	.9964	.3042
0.4	.9936	.2963
0.5	.9901	.2884
0.6	.9858	.2806
0.7	.9807	.2728
0.8	.9749	.2651
0.9	.9685	.2575
1.0	.9613	.2499

Table A.2. Unit coefficients for Type IIa data from numerical example.

With Type III data, we encounter a situation similar to that of IIa, namely that $L(\theta)$ from (7.3) is monotone increasing without a mode of its own. The formulae for the unit coefficients are exactly the same as those given in (A.8) for IIa data, but with y_j replaced everywhere by $t-x_j$. The approximations (A.9)(A.10) are also still correct, with now $m_2 = [\Sigma(t-x_j)^2/r_3]$. For large t, these approximations may not be very good, as $L(\theta)$ is essentially very small and flat, and is being approximated by the front edge of a Gammoid with a δ coefficient that is quite sensitive to the value of the parameter. Table A.3 shows the variation of these coefficients over the range of interest for the 100 maximum possible Type III data points from the numerical example of Section 11.

	t = 0.5T		t = T		t = 2T		t = 3T		t = 4T	
$\theta_0 T$	γ	δ/T	γ	δ/T	γ	δ/T	γ	δ/T	γ	δ/T
0.1	.9998	.2201	.9995	.3703	.9979	.7401	.9896	1.5603	.9540	2.8357
0.2	.9993	.2167	.9980	.3602	.9916	.6983	.9591	1.3565	.8306	2.0054
0.3	.9985	.2134	.9955	.3501	.9813	.6570	.9108	1.1628	.6648	1.3361
0.4	.9973	.2100	.9920	.3401	.9671	.6164	.8480	.9832	.4941	.8444
0.5	.9958	.2067	.9875	.3302	.9492	.5767	.7749	.8204	.3450	.5103
0.6	.9940	.2034	.9821	.3203	.9280	.5380	.6957	.6761	.2287	.2973
0.7	.9919	.2001	.9757	.3105	.9037	.5006	.6143	.5507	.1453	.1682
0.8	.9894	.1968	.9684	.3008	.8767	.4646	.5343	.4438	.0892	.0929
0.9	.9866	.1935	.9603	.2912	.8473	.4300	.4582	.3541	.0533	.0504
1.0	.9835	.1902	.9513	.2818	.8161	.3971	.3880	.2801	.0311	.0269

Table A.3. Unit coefficients for Type III data from numerical example.

Appendix B. Gammoid Approximations of Terms Involving Π

Analysis of Type IV data $L(\theta)$ and the kernel $K(\theta)$ in (9.1) with exponential delays is simplified if we define the function:

$$\psi(x) = \frac{1-e^{-x}}{x} = 1 - \frac{x}{2} + \frac{x^2}{6} - \frac{x^3}{24} + \frac{x^4}{120} - + \ldots . \quad \text{(B.1)}$$

and its derivatives:

(B.2) $$\psi'(x) = -\left[\frac{1-(1+x)e^{-x}}{x^2}\right] \quad ;$$

(B.3) $$\psi''(x) = \left[\frac{2-(2+2x+x^2)e^{-x}}{x^3}\right] \quad .$$

All of these functions are well-behaved; for example, $\exp(-x/2) \leq \psi(x) \leq (1+x/2)^{-1}$.

With Type IV data, $L(\theta) = [\Pi(t|\theta)]^r$, and for $t \leq T$, $\Pi(t|\theta) = (t/T)[1-\psi(\theta t)]$. Then:

(B.4) $$\frac{\partial ln\Pi(t|\theta)}{\partial\theta} = \frac{-t\psi'(\theta t)}{1-\psi(\theta t)} \; ; \; \frac{\partial^2 ln\Pi(t|\theta)}{\partial\theta^2} = \frac{-t^2\psi''(\theta t)}{1-\psi(\theta t)} - \left[\frac{\partial ln\Pi(t|\theta)}{\partial\theta}\right]^2 \quad .$$

The gammoid coefficients, γ_4 and δ_4, are then found using (A.3) at the current mode θ_o. For small $(\theta_o t)$, we find:

(B.5) $$\gamma_4 \approx 1 - \frac{1}{18}(\theta_o t)^2 + 0\left[(\theta_o t)^3\right] \; ; \; \delta_4 \approx \frac{1}{3}t - \frac{t}{9}(\theta_o t) + 0\left[(\theta_o t)^2\right] \quad .$$

When $t > T$, $\Pi(t|\theta) = 1 - e^{-\theta(t-T)}\psi(\theta T)$, and (B.4) becomes:

(B.6) $$\frac{\partial ln\Pi(t|\theta)}{\delta\theta} = \left[\frac{(t-T)\psi(\theta T)-T\ \psi'(\theta T)}{e^{\theta(t-T)}-\psi(\theta T)} =\right] \; ;$$

$$\frac{\partial^2 ln\ \Pi(t|\theta)}{\partial\theta^2} = \left[\frac{-T^2\psi''(\theta T) + (t-T)T\psi'(\theta T)}{e^{\theta(t-T)}-\psi(\theta T)}\right] - \left[\frac{\partial\ ln\ \Pi(t|\theta)}{\partial\theta}\right]^2$$

,

with unit coefficients again found using (A.3). For small $(\theta_o T)$:

(B.7) $$\gamma_4 \approx 1 - \left[\frac{\mu_4}{12} - \frac{\mu_3^2}{18}\right]\theta_o^2 + O(\theta_o^3) \; ; \; \delta_4 = \frac{\mu_3}{3} - \left[\frac{\mu_4}{6} - \frac{\mu_3^2}{9}\right]\theta_o + O(\theta_o^2) \quad .$$

where $\mu_k=[t^k-(t-T)^k]/[t^2-(t-T)^2]$.

Table B.1 shows the behaviour of these coefficients over the interesting range of $(\theta_o T)$, for several different values of (t/T). Note that for large t, δ_4 can become negative. In this case, we recommend using just a polynomial approximation, with δ_4=o and γ_4 determined from the first derivative in (B.6).

	t = 0.5T		t = T		t = 2T		t = 4T		t = 8T	
$\theta_o T$	γ	δ/T	γ	δ/T	γ	δ/T	γ	δ/T	γ	δ/T
0.1	.9999	.1639	.9995	.3223	.9053	¯.1919	.7392	¯.9518	.4843	¯1.8693
0.2	.9995	.1612	.9978	.3116	.8204	¯.1650	.5454	¯.7207	.2282	¯1.0130
0.3	.9988	.1585	.9952	.3010	.7444	¯.1412	.4031	¯.5379	.1091	¯.5208
0.4	.9978	.1558	.9916	.2907	.6762	¯.1203	.2995	¯.3959	.0550	¯.2566
0.5	.9966	.1531	.9871	.2807	.6149	¯.1020	.2245	¯.2877	.0296	¯.1224
0.6	.9952	.1505	.9817	.2709	.5598	¯.0861	.1699	¯.2065	.0167	¯.0571
0.7	.9935	.1479	.9755	.2613	.5102	¯.0723	.1300	¯.1467	.0097	¯.0262
0.8	.9916	.1454	.9685	.2520	.4654	¯.0604	.1005	¯.1032	.0056	¯.0119
0.9	.9895	.1428	.9608	.2430	.4249	¯.0501	.0783	¯.0719	.0033	¯.0054
1.0	.9871	.1403	.9525	.2342	.3883	¯.0414	.0613	¯.0497	.0019	¯.0024

Table B.1. Unit coefficients for Type IV data.

The kernel $K(\theta)$ in (9.1):

(B.8) $$K(\theta) = \left[1 - [\tfrac{T}{T}]\Pi(t|\theta)\right] = \begin{cases} 1-\left[\frac{t}{T}\right]^2[1-\psi(\theta t)] & (t\leq T) \\ e^{-\theta(t-T)}\psi(\theta T) & (t\geq T) \end{cases} .$$

is a monotonic decreasing of θ, with first logarithmic derivative:

(B.9) $$\frac{d\ln K(\theta)}{d\theta} = \begin{cases} \dfrac{(t^3/T^2)\psi'(\theta t)}{K(\theta)} & (t\leq T) \\ -(t-T) + \dfrac{T\psi'(\theta T)}{\psi(\theta T)} & (t\geq T) \end{cases} .$$

As both these forms are negative and slowly varying over a wide range of values, in contrast to (B.4) (B.5), it makes little sense to use a full Gammoid approximation, especially since negative values for γ_K may result ! Thus, for the kernel, it seems reasonable to just approximate by a negative exponential, i.e., set:

$$\text{(B.10)} \qquad \gamma_K = 0 \quad ; \quad \delta_K = - \left. \frac{d\ln K(\theta)}{d\theta} \right|_{\theta_o} .$$

It is easy to show that, for small values of $(\theta_o t)$ or $(\theta_o T)$:

$$\text{(B.11)} \qquad \delta_K \approx \left\{ \begin{array}{ll} \left[\frac{t^3}{2T^2}\right]\left[1-\frac{2}{3}(\theta_o t)[1-\frac{3}{4}(\frac{t}{T})^2] + 0\left[(\theta_o t)^2\right]\right] & (t \lesssim T) \\ (t - \frac{T}{2}) - \frac{T}{6}(\theta T) + 0\left[(\theta T)^3\right] & (t \gtrsim T) \end{array} \right\} .$$

Of course, approximation of the kernel results in an updating of the Gamma coefficient d_o by $\delta_K u$. Table B.2 shows the variation in this unit coefficient for different values of (t/T).

			δ_K		
$\theta_o T$	t=0.5T	t=T	t=2T	t=4T	t=8T
0.1	.0608	.4917	1.4917	3.4917	7.4917
0.2	.0592	.4833	1.4833	3.4833	7.4833
0.3	.0576	.4750	1.4750	3.4750	7.4750
0.4	.0561	.4668	1.4668	3.4668	7.4668
0.5	.0546	.4585	1.4585	3.4585	7.4585
0.6	.0531	.4503	1.4503	3.4503	7.4503
0.7	.0517	.4421	1.4421	3.4421	7.4421
0.8	.0503	.4340	1.4340	3.4340	7.4340
0.9	.0490	.4260	1.4260	3.4260	7.4260
1.0	.0476	.4180	1.4180	3.4180	7.4180

Table B.2. Unit coefficients for Kernel (γ=0).

The Gammoid approximations presented above can be further refined by the use of additive terms to model the non-zero asymptotes in Types IIa, III, and IV data, or to give a better fit to the long tails of all the factors. However, our limited experience is that the refinements are of second-order effect in modifying the shape of h_θ, especially when the prior parameter density is reasonably informative.

Perhaps something should be said about the case when only Type IV data is available. Then, the integrand will be $[\Pi(t|\theta)]^r[K(\theta)]^u = I(\theta)$, say, resulting in a unimodal curve when r and u are larger than unity simply because we have the product of an increasing with a decreasing curve. In this case, it might make sense to determine the approximation coefficients Γ and Δ "at one blow" by using the first and second logarithmic derivative of $I(\theta)$; the problem is that this needs to be mechanized efficiently for all values of u in order to normalize the density.

A completely different approach to Type IV-only data is given in Appendix C.

Appendix C. Type IV Data Only with Beta Prior

If we have only Type IV information and t>T, then:

$$h_\theta(u|D) = \int [\Pi(t|\theta)]^r[1-\Pi(t|\theta)]^u \, p(\theta) \, d\theta \ , \tag{C.1}$$

which suggests that a reparametrization on the r.v. $\tilde{\pi} = \Pi(t|\tilde{\theta})$ would be appropriate, and, with a Beta prior, $p(\pi)$, would give an exact integral. The only inconvenience is that, if one truly believed in a Gamma(c_o,d_o) prior on $\tilde{\theta}$, then the transformed density would be a rather complex form on (0,1]. Nevertheless, with a highly peaked Gamma, one could use the Gammoid approximation ideas to approximate $p(\pi)$ by a highly peaked Beta density with equivalent parameters (α_o,β_o); we omit the details.

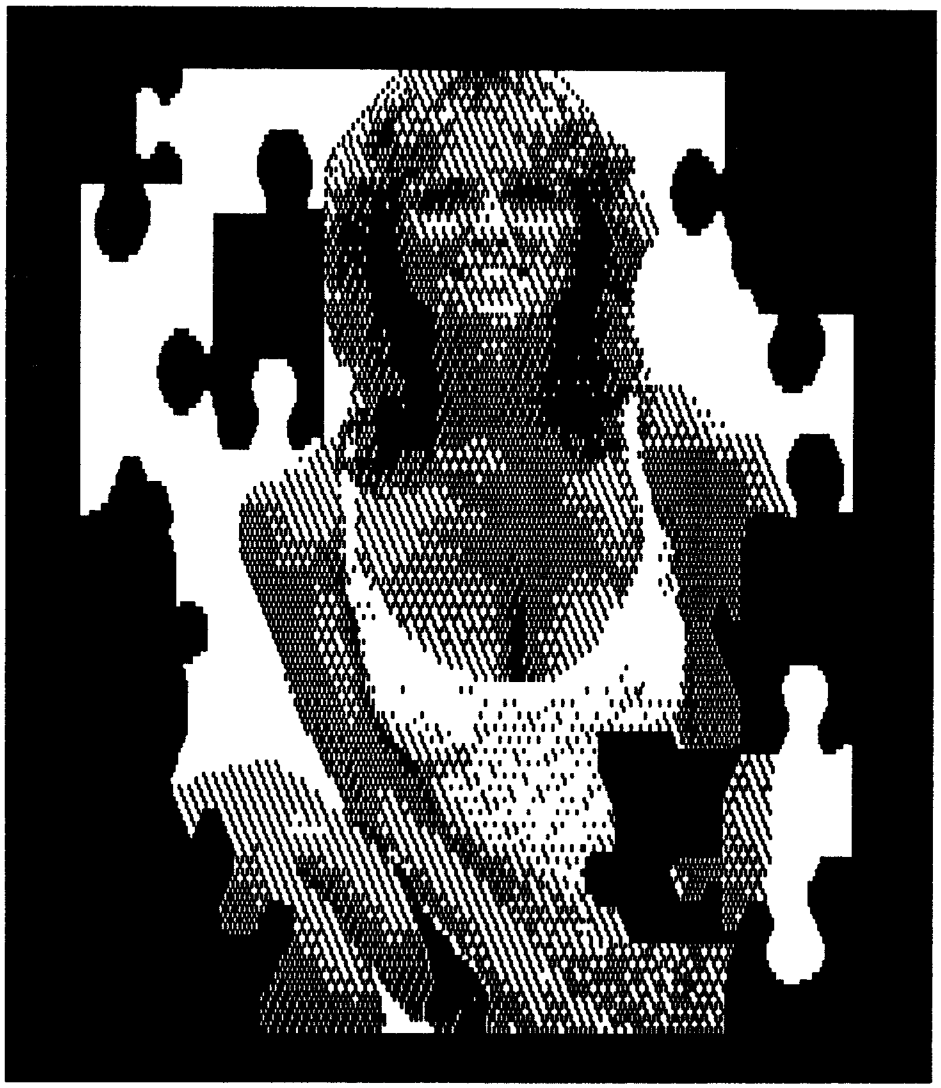
We would then find $h_\pi(u|D) = \Gamma(\beta_o+u)/\Gamma(\alpha_o+\beta_o+r+u)$, changing the shaping factor in (10.2) as follows:

$$\left[\frac{d_o+r\delta_4+\delta_K u}{d_o+r\delta_4+\delta_K+\delta_K u}\right]^{c_o+r+\gamma_4} \longrightarrow \left[\frac{\beta_o+u}{\alpha_o+\beta_o+r+u}\right] \tag{C.2}$$

There is no set of parameters which will make these two shapes entirely equivalent, but one might attempt to fit the shapes for u=0 and u very large, say, for fixed t and r. In any case, the shaping for intermediate values of μ will be different for h_θ and h_π.

Although somewhat simpler, it is not clear that this approach is "better"; the parametric approach through an assumed form for $f(w|\theta)$ seems more "real" to us, as it is difficult to imagine how one could develop a consistent prior $p(\pi)$ for many different values of t. And finally, we must remind the reader of the very poor results obtained in Section 11 with Type IV data; we do not expect that this approach will give any improvement for equivalent values of initial precision.

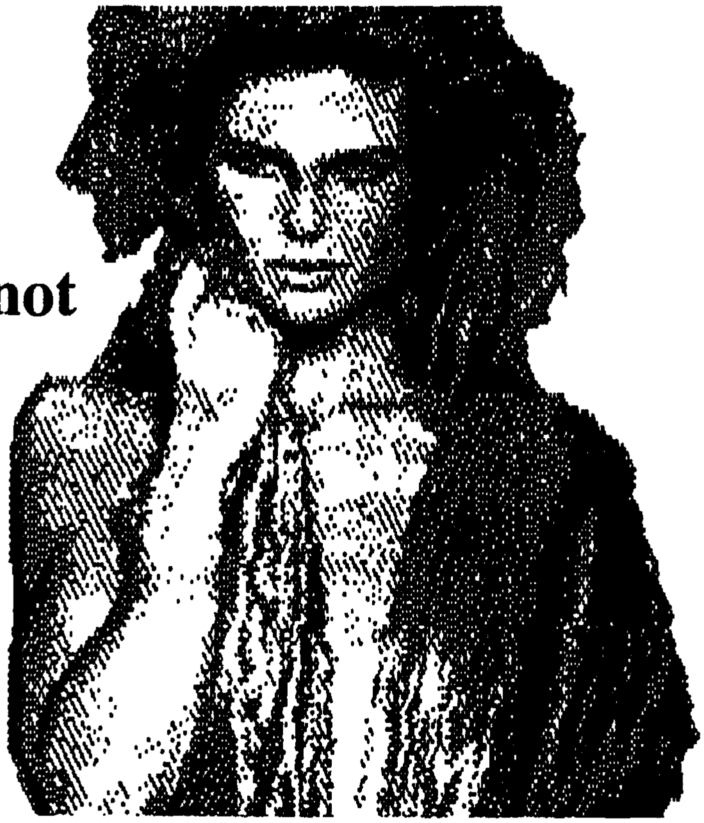
BUILDING MODELS



Original Cheryl Teigs Computer Portrait Courtesy of CompuServe PICSIG

BUILDING MODELS

Some Early Lessons -



Using models does not generally involve Christie Brinkley

Monte Carlo simulation is not nearly so romantic as it sounds

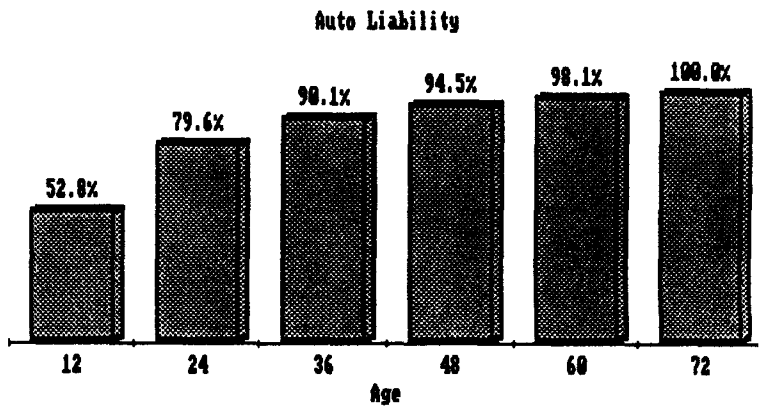
Original Computer Portraits Courtesy of CompuServe PICSIG

BUILDING MODELS

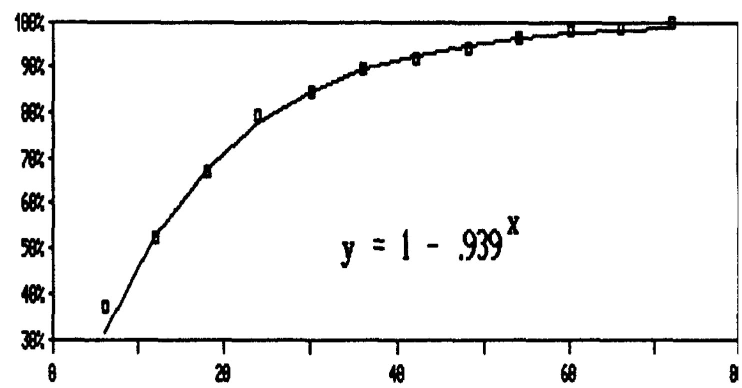
It is a short step from traditional reserving methods...

Acc. Year	Age 12	Age 24	Age 36	Age 48	Age 60	Age 72
1982	$5,280	$7,960	$9,010	$9,450	$9,810	$10,000
1983	$5,800	$8,756	$9,911	$10,395	$10,791	
1984	$6,389	$9,632	$10,902	$11,435		
1985	$7,028	$10,595	$11,992			
1986	$7,731	$11,655				
1987	$8,504					

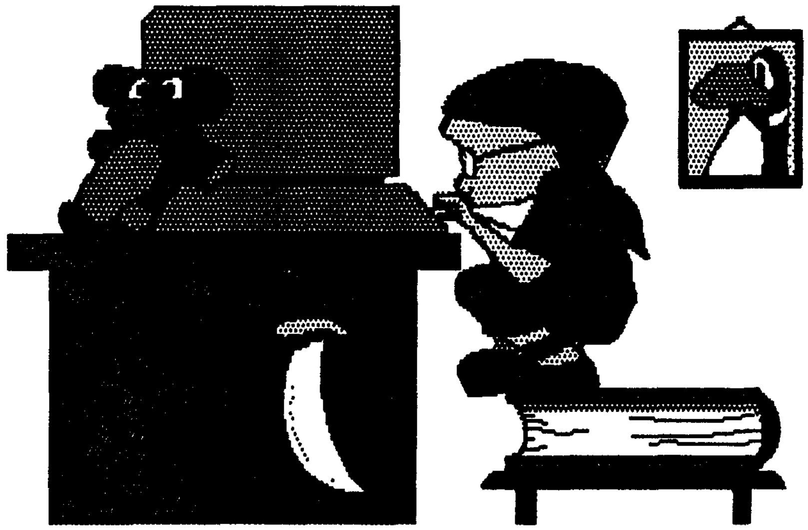
	12-24	24-36	36-48	48-60	60-72
1982	1.508	1.132	1.049	1.038	1.019
1983	1.508	1.132	1.049	1.038	
1984	1.508	1.132	1.049		
1985	1.508	1.132			
1986	1.508				



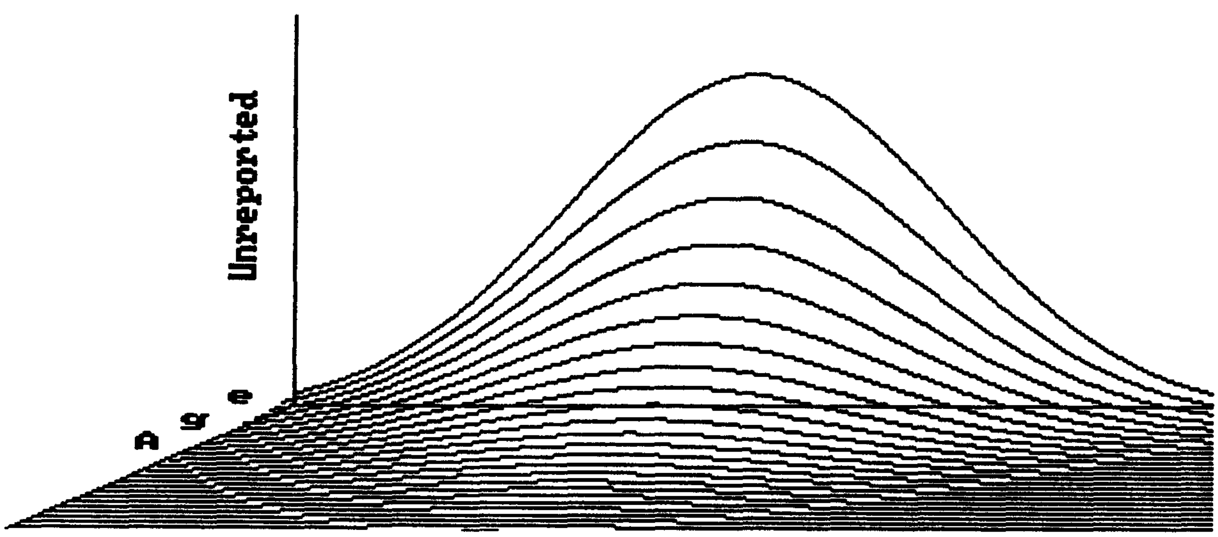
... to simple deterministic mathematical models



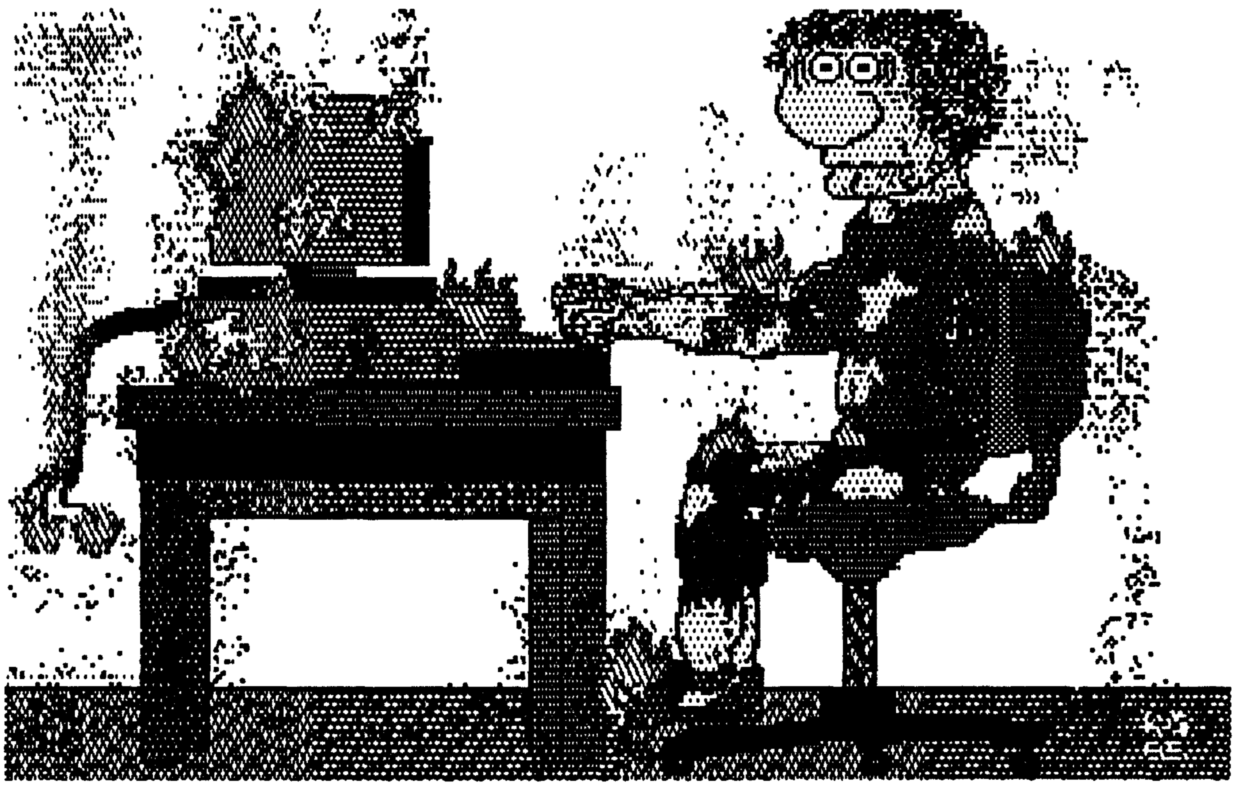
BUILDING MODELS



Personal Computers have facilitated the development of more sophisticated models involving elements of risk theory for use by casualty actuaries in the loss reserving process



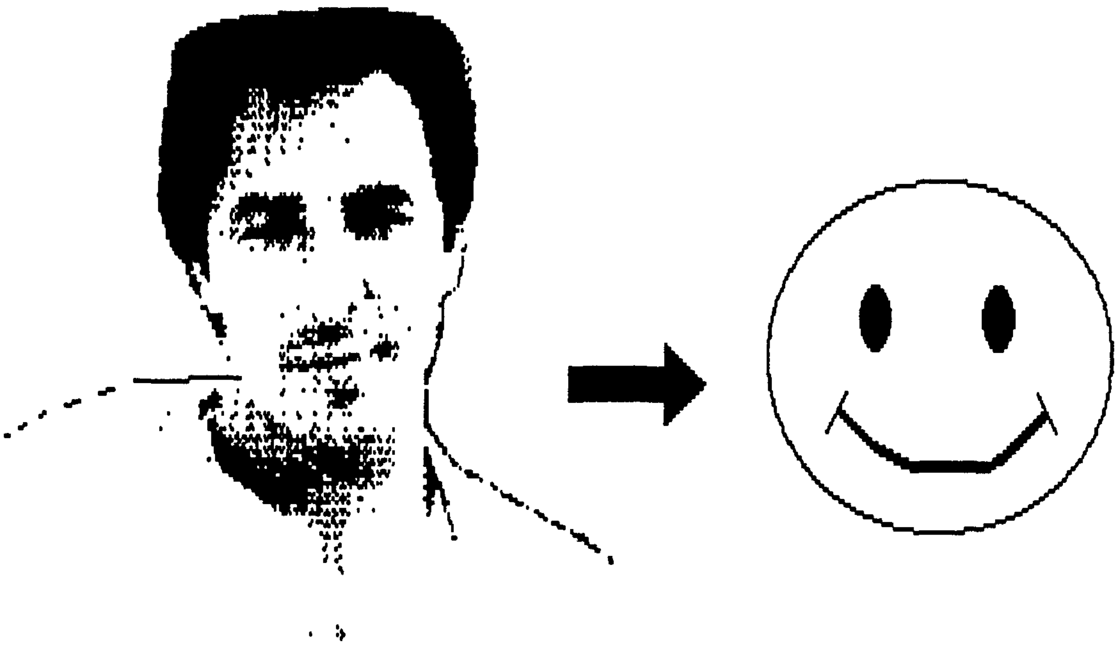
Sometimes, however . . .



. . . the models don't perform as well as they might

BUILDING MODELS

Some Common Problems:



OVER-SIMPLIFICATION

Examples:

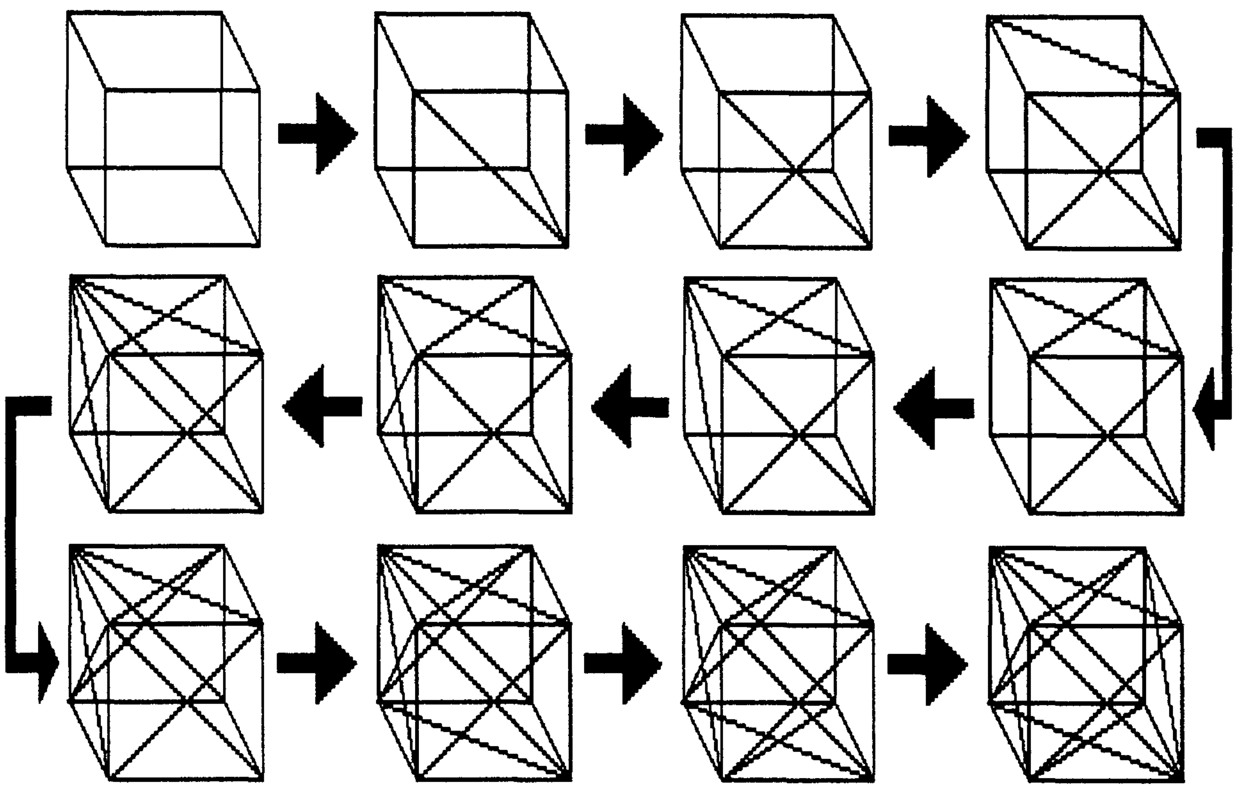
Retro Reserves based (solely) on Loss Ratio

IBNR as % of Premium

Allocated based upon calendar year paid

BUILDING MODELS

Some Common Problems (Continued):



OVER-COMPLICATION

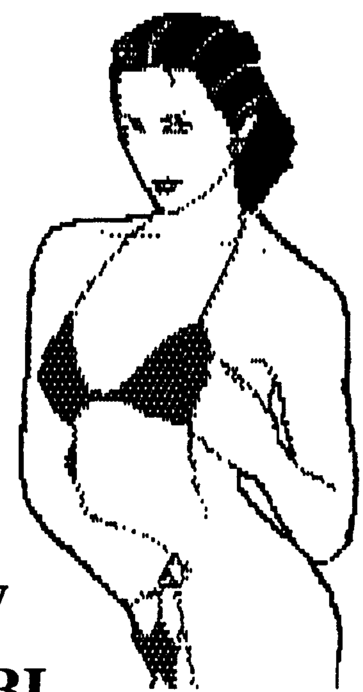
Examples:

Unallocated based upon size-of-loss

Too many independent variables

BUILDING MODELS

Some Common Problems (Continued):



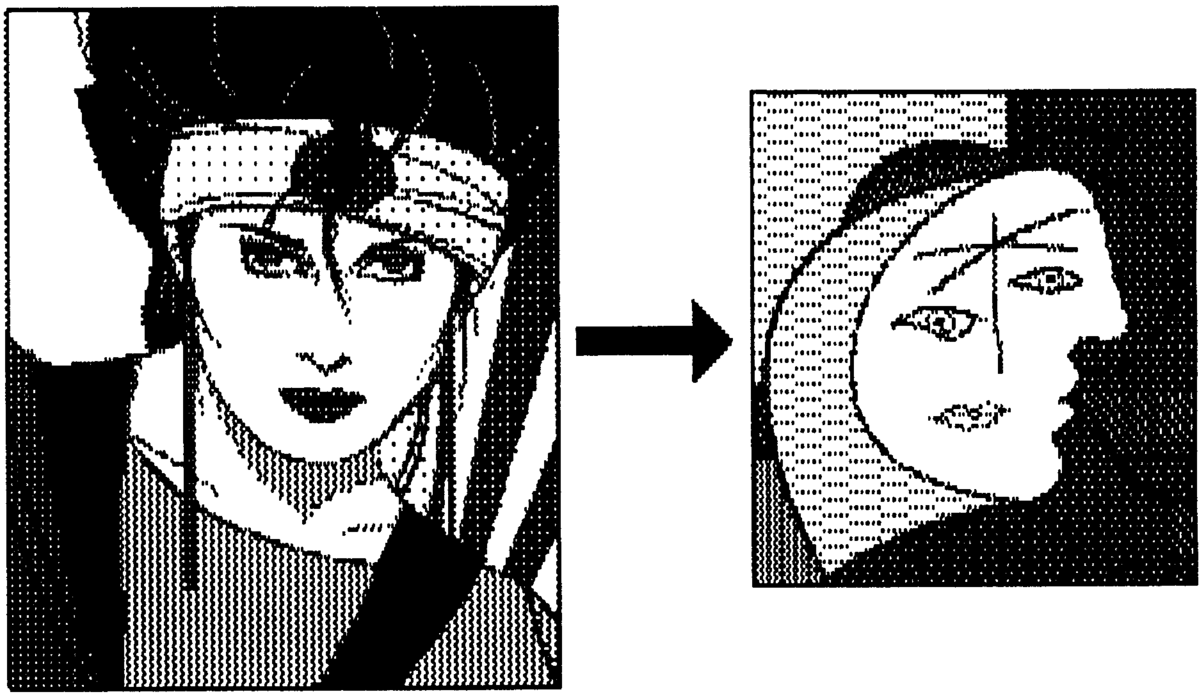
FAILURE TO RETAIN ESSENTIAL ELEMENTS

Example:

Portfolio Selection Model applied to multi-line company resulted in finding that Auto BI should be emphasized; Auto PD should be avoided

BUILDING MODELS

Some Common Problems (Continued):



<u>PUTTING IT TOGETHER WRONG</u>

Example:

Mortgage Guarantee model -

Based on <u>absolute</u> rate of unemployment rather than <u>change</u> in the rate

BUILDING MODELS

Some Common Problems (Continued):

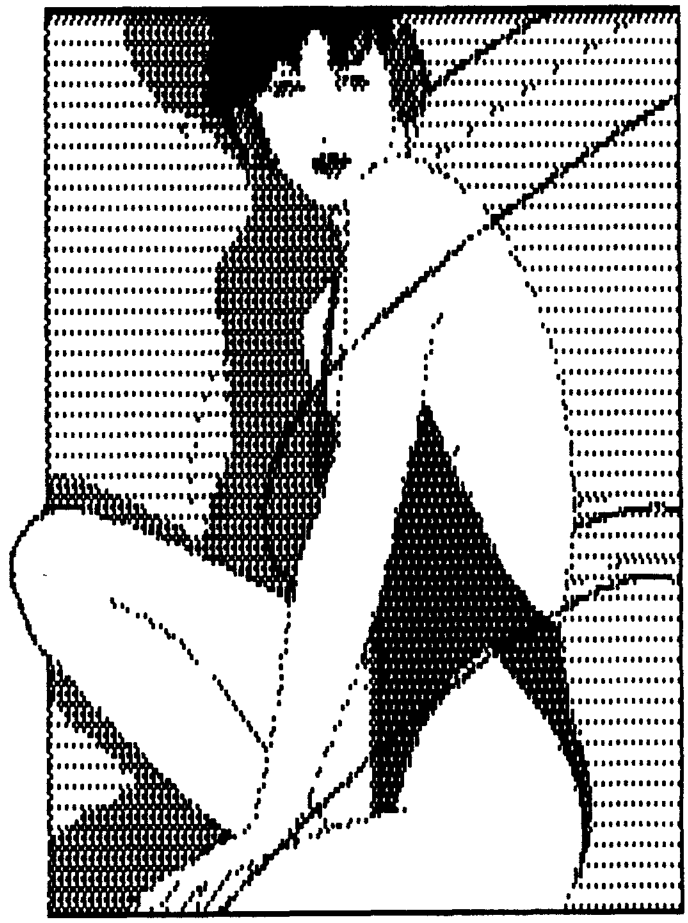
SOMETIMES THE MODEL DEVELOPS A LIFE OF ITS OWN

Example:

NAIC IRIS System

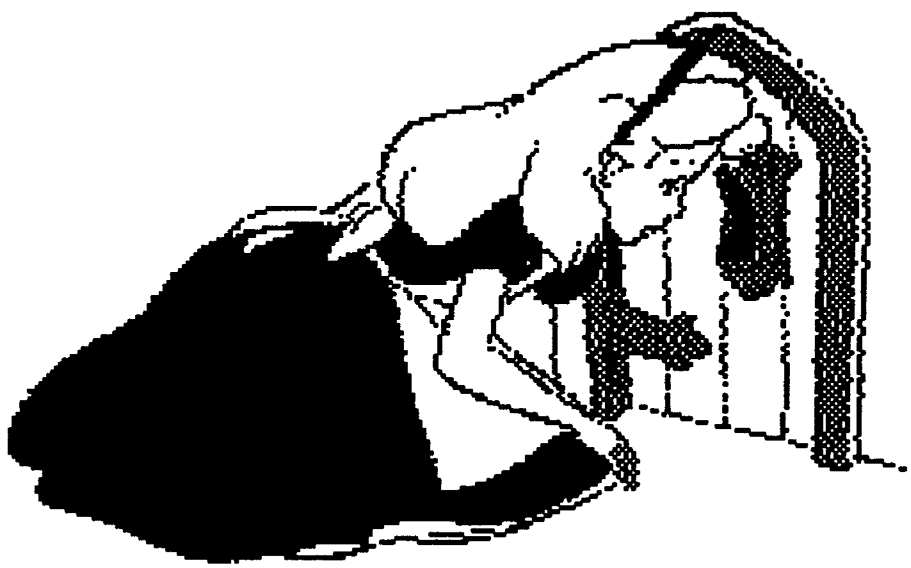
BUILDING MODELS

Why I Like Models



BUILDING MODELS

Why I Like Models (Continued)



They allow me to look at things in new ways

- **Ability of reserve portfolio to self-liquidate**
- **Impact of economic changes**
- **Confidence levels**

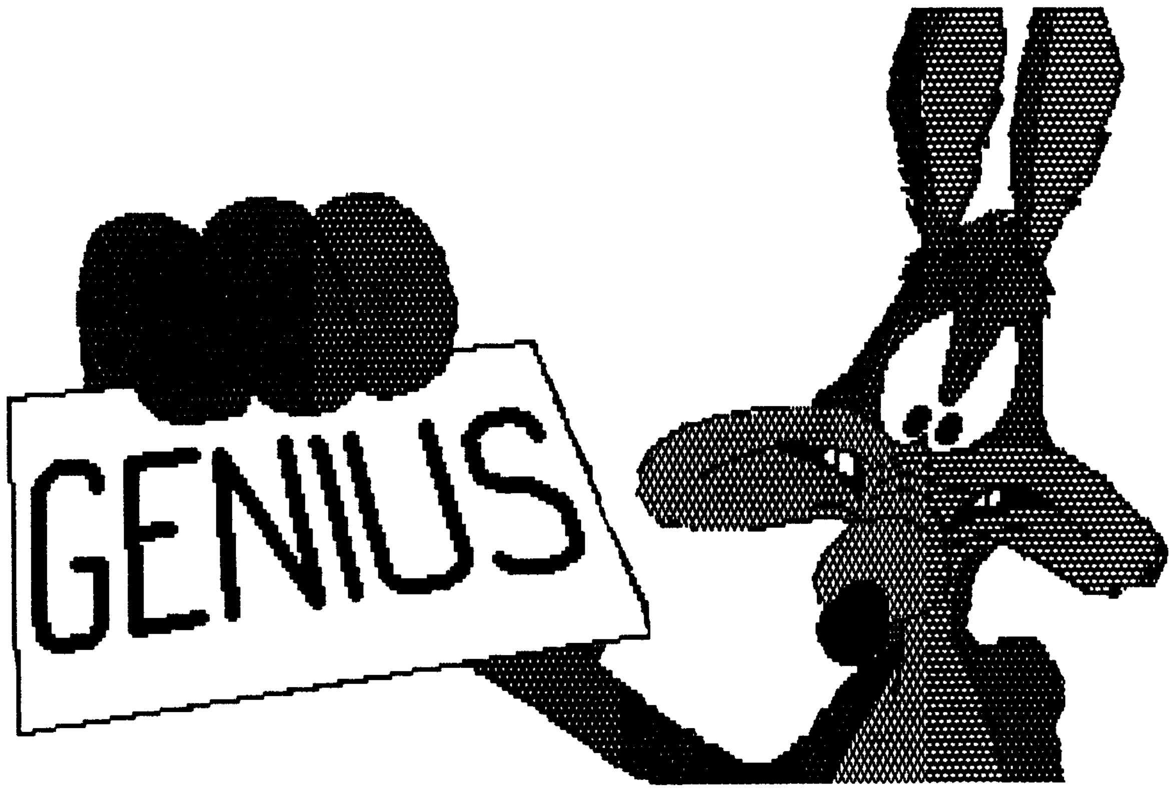
Why I Like Models (Continued)

Sometimes the reduction to essentials results in elegance

Why I Like Models (Continued)

They let me look at risky situations without actually taking any risk

Why I Like Models (Continued)



They help make me LOOK GOOD!

1987 CASUALTY LOSS RESERVE SEMINAR

2C/6C - INTERMEDIATE TECHNIQUES II

Moderator: Aaron Halpert, Manager
Peat Marwick Main & Co.

Panel: James E. Buck, Jr., Sr. Vice President & Actuary
Jefferson Insurance Co. of New York

Jerome E. Tuttle, Vice President & Actuary
Mercantile & General Reinsurance Company

Recorder: Douglas Oliver, Consultant
Peat Marwick Main & Co.

AARON HALPERT: Before we begin I'd like to emphasize that while this session is on techniques, the techniques that will be presented, as well really all actuarial techniques, are really nothing more than tools that can be used to address issues in order to formulate projections and opinions. In presenting each technique I've asked Jim and Jerry to highlight the underlying issues that each technique is meant to address. I urge all of you to focus not only on the techniques, but on the issues that they are addressing as well. We've structured the presentation to allow for questions at the end so that I'd urge you to defer the questions until all the presentations have been made. Jim will begin with a presentation on the discussion of segmenting data.

JAMES E. BUCK: Thank you Aaron. Aaron started off by talking about issues and techniques and opinions. I'd like to start off with a couple of principles. [SLIDE 1.1] Principle No. 1 that loss reserve data should contain a long stable history of homogeneous claim experience with sufficient number of claims to produce a credible loss reserve patterns. Long and stable so that you know when development stops--that is, when you get the ultimate value. A large number of homogeneous claims so that the past is as good a predictor of the future.

[Slide 1.2]

Principle No. 2 is more practical and probably more important. It is: Because insurance companies are not run for the purpose of producing loss reserve data, Principle No. 1 is rarely, if ever, met. There are several reasons that Principle No. 2 holds. First among them might be new lines of business -- I'm not going to be the reserve actuary to tell my CEO that he can't start a new line of business because it will make the loss reserve data less homogeneous. Deductibles change, policy forms change, claims management changes, and with all these changes comes significant changes in loss reserve patterns. Data is almost never homogeneous and this can be a problem--otherwise we wouldn't be talking about it this morning.

[Slide 1.3]

This slide shows the basic triangle that I'm going to use to illustrate techniques throughout my presentation. The accident years run across the top and the valuation months run down the side of my slide. Pay attention, because when Jerry's speaking the valuation months are across the top and the accident years are down the side. For example, here the 2.0 in the upper left hand corner represents $2 million or $2 billion or $2 thousand of paid losses at the end of 1983 on accident year 1983. This triangle looks very stable -- 2.0 at 12 months of development, 4.0 at 24 months, and 5.0 at 36 months, for 1983 and 1984, and similarly for 1985 and 1986 so far as is known. It looks like it would be rather easy to set reserves for this line. It could be, but it turns out that it isn't quite so easy.

[Slide 1.4]

This slide shows in the right hand column the same total dollars that we've seen in the previous triangle but it's split into two subsets -- Subset A and Subset B. Subset A and B could be almost anything -- it could be territory, urban versus rural, it could be coverage, BI versus PD or it could be any number of other things. What's important is that there are two different patterns of development shown. Subset A goes from 1.5 at 12 months to 2.0 at 36 months of development and Subset B has a lot more severe development from 0.5 at 12 months to 3.0 at 36 months. This represents the mix for the years 1983 through 1985.

[Slide 1.5]

In 1986, we switched things around. Subset A, which used to represent 75% of the dollars at 12 months, now represents 25%-- Subset B, the more severe development, now represents 75% of the paid loss dollars at 12 months.

[Slide 1.6]

If the patterns for each of the Subsets remains the same and we project that out, we get an ultimate loss for 1986 of 9.7 which is almost twice the 5.0 for 1983 through 1985.

You may ask, can this kind of thing happen? Am I exaggerating a little bit? Is this the kind of industry where things change that much in a year? In my experience, it can change that much.

One way the mix can change would be, strangely enough, by a promotion. A claims manager who reserved claims very differently from the rest of the company was running a field claim office which handled 5% of the claims of the company. He was promoted to regional director, with responsibility for 40% of the company claims. In about 6 months, the claim patterns and the development patterns for that whole region started to change--claim management does have an influence. These kinds of things can happen.

I've never seen loss reserve data that is truly stable, and I've worked with a pretty large company. Statistical variation may have been very small but the parameter variation never was, due to lack of homogeneity. And because claims data is never homogeneous, it's important to try to understand what's happening and what the subsets of data are.

[Slide 1.7]

In order to do that, it's very important to talk with underwriters -- what the products are, how they are changing, where you're selling, where you're not selling. It's important to talk with the claims staff--what their reserve philosophy is, what it was, what their opening practices are and what they were. It's also important to talk with agents to find out what's really selling as opposed to the underwriters' opinions on what's selling.

These are some of my thoughts on this topic, and Jerry wants to talk about the same subject from a reinsurance company perspective.

JEROME E. TUTTLE: Jim talked about segmenting data and why we do that. The idea is to group similar kinds of claims into classes to get more stable development patterns. His last point about talking to other people in the company is something I'd like to emphasize. For example, for a primary company it is probably pretty common to call all workers' compensation as one class for reserving purposes. But if you were sit down with your underwriters, your underwriters might ask why don't you break apart the large accounts from the small accounts. If you were to sit down with the claims people, the claims people might ask you why don't you separate the large development states from the small development states. And if you think about it, the underwriters and claims people have good points.

As a reinsurer we have some other problems with segmentation. Some of the things that make the reinsurer different than a primary company is that our contracts are often multi-line, sometimes even combining property with casualty, often we don't see line of business detail, and we get very few claims. For these reasons we need some very broad groupings.

Please refer to Slide 1-8. These are some typical classes for a reinsurer. Rather than split out each line of business, we basically just split out the property from the casualty, and in addition we split up the proportional business from excess of loss business. Those first four classes are probably the major classes for reserving purposes. We also split out property catastrophes because loss development on things like hurricanes are very different than on other kinds of property losses. We split our financial business. Financial business has all sorts of meanings. Financial business could be business where the risk element is somewhat minimal, or financial business could be where the insurance is guaranteeing some sort of financial obligation such as prompt payment of interest and principal on municipal bonds. Certainly these kinds of things have very different loss development patterns than normal types of business. International business -- my company does not reinsure international business. If we did, I'd certainly expect that the loss development on $1 million excess of $1 million U.S. dollars would be different than excess 1 million of 1 million British pounds. I wouldn't want to combing those two.

Lastly, facultative versus treaty is often split.

If you're interested in some more discussion on this particular topic. I'd like to refer you to Steve Philbrick's paper in the 1986 CAS Discussion papers where he discusses reinsurance groupings.

On the other hand, I may be one of the rare actuaries who sometimes is interested in fewer classes rather than more. Please see Slide 1-9.

Here I show you the loss development factors for three Classes A, B, and C. "A" is a very large class in terms of premium, losses, and number of claims, and "B" and "C" are very small classes. This slide is simply averaged age-to-age loss development factors and the standard deviations of those factors. At first glance, other than Class C's 12 to 24 points, it seems that Classes C and B are pretty similar to Class A. Intuitively, knowing what kind of business goes into each of these three classes, I felt that maybe I ought to be combining B and C, which have a very small amount of data with A. (How do I know what's in B and C? Maybe that's why we take Part V, we learn something about what exposures we're covering.) At that point I went to speak with our underwriters, and they confirmed for me that even though these three classes are priced very differently, the kinds of business that are in them are very similar, and from their point of view it made sense to combine B and C into A.

At this point I wanted to do one more thing, so I dug out the old dusty Part II book and I performed a T-Test. I assumed Class A was the population and those are population parameters, and I assumed Classes B and C were potential samples and those are sample statistics. I asked the question, "could the sample means of B and C possibly come from the population of Class A?" The conclusion from the T-Test is there's not a significant difference between B and A or between C and A. And therefore, it would make sense to combine these two classes.

AARON HALPERT: As I said before, we'll be covering six topics and we'll have questions at the end. Jim will now cover the second topic; What to do when you detect that there have been changes in settlement patterns or in the adequacy level of the case reserve. Jim.

[Slide 2.1]

J. BUCK: We can start again with the basic triangle slide, but with a difference--something is changing a little bit at the latest valuation for accident years '85 and '86.

[Slide 2.2]

If you take a look at this next slide we can start to see what may be happening. In Slide 2.1, we had payments in the triangle, and here we're taking a look at the percentage of claims closed to reported for the accident years at the various points in time. This is one way to measure, using statistics, the speed at which a claim department is handling claims. As we see it, the claim settlement speed is getting slower at the latest valuation points.

[Slide 2.3]

It's probably easier to see if we put the paid losses ad percent of claims closed next to each other as on this slide. At 12 months, with 50% of the claims closed, we're paying $2.0 million of loss. In 1986, we dropped to $1.5 million but we also dropped to closing only 40% of the claims.

[Slide 2.4]

If you evaluate not just the annual points of development--this is, 12, 24 and 26 months, but take a look at 9 months ad 21 months of development, we see that in the previous years when we had closed 40% of the claims, we paid $1.5 million of the losses.

[Slide 2.4a]

In fact, I think it makes more sense, particularly with paid loss development, to calibrate your development triangles not with development months but with percentage of claims closed.

[Slide 2.5]

One of the bad things about making up slides for a talk like this is that, in order to make the slides legible from even the middle of the room, much less the back of the room, you have to include just a few simple numbers. When you go back to your office and look at your claim reserve data, it will probably look a lot like mine, which is not quite so neat. I think that percentage of claims closed tends to be a statistic like our other loss reserve statistics that ha some variability. Sometimes, it's tough to tell whether there is a real slow up in claim settlement speed or to detect whether a change in settlement speed is real or not, is to look at other accident years for the same line of coverage, and also look at other lines of business that are handled by the same claims staff. If there's a real change in settlement speed, it will probably show up in other lines. That's one way you can see whether what you see is just a random variation or a significant change.

[Slide 2.6]

The next series of triangles that we're going to look at and talk about involve changes in reserving patterns and how to adjust for those changes. Here we're showing cumulative incurred losses. For 1983, the paid numbers underlying the incurred loss numbers are exactly the same as on the previous paid triangle slides. We've added a couple of changes for later accident years. For one, we had 10% inflation across the accident years. In addition, we have something strange happening again in 1986 at 12 months and in 1985 at 24 months. Things look to be getting better again.

[Slide 2.7]

If we look a little closer at the average reserve for open claims, we see that things may not really be getting better. At 12 months of development, we're going from an average reserve of 1,000 in 1983 to 1,100 in 1984, 1,200 in 1985, and in 1986, we're dropping down to 666. It's possible in real life that if the average reserve shows a significant decrease that you are getting less severe claims. A decrease of this magnitude, in the 50% range, is probably not that. In this example, it's certainly not that, but a decrease in loss reserve adequacy.

[Slide 2.8]

One of the ways you can adjust for changes in loss reserve adequacy is to take your current reserve levels by development period and take out inflation in order to restate your loss reserve triangles. That's what we've done on this slide. For example, the 1983 12-month number used to be 3.0 based on a $1,000 case reserve. It has been restated to 2.5, which is the sum of $2 million of paid losses and a restated reserve of 0.5, based on a $500 average. To get the $5000 average, we took the 666 at 12 months for 1985, and reduced it for 3 years of inflation at 10%. This gives a different loss reserve pattern than we have been experiencing, but it does give a consistent one.

[Slide 2.9]

Here, you can see that, with the restated patterns, when we project out the years 1985 and 1986, we once again get the 10% inflation in accident year incurred losses.

[Slide 2.10]

The last adjustment I'm going to talk about is adjusting incurred losses based on the percentage of claims closed. This slide is almost the same as Slide 2.3 except here we're using incurred losses instead of paid losses. There is the same change in the percent of claims closed that saw before--in 1986 at 12 months and in 1985 at 24 months.

[Slide 2.11]

Again, if we look at the different valuation months including 9 and 21 months we see that the pattern of incurred losses is similar to the pattern in paid losses.

[Slide 2.12]

And if we calibrate the loss reserve triangle based on percentage of claims closed, rather than months of development, we have, at least in the example, consistent development patterns.

There's no strong intuitive reason to calibrate incurred loss development triangles based on percentage of claims closed. With paid loss development there's a strong intuitive reason to calibrate development based on percentage closed, since most claims are paid when closed. For incurred losses, at first it doesn't make sense because whether a claim is paid or reserved for shouldn't seem to make a significant difference. But I think one of the reasons it does make sense is that the reason for claims slowing up and the reason for reserves not being adequate are essentially the same reason. The claim department is swamped. The claim department is charged with settling the claims. The claim department is setting the case reserves. Serious deterioration in claim payment patterns and in reserve levels are a good indication that there are too many claims or too few competent claims personnel.

[Slide 2.13]

If this does happen in your company--that is, if you see a significant decrease in average case reserves and a slow down in claim settlement speed--there are several things that you might do. There are probably some things you'd want to try before the ones shown on the slide. I think the first thing to do is to go talk to your Claims Vice President and tell him what you're seeing in the numbers that you are reviewing. If you get the answer, "I'm aware of it" or "I'm now hiring staff and we expect to have it fixed by next month," then I don't think you have to go on with the next steps. But if you get a different answer like "what are you talking about?" your "I don't believe you," your company may have a very serious problem. A significant slowdown in claim settlement speed can seriously affect the amount of loss dollars paid out--due both to an increase in bad faith exposure as well as an increase in the number of lawsuits. And because of this, updating your resume and selling the stock short may not be bad advice. If you'd like to read more about these and other techniques for adjusting for changes in case reserve adequacy and payment patterns, I'd recommend the paper by Berquist & Sherman in the 1977 Proceedings of the CAS.

AARON HALPERT: Thanks Jim. Jerry will now take us through the third topic in discussing the advantages and disadvantages of using gross versus net of reinsurance data in your reserve analysis.

JEROME TUTTLE: This topic is about doing loss reserve analysis gross or net of ceded reinsurance. This topic is very similar to the topic of what should we do with some multi-million dollar losses. I'm going to sort of combine these two topics. The large loss topic and the reinsurance topic, into one. I'm going to talk about it really from the view point of a primary company and its ceded reinsurance, but it's fundamentally the same topic, because why do we buy reinsurance? One of the reasons we buy it is to protect our earnings from the volatility of large losses.

Suppose your company reinsures the excess portion of losses over $2 million per occurrence. $2 million would be called the reinsurance retention. A logical possibility is to do a reserve analysis gross ignoring the reinsurance, or else to do the analysis net splitting the losses exactly at the $2 million. In the second possibility you would be doing an analysis from zero to $2 million, and then also doing a separate analysis from $2 million to infinity.

[See Slide 3-1]

There are advantages and disadvantages of each approach. One of the advantages of doing an analysis gross of reinsurance is that your data is unaffected by a change in reinsurance retention. In the example I gave, for years, say during the late 70's and early 80's, your company may have been going along at a $1 million reinsurance retention, and as reinsurance prices hardened the company may have found that the opportunity to continue to buy that $1 million reinsurance was prohibitive. Now you've got a $2 million reinsurance retention for the current accident year only, and you've got a history going back many years of a $1 million retention. If you are doing the analysis net, then those loss reserve patterns at a $1 million retention probably are not going to be applicable to the $2 million retention. On the other hand, if you do a gross analysis, then your data is not affected by the change in reinsurance retention.

The second advantage of gross is that it gives you the total liability in case your reinsurance proves uncollectible. Again, for many years in the past, this was not a problem. I'm sure you know currently many reinsurers do have some problems, and companies may have some problems collecting reinsurance. It may be fun to sit down with a knowledgeable person in your company, look at your own Schedule F of the ceded reinsurance, and see who's on there. I did that in my own company and we discovered we had a few unsavory characters.

On the other hand, there are some advantages of doing your analysis net. Certainly the main one is to improve the stability of your lower layer by capping your losses at some dollar amount. That would certainly have to be the main advantage. Another advantage of a net analysis is that it is required for financial statements. If you think about it, your balance sheet is net to reinsurance and Schedule P is net to reinsurance, so obviously there needs to be a net analysis.

Beyond that there may be some internal reinsurance uses of a net analysis. The company that externally cedes losses in excess of $2 million per occurrence may need to internally do an analysis at a lower level. The Detroit Branch Manager, for example, may have profit sharing calculated on his results net to $500,000 per occurrence. And if that's the way his profit sharing works, obviously you have to do your reserve analysis on net to $500,000. And perhaps the layer between $500,000 and $2 million is internally ceded from the Detroit branch to the home office. If you have some sort of internal reinsurance set-up, then obviously you need to do a net analysis.

Another interesting question you may want to ask the claims people as if they feel that their case reserving is equally accurate on both a net to reinsurance and gross to reinsurance basis. You might be surprised at the answer.

So really there are good reason to do both a net and a gross analysis.

Assuming that you were interested in doing an analysis by layer, the next question is what to do with the excess layer. There are at least 3 techniques. Please see Slide 3-2. Certainly the obvious thing to do with excess losses is to gather the excess data by itself, perform the usual reserve techniques with it and develop actual excess losses. That gives you an excess liability indication. The second technique is one that I haven't seen too much, but certainly seems reasonable, is if you do a primary layer analysis and a total layer analysis and then just take the difference. It sort of backs into the answer. The difference is certainly one indication of the liability for your excess layer. The third possibility is also one I haven't seen too often but it seems to make a certain amount of sense and that is a variation on a premium based reserve analysis which estimates excess losses with increased limit factors.

[Please see Slide 3-3]

Suppose, as an example, you have many years of data at a $1 million retention, but now for the current accident year you have a $2 million retention. You really can't use those loss development factors. The question is what to do in the current accident year in the layer between $1 million and $2 million. You can take the current accident year and limit its losses to $1 million and do an analysis, and suppose your ultimate losses are $1,000. If you can go into your premium data base and calculate a distribution of policy limits between $1 and $2 million, then calculate the average increased limit factor which applies to these policies -- and in my example it's 1-1/3. This would tell us based on these statistics that $1,333 is an estimate of ultimate loss to $2 million.

In doing this kind of analysis, the only thing I caution you about is to speak with your ratemakers and understand exactly what is in increased limit factors. In particular, what's in them is loss adjustment expense and risk loads. You should be sure that you're doing the appropriate thing with the loss adjustment expense and the risk loads in applying increased limit factors in reserve analysis.

Ideally, what would be nice is if you could maintain your database historically over time so you could restate prior periods at the current retention. If you had a net database where you could restate those old years to what they would be now at the $2 million retention, that would be ideal.

Finally, I would like to refer you to an interesting paper that discusses excess loss development factors as functions of dollar retentions. And that's Mel Pinto's paper from the 1986 CAS discussion papers, and I think that's an interesting paper.

AARON HALPERT: Any questions?

QUESTION: Jerry had mentioned one way of segmenting data was between large and small accounts. Why is there logic or what's the underlying logic in making that separation?

JERRY: I guess to answer that you need to know something about the pricing of large accounts. Large accounts are very often priced on some sort of cost plus basis. In a sense they are sort of paying their own way, as opposed to smaller accounts who are priced on a class or an average basis. Once you price on a cost plus basis, you may find that the kinds of business that your underwriters are willing to write on large accounts may be different than what they're willing to write on small accounts. They might very well be willing to write higher severity large accounts because the business is cost-plus priced and they will sort of pay their own way. You might expect greater loss development on large accounts than small ones. Perhaps going in the other direction though, because they are large they get better loss control service from the company and possibly internally. If that's true, possibly there is lower average severity for large accounts. In any case, large accounts are different than small accounts, and it would certainly seem that the loss development ought to be different.

QUESTION: Another way of segmenting data that was mentioned was by state or jurisdiction. There is some logic in that because the regulatory environment and the court environments may differ by state. What are ways to find out which group of states are similar enough that it would make sense to group them together. What databases can be accessed?

JERRY: I guess the obvious thing would be to look at your own data. You can segment your data by looking at the loss development by state, and grouping them into high and low development states. The rating bureaus can probably help you with that. In some lines of business the rating bureaus have produced high, medium and low loss development factors. Beyond that, probably the home office claims people can just rattle off a list of states. In workers' compensation, for example, it is well known that Minnesota is a high loss development state. I think from all of these you should be able to find some clues.

COMMENT: I guess if I could add something I would only underline everything that has been mentioned thus far. None of us should be working in a vacuum in terms of only looking at the numbers or only working within our own actuarial environment. Particularly in the reserve functions, where parts are the entire unit and need to be constantly be in touch with the claims department and underwriting departments to get answers exactly to those questions.

AARON HALPERT: Let's go on to our fourth topic of the tail factor analysis. And once again we'll try to leave some room at the end for questions on any of the six topics.

JERRY: By tail factors what we're talking about is what you do at the end of your oldest year. You've got your last evaluation point, you still have open claims, and you still think there's going to be some development.

There are many reasons why we need to worry about tail factors. I know a company that never had development beyond 10 years, although they wrote the usual long-tail casualty lines. It was discovered that the reason they never had development beyond 10 years is they had a 1 digit accident year code. Any time that development hit the 11th year it went into year 1. Other companies are like my own -- my company is about 15 years old. Even though we kept our statistics after year one, we still have open claims each year. Obviously we have need for a tail factor. Even companies that go back to the 1800's -- if you've got a new database system and you haven't input all of those old claims, you probably have some accident years with some open claims that you didn't go back far enough to input. If you've done that, obviously your oldest accident year in the database really is not complete. It needs to be adjusted for tail.

Any kind of loss reserve development can be both case reserve development and claim count development. As far as tail factors go I can sort of understand case reserve development. Particularly in workers' compensation if you're paying claims out to a permanently total disabled worker for life, his medical can go on for a long time. Or if you're paying workers' compensation benefits to a widow on a death claim, she can die or remarry early and it might be expected and that the reserve then goes down.

It has always bothered me as to why there is so much claim count development. I went into my company's claim files and pulled out some claims. Please see Slide 4-1. These are some claims reported to my company at least 10 years after the accident occurred. We are a reinsurance company so we are a little different than a primary company. But I think there are some lessons to be learned from this.

Claim No. 1 is a complicated products claim. There are a number of factors that contributed to the loss. The date of loss itself is uncertain. There has been a very lengthy discovery period where the claims people and lawyers seems to go on forever, and there have been many reserving increases until the reinsurance retention was pierced. Claim No. 2 is a is a catastrophic products claim on a very well known consumer product -- if I tell you the product you'll know -- and there are numerous claimants. Here the delays are probably due to a combination of there being an aggregate deductible and also that the primary company is waiting to see just how many claimants there are going to be. Claim No. 3 is another products claim. This is a sailor -- not a U.S. Navy sailor, but a sailor on a private fleet, who for 14 years was exposed to a hazardous solvent, and then many years after that the injury manifested itself. This claim took many years to appear. Claim No. 4 is an ocean marine claim. We generally recognize we have a problem casualty business, and we sort of think we have a handle on property type business. You don't usually have many dollars up on property IBNR. This is an ocean marine claim, and obviously we didn't adequately reserve for it either on a case basis or an actuarial basis. This is a ship collision and explosion involving injury to crew, cargo and a pier. The claim was closed, and then it was mysteriously reopened six years later. It's only after the opening that we as the reinsurer found out about it. Claim No. 5 is also sort of scary. Claim No. 5 is a pretty ordinary, but severe, workers' compensation case. This is a serious accident to a worker who injured his back falling off something, and who was declared permanently and totally disabled pretty quickly. There doesn't seem to be much discussion about that. The benefits were fixed pretty quickly, and there didn't seem to be very much debatable about it. In any case it took us 10 years to find out about it, and our claim file is only two pages long. There just isn't any indication what took so long -- this is an ordinary claim and it took us ten years.

These are some reasons why there can be claim count development. When you worry about tail factors, I urge you not to worry merely about the reported cases that have not developed. But give some thought to whether you've seen them all.

[Slide 4-2]

There are three techniques that can be used to derive tail factors. Certainly an obvious one to consider is to examine broader data sources. The two major rating bureaus, ISO and NCCI, produce lots of loss development information. The Reinsurance Association of America (RAA) produces loss development triangles which come out to 31 years. That's specifically reinsurance data so it's probably not too useful for primary companies. Best's produces its loss reserve development series which is a compilation of Schedule P. For any of these broader data sources what you probably would want to do is compare your own loss development with this broader data source up to a point, see how they compare, and consider that comparison as an adjustment factor to apply to the broader data. If my company is running at 120% of the RAA up to 15 years, I guess I ought to consider applying the RAA factor beyond 15 years.

A very quick and dirty technique is called the Bondy method. A lot of experienced people know that method. It's named after Marty Bondy-- you don't often find that documented. The Bondy method says to take your latest loss development factor for the year n-1 to n, and use that as an approximation for loss development from n to infinity. I personally used this in a case where my loss development triangle only went out to two years. The rating bureaus have used this, in particular started using in GL rate making.

A third technique is curve fitting. That is to fit your loss development to date to some curve, and then extrapolate beyond that point and hope that the development that you haven't seen bears a reasonable relationship to what you have already seen. I guess what is becoming a classic paper on this technique is Rick Sherman's paper in the 1984 CAS Proceedings where he fits inverse power curves to a variety of data and gets what he feels are pretty excellent results. One of the statistics that Rick considers in his paper is something he calls decay ratios. This is the ratio of the i-th loss development factor minus one, divided by the (i-1)st loss development factor minus one. He feels that there are certain properties of these decay ratios that make inverse power curves very important. In playing with curve-fitting on my own I have tried to explore these decay ratio properties, which are not particularly intuitively obvious to me. After a certain amount of smoothing, I found that Rick's claims about the patterns of decay ratios did seem to hold up pretty well. If you are going to use curve fitting, I would encourage you to look into this particular statistic called the decay ratios and see whether your data fits the characteristics of them.

[Please see Slide 4-3]

I'd like to cover quickly the possible magnitude of tail factors. This is from the latest Reinsurance Association of America study and again this is reinsurance data. These are cumulative age-to-ultimate factors by averaging a set of factors in the casualty lines. This gives you some indication of how much development there can be for a reinsurer. Even after 25 years there is positive development in workers compensation and GL. As I mentioned my company is about 15 years old, so our actual history goes out to 15 years, and there's nothing else we have. I have a 15 year-old company, so I need to worry about 15 to ultimate factors of the magnitude of these factors you see in the slide. Even this says the ultimate is 31 years -- maybe it's not.

J. BUCK: Thank you Aaron. Yes, the current topic is expected loss ratio methods, and I don't like them. However, I'm not alone. It seems that almost every actuary I talk to doesn't like, or professes not to like, expected loss ratio techniques. However, almost everyone uses them at one time or another.

To start off, I thought I'd at least share with you why I don't like expected loss ratio methods. I don't like them because I think they're dangerous. They are certainly easy to use--all one has to do is select an ultimate loss ratio and multiply it by the premium, and subtract out the claims to date. The result is the IBNR reserve. That was certainly easy, and as long as you have a good handle on the ultimate loss ratio, produces an accurate result. Just for curiosity I'd like to do an informal survey here. Would anybody who knows what the ultimate loss ratio on the current accident year for their company please raise their hand? I see there are a lot of people in the audience who don't know any more than I do about a company's ultimate loss ratio.

Now, in a way that comment is unfair, since they're aren't too many people who know or sure how many claims are going to be reported in an accident year, or what the average claim cost is going to be for the accident year either. But I think if you do the work to see how many claims have been reported, and what they're evaluated at, what's been happening with the pricing, the underwriting, the claims handling, that by the end of that kind of a process you'll know a lot more about what your accident year frequency and severity are. I you just look at the loss ratio, you lose some of the educational process provided by looking at the claim counts and averages. You could look at those claim counts and averages and still use the expected loss ratio technique, but you don't <u>have</u> to. And that's where to me, the danger comes in. It's easy not to do the homework and the digging that's required and to just keep the expected loss ratio at what is felt to be a reasonable level, while if other techniques were used, the work required would bring one to the realization that the reasonable loss ratio isn't reasonable any more.

[Slide 5.1]

Let's now turn to some slides to illustrate the point. The top of the slide here is very similar to the ones that we've seen before, showing paid losses by accident year at various months of development. You'll see that at the bottom of the slide we've added an additional row showing the premiums. Below that we have projected 1986 ultimate losses using the expected loss ratio method, the Bornhuetter-Ferguson technique, and the loss development technique. The expected loss ratio technique was based on a 100% loss ratio, derived rom the 1983 and 1984 experience. The Bornhuetter-Ferguson technique is essentially a blend between the expected loss ratio method and the loss development method. I'm not going to explain the Bornhuetter-Ferguson technique any further, since it was covered in the previous session. If you want to learn more about the Bornhuetter-Ferguson method, please attend the previous session.

You'll note that on this slide the 1986 accident year paid losses at 12 months are 1.5. If it turns out that the reason that the paid losses dropped in 1986 on this slide is the same reason as it was previously, i.e., the claim payments were slowing up, then the expected loss ratio technique produces the right answer.

[Slide 5.2]

However, as we see on this slide, the expected loss ratio technique will always produce the same answer, no matter what the paid losses at 12 months for 1986 are. On this slide, even after seeing paid losses double between the 1985 and 1986 accident year at 12 months, the expected loss ratio still produced the same estimated of ultimate loss.

[Slide 5.3]

If you're not going to use the expected loss ratio technique, what do you do? I've broadened that question a little bit to show at least in general terms for various lines of business the techniques that tend to be the most popular -- they are certainly not the only ones to use and they're certainly to be used with adjustment and knowledge.

The first group of lines have very fast closing claims, and not a lot of variety in the average claim costs -- Major medical coverage, dental coverage, and auto physical damage. These lines tend to be reserved using paid loss development. For at least the first two you don't really have much choice. Most companies do not set up individual case reserves for these lines, so one is limited to paid loss development. Also, if you don't have open claim counts it is difficult to make the adjustments we talked about for claim settlement speed. But in lieu of that, you can call the offices where they are processing the claims to find out about backlog. They usually have backlog numbers that they keep or their own operational purposes, and these statistics can be used to adjust loss development actors for changes in claim settlement speed.

The second group of lines include property coverages, primary auto and primary GL--certainly less stable development pattern than the first group. Incurred loss development techniques are the most popular, supplemented by paid loss development techniques.

The third group of lines are even more dicey and difficult to estimate--excess auto, excess general liability, umbrella coverages. Either the Bornhuetter-Ferguson technique or what I'll call frequency/severity methods tend to be useful here. When I say frequency/severity methods I'm reserving to trying to protect separately the number of claims that you expect on a particular line as well as the average claim cost. The reason this is used on these lines is because incurred loss development techniques applied to what are, at the early points of development, very small numbers, (can produce some wild swings). If the development factor you're applying is 120, it makes a big difference whether you're applying it to a $5 or $10 reserve.

[Slide 5.4]

Last and least rom my perspective with a primary company are expected loss ratio techniques. One place I use them is for small immaterial lines. If the level of the reserve for a line is not going to materially effect the overall reserve, this is one place where expected loss ratio technique can be useful. The second place the expected loss ratio technique can be used is where you really don't have anything else to do. If you have no claims--if you just started out and you need to put up a reserve.

AARON HALPERT: The final topic is a topic that's related to loss reserving, although it's more on the flip side of IBNR reserves and that's a reserve for earned but not reported premium. And Jerry will take us through that last topic.

JERRY TUTTLE: In Jim's last remarks he said you might want to use expected loss ratios when you have nothing better to do. Remember our slide 1-9 with Classes B and C? Classes B and C were two small classes, in some of those accident years I had no claims at the end of 12 months. My 12-24 factors for that particular accident year had a zero denominator. For those classes I had nothing better to do, and I confess to using expected loss ratios on occasion.

If your loss reserve analysis is even partly premium-based, then you need to worry about unreported premium. And this is a issue both for primary companies and reinsurance companies. Why is there earned but not reported premium? Please see Slide 6-1. There are a few reasons -- certainly one of the main ones is premium audits. If you're working with a line of business such as workers' compensation, where the premium is a function of the payroll and the payroll is audited at the end of the policy period, there's going to be either additional premium or returned premium after the policy expires, which really has already been earned. Ideally we should have estimated that amount of premium and earned it at the proper time. One company estimates that in workers' compensation the net of additional less return for the audited premiums is additional 10% of premium. That's not an insignificant number. For fun, 1988 renewals are coming up in a couple of months. On that business the '87 policy has not yet expired, and you might ask your underwriters how they're going to estimate payrolls on January '88 business, which is exactly what goes into why there is an EBNR problem.

The second reason for EBNR is what I'll call extended premium billing plans. We used to call these cash flow plans a few years ago. This is when we're not collecting the premium in 12 months, but we're permitting it to be deferred over some period of time into the future. For some companies the earnings system is a function of when that premium is billed. If you are billing premium for three years and your earning system is earning it over three years, yet your exposure has been earned during the 12 months. Therefore, you should make some adjustment to the earnings system for EBNR. Premiums really should have been earned even if they have not yet been reported.

Retrospectively rated business is when the premium on this year's policy is a function of this year's losses. You've got to wait to see how those losses develop to determine what the final premium will be -- there's another example of EBNR.

An interesting example of EBNR you may not have thought about is disputed classifications. I grant some admiration for the underwriters and especially commercial underwriters for being able to classify business -- a pipe fittings manufacturer or a pipe valves manufacturer sounds about the same to me, but they have different rates and one of the underwriter's jobs is to decide which is which, and put which risk in the proper class. Sometimes the insured doesn't agree and the insured appeals it, and if he's successful in his appeal he is reclassified and you've got to go back and change the premiums. In workers'compensation experience rating for three years, you may have several years that you've got to go back and adjust, and so there's EBNR. As an example of really how complicated classification is, when I was with a primary company I was on a mailing list where the workers'compensation rating bureau sent me circulars on classification disputes. I remember an insured disputing his classification of a fertilizer blending plant operated by grain mills. This class was alleged to be different rom all of the other grain mills, and the circular told you in great detail what fertilizer blending plants do. The circular went into the two-sides fighting about fertilizer blending plants, and when it was all over the premium needed to be adjusted by several years. So this was another EBNR problem, if you can predict it.

Finally, there are processing lags. Not everything gets processed right away. Besides normal processing lags, sometimes called pipelines, your organization may not even issue the policies to begin with. If an MCA is issuing your policies, it's going to be a long time before the MGA policy comes into your shop, and if you can try and measure that and forecast it, then that's EBNR.

For whatever reasons primary companies need to worry about EBNR, and ultimate premium can be estimated by normal triangulation methods, so there's really nothing unusual there. One primary company I know feels that EBNR is chiefly due to premium audits-- the first category I talked about. And they feel that premium audits are related to general economic conditions, so therefore this primary company models uses econometric modeling to calculate its EBNR indication -- it's a pretty interesting variation.

Doug Collins in the '85 CAS discussion papers reminds us of an important point. And that is if your IBNR is calculated as a function of premium and you're using a reported premium rather than ultimate earned premium, then your dollars of IBNR are going to be understated. Now that in itself may not affect net income the wrong way because then you have to ask yourself how does the relative magnitude of the EBNR compare with the relative magnitude of the IBNR -- and the difference can affect net income in a positive or a negative direction.

My company calculates the estimate ultimates for earned premiums and then estimates the amount of EBNR that's applicable. This is messy for us because some of our business is on an underwriting year. which is sort of like a policy year. Please see Slide 6-2. When you have that, not all of your ultimate premiums ought to be earned in the current calendar year.

We will talk about a reinsurer's underwriting year. This is sort of an extension of a primary company's policy year. Just in a primary company's policy year spans two accident years, a reinsurers underwriting year spans three accident years. Now what we're covering is all underlying policies whose inception dates are in a single 12-month period. If the 12-month period's inception dates are from July '83 to June '84 then our last June '84 policy could have its last accident in June '85. Now I've got accidents spanning '83, '84 and '85. Reinsurers are covering three accident years, and therefore the premium ought to earn over those three accident years. So what we decided is ultimate earned premium certainly shouldn't all be earned in the '83 year, and some of it should be earned in the '83 year and some of it ought to be earned in the '84 and '85 years.

[Please see Slide 6-3]

This just gives us an example of earned premium development for a reinsurer. This is business on an underwriting year, and it is pro rata reinsurance. It just takes us an awful long time for us to earn all of our earned premiums -- 96 months and we still have positive earned premium development. If you have access to NCCI data, you have state ratemaking data and you should take a peak at their policy year earned premium development. This is not retrospectively rated business. You'll be surprised as to how many years direct, non-retrospective rated business takes to develop.

[Please see Slide 6-4]

This slide 6-4 illustrates the interplay EBNR and IBNR. Every primary company that has an EBNR needs to worry about properly matching IBNR with EBNR. Your accounting department is the one that earns the premiums. They may or may not be the department that sets the EBNR. But for various assumptions on EBNR there are different assumptions on IBNR, and you really shouldn't mix the two. This is what this exhibit talks about.

The first row, columns 1 thru 6, are premium calculations. The second row, columns 7 thru 12, are loss calculations. Below that are 3 pairs of EBNR and IBNR combinations: 0 EBNR and 100 IBNR are one possible combination; 120 EBNR and 190 IBNR is the second combination; and 200 EBNR and 250 IBNR is a third possible combination. Those three combinations are consistent -- the IBNR in consistent with the EBNR in each of them, but you wouldn't want to mix the one from column 1 and the one column 2. That would be wrong. That's what I'll talk about now.

Let's start with the earned premium. It's an underwriting year, and it's an incomplete underwriting year. It's the '85 underwriting year at the end of the 2nd year -- it's incomplete, just like an incomplete policy year. In Column 1 we have $800 of reported earned premium. We triangulate that and say ultimately they become $1,000 in premiums, and $200 in unearned premiums. Based on other internal analysis, my company has decided that 60% of the $200 ought to be earned at 12/86, and the remainder is earned at the third calendar year. My company sets its EBNR in Column 5 at 60% of $200. Therefore, on a cumulative basis for the underwriting year we've earned in Column 6 -- $920. Column 5 and Column 6 are going to create consistency problems as we start worrying about the IBNR.

In Column 7 we've reported $500 in losses incurred. By whatever reserve techniques, it's going to ultimately become $750 in Column 8. The difference in Column 9 is $250, and the ultimate loss ratio is Column 8 $750 ultimate losses divided by Column 2 $1,000 ultimate earned, or 75%. Now we're going to say 75% is the ultimate loss ratio and we want to book this ultimate loss ratio now, but in terms of dollars of losses we want to book Column 11. Column 11 is the ultimate loss ratio times cumulative earned premium of $920. So we're booking $690 on a cumulative basis of losses, and the IBNR is $190.]

The point here is understanding that we've taken a philosophical stance on the EBNR and we feel the EBNR is something greater than zero but it's not the full $200 in Column 3 -- it's something in the middle. You've chosen $120 of EBNR --the IBNR that corresponds with that -- the $190 in IBNR in Column 12.

There are two other options towards EBNR and IBNR. Assume first there is no EBNR, and the only earned premium you should worry about is what's been reported to date -- the $800. If you do that I guess you want to say the IBNR is $100. The $100 is the ultimate loss ratio of 75% times your reported earned premium less losses reported to date. If you were to ignore the EBNR and say it's zero, then it would be consistent to say your IBNR is $100. I'm not saying it is proper to ignore the EBNR, but if you are, it would make sense to take an IBNR or $100.

On the other hand, consider the third pair of numbers on Slide 6-4. If you were to say the full $200 in Column 3 is your EBNR, then I guess it would make sense to say the full $250 of additional losses in Column 9 is IBNR, and that pair would make sense -- it would be consistent internally. My company takes the middle ground. The point is once you have an EBNR concern, to understand how your company books premiums and sets EBNR, and then to set an IBNR that's consistent to your EBNR philosophy.

AARON HALPERT: We've got a few more minutes for questions.

QUESTION: How is EBNR accounted for in the annual statement?

JERRY: The premium is considered earned premium. The corresponding asset is line 9, Agents' Balances or Uncollected Premium.

COMMENT: I think that the earned premium they don't show it-- they show it as actual earned premium. And that if there are changes in that estimate over time it shows up as a change in earned premium -- it's not constructed as an asset.

[QUESTION, INAUDIBLE]

COMMENT: I've seen one strange treatment of it as a decrease of unearned premium. There's is no uniform application of it.

[QUESTION, INAUDIBLE]

QUESTION: Are there any good statistical methods that test whether there is an actual change in adequacy levels of case reserves, vis a vis, trying to separate that from noise in the data?

J. BUCK: There are a few things you can do. One thing you can do is look at different accident years and lines that are handled by the same claims staff. Another thing you can do is, with help from your claims department, take a sampling of files and get them to select for you claims of similar severity of injury, and then look at the reserves on last year's claims and this year's claims with similar profiles from a claim perspective. That's a little difficult to do but it can be done, and it also can be done with an outside claims consultant as opposed to your own claims people. A third thing I suggest is to look more at the more recent accident years rather than at the older accident years. The reason is that there are going to be more claims open so statistical variation will be less. Also, claims people know less about these more recent claims, and the less your claims department knows about them, the more they are influenced by their own particular judgment and philosophy, and the less they are influenced by the particulars of the claim.

2D - REINSURANCE RESERVING I

Moderator: Michael D. Covney, Vice President
Skandia American Reinsurance Corporation

Panel: Wayne S. Keller, Consultant
Tillinghast, a Towers Perrin Company

MICHAEL COVNEY: I'd like to begin with what I referred to earlier as a crash course covering some fundamental terminology just to get everybody on the same footing.

[SLIDE #1]

This illustrates what I refer to as the "risk transfer process." We're dealing with risk, which can be defined simply as uncertainty. The risk transfer process begins with original risks, illustrated by the small boxes shown at the top of the slide. They transfer their risk to insurance companies via direct or primary insurance. The larger boxes represent insurance and reinsurance companies at various stages in the process. The top row of the large boxes represents primary insurance companies, essentially because they sell their products to consumers -- the original risks. Primary insurance companies usually transfer a portion of risks they accept to other companies -- generally referred to as reinsurers. They are in the second and lower rows of the slide. The process continues to still other reinsurers, sometimes referred to as retrocessionaires. It's a rather complicated network of risk transfer. If you can imagine it, the entire network in the United States might consist of 150 million or so original risks, because that probably represents the number of households and businesses. So the flow of risk through that industry is necessarily complicated.

There's a couple of points I want to make to distinguish treaty and facultative reinsurance. Your model for that on the slide is a couple of red and dashed vertical lines in the second and fifth boxes at the top. They represent facultative reinsurance, the reinsurance of particular original risks. The white lines represent treaty reinsurance, which protects an entire book of business. Not just a single original risk.

There are at least five aspects to this process that I think are worth noting, but they're not apparent from the slide. One is that the flow of risk represents a flow of premiums and losses. Premium and risk flow in the direction of the arrows. Financial security flows in the opposite direction. Primary companies are financial security retailers, and reinsurers are financial security wholesalers. Premiums and losses flow to abe sure but they do not flow at the same time, and that's perhaps the most important characteristic of this process, and the reason why we're here. The lag between the flow of premiums and the flow of losses is often referred to as the tail. In reinsurance that can last for many, many years, even decades under certain conditions. You see the flow but you don't get a sense of the timing from the slide. Two other aspects of the process are the highly uncertain nature of exposure. The exposure from individual risks gets lost in the maze of the network. Reinsurers generally do not know the particulars of the individual risk they are reinsuring. So consequently they do not know their exposure on individual risk. The process is circular in the sense that a single risk can produce a loss from a single occurrence and produce that loss on two or more contracts. Another aspect not clear from the diagram is the discretion that reinsurers have in their underwriting. There are two forms that discretion can take. There's a certain discretion with regard to the selectivity and control that reinsurers can exercise in their underwriting. And that discretion is exercised by writing either treaty business or facultative business. The other form of discretion is in the manner of sharing risk. That is to say whether they share risk proportionally or non-proportionally. To explain those terms a little bit better I'll go to the next slide.

[SLIDE #2]

This a classification of reinsurance contracts. Treaty represents multi-risk reinsurance. It's basically reinsurance projecting a whole book of business. Facultative reinsurance is single risk reinsurance. I show three particular forms of excess reinsurance, which is the only non-proportional reinsurance that I show there. Excess can be subclassified into per risk-per occurrence, per occurrence, and aggregate. And the proportional reinsurance can be classified into surplus share and quota share. Each form of reinsurance has unique features that effect the loss reserving process. The non-proportional reinsurance has a much longer tail than proportional reinsurance. I won't say anything more about that. Wayne will describe that in more detail. I just quickly want to give you a graphical perception of how risk is shared between an insurance company and a reinsurance company under these different forms of reinsurance. [SLIDE #3] I hope these diagrams speak for themselves so that I can go through them rather quickly. I think you can see the effective difference--proportional reinsurance is a percentage share between the insurer and the reinsurer, whereas excess is not. [SLIDE #4]

On the next slide there are illustrations which show the differences between surplus share, quota share, and excess. I'll make a couple of quick observations. Quota share is the simplest form of reinsurance -- it is a single percentage applied across the board. All policies and losses of any size are ceded by the same percentage. You'll often see the percentage in the title of the quota share agreement. Surplus share is a little bit more complicated than that and it addresses a couple of the problems that quota share presents. One problem is that the ceding company may cede more than it wants to. Another problem is that it may cede less than it needs to. For example, if it's ceding more than it wants to is illustrated by Policy No. 1 at the bottom. It is ceding less than it used to is illustrated by Policy No. 3. The ceding company might have established a net retention of $100,000. In Policy No. 3, a net retention after the 50% quotashare exceeds that. Surplus share addresses those problems by not ceding any policies and ceding a sufficient part of large policies. The shaded part for Policy No. 3 comes down to the retention of $100,000 under surplus share. Another problem however, is the cession of small losses on large policies. The percentages ceded in each instance are indicated by the graphs at the bottom, and they're interesting to look at as well.

Another very important aspect of reinsurance is the question or issue of priority. [SLIDE #5] You probably have, more often than not, two or more reinsurance contracts covering or protecting the same book of business. If you have that, you have a question of priority -- which cover to apply first, which cover to apply next and so on. And each contract of course depends on the other covers protecting that same book of business.

[SLIDE #6]

This is a description of some of the more complicated issues a reinsurance program. This illustrates in one reinsurance program the range of problems that reinsurers face in attempting to do a reserve evaluation. Here are three contracts, numbered one through three running consecutively for a program of medical malpractice. Complications included the change in participation of the reinsurance company, the change and retentions and the different sections: Section A applies per doctor -- Section B applies per medical incident and Section C applies per medical incident as well but has extra contractual obligations covered on a claims made basis. To further complicate matters there was a period of time during which an aggregate participation by the ceding company applied. These kinds of contractual curve balls really make it difficult to determine proper reserves. Each of these kinds of wrinkles deserves special treatment.

I just want to run through quickly some of the important contractual features of reinsurance. [SLIDE #7 and #8] Allocated loss adjustment expense may be excluded or included. If it's included it can be shared pro rata, in addition to the indemnity, or it could be combined with the indemnity.

Other very important contractual features of reinsurance include the portfolios that might be transferred at inception or expiration. [SLIDES 9 thru 12]

The Index Clause [SLIDE 13] it shows an increase in retention and possibly an increase in limit. Here are three different species of index coverage.

The Sunset Clause [SLIDE 14] basically imposes a time limit for the ceding company to notify the reinsurer of claims.

The Commutation Clause [SLIDE 15] may authorize commutation negotiations or specify the terms of commutation.

The Intermediary Clause [SLIDE 16] says essentially that the broker is the agent of the reinsurer for purposes of cash remittances.

WAYNE KELLER: Thank you very much Mike. Good Morning. I would like to present the 1987 Reinsurance Association of America (RAA) Loss Development Study. This study is performed every two years, and was last performed in 1985.

The stated purpose of the study is to reinforce the awareness of loss development patterns for companies which write casualty excess reinsurance and for companies which write high deductible or umbrella insurance.

The study contains the raw loss development data gathered from the 26 members of the RAA. The following companies are members in the RAA:

[SLIDE]

The members are both big and small. The membership includes broker market companies and direct writers. Most of the members maintain an active claims department.

The incurred loss data is arranged in loss triangles and the loss data has the following attributes:

[SLIDE]

- excess casualty or reinsurance experience, no first dollar losses;

- incurred losses, excluding IBNR;

- broken out by Schedule P lines of business, including:

    = Auto Liability
    = Worker's Compensation
    = Medical Malpractice
    = General Liability, excluding asbestos losses;

- allocated loss adjustment expense (ALAE) is included;

- the losses are mainly net of retrocessions;

- claims-made losses are mixed with occurrence losses, especially for Medical Malpractice;

- treaty and facultative business is included.

[SLIDE]

This overhead is a graph showing the ratio of cumulative incurred losses to ultimate losses at annual points in time for all four lines of business.

Auto Liability is the fastest developing line, followed by Worker's Compensation, General Liability, excluding asbestos and Medical Malpractice.

It should be noted that the first accident year for which Medical Malpractice experience was collected seperately was 1968. Prior to that year Medical Malpractice loss data was combined with General Liability loss data. Because the length of time needed for Medical Malpractice to develop to ultimate, it was necessary to use the combined data to create the Medical Malpractice portion of this graph. The shape of the curve is based on Medical Malpractice only data, but the scale of the curve was estimated using the combined data. The use of General Liability data in this manner probably causes the graph to overstate the amount of development at each annual report period.

The curves that I am going to show you are not the product of an exhaustive actuarial study. They are not meant to be. As stated previously, the purpose of the study is to present reinsurance loss development data in a fairly raw form. However, it is my understanding that the curves contained in the study have been created in a fairly consistent manner from year to year and between lines of business. Therefore, these curves probably are best suited for making inferences about relative values, and not absolute amounts.

In recent years, the member companies have observed that loss development has deteriorated. That is to say that loss development factors have gotten larger. The graphs on the following overheads will show this deterioration by comparing estimates of loss development at the end of 1978, 1982 and 1986.

The first overhead is for Auto Liability.

[SLIDE]

The deterioration is clearly evident. Some factors which may be causing this trend include the rising costs of medical expenses under unlimited no-fault benefit statutes, changes from contributory to comparative negligence and inflation, both economic and social.

I would like to point out that the curves for older accident years are not created out of loss data from prior RAA studies. The companies that participate change from study to study. The older curves are restated based on the data available from the companies that are participating in the 1987 study.

The next overhead is for General Liability, excluding asbestos claims, where they could be excluded.

[SLIDE]

If asbestos claims were included the time needed for losses to develop to their ultimate value would probably be greater.

The asbestos claims were removed from the General Liability data, due to the distortion caused by them. The distortion occurs, because the asbestos claims are currently being negotiated and litigated, and therefore the ultimate responsibility and accident dates for these claims have yet to be determined.

Again, the deterioration in loss development has continued for 1986. An additional factor causing the deterioration of loss development for this line may be a change the mix of underlying business. Perhaps product liability or other "heavy" liability may be becoming a larger segment of this line over time.

The change for Medical Malpractice is even more pronounced.

[SLIDE]

Finally, the development for Worker's Compensation appears to be stable.

[SLIDE]

There is a major difference between the loss development patterns of a reinsurer that offers excess of loss coverage, and a primary insurer.

The following overheads contain graphs that compare RAA loss development for reinsurers with AM Best loss development data for primary insurers.

Even for the fastest reporting line, Auto Liability, there is a noticable difference between reinsurers and primary insurers.

[SLIDE]

After four years, the primary company's accident year losses are nearly all reported, while only approximately 77% of ultimate losses are reported for the reinsurer.

The difference between primary insurer and reinsurer is more pronounced for General Liability, which includes asbestos in this exhibit.

[SLIDE]

After four years, the primary company's reported accident year losses are equal to 90% of ultimate value, while only approximately 37% of ultimate losses are reported for the reinsurer.

The results for Medical Malpractice and Worker's Compensation are similar to those for General Liability.

Although the purpose of this study is merely to increase the awareness of loss development for casualty excess of loss reinsurance, the factors in this study are sometimes utilized by analysts for purposes of loss reserving. It should be remembered that the loss development patterns presented in this study are a composite of many reinsurance companies. The results for an individual company, whether a member of the RAA or your company, can vary widely.

Some of the items which can cause this variance between companies include:

- the retentions over which reinsurance coverage attachs;
- the reinsurer's retrocessional program;

- the reinsurer's underwriting rules;
- reinsurance contract provisions or coverage modifications;
- the reinsurer's marketing strategy;
- the claims handling practices of the reinsurer and its clients.

The following overheads contain graphs which seperate the composite RAA loss development patterns into a range of patterns The range is developed by considering the loss development patterns of individual RAA members. These graphs will clearly illustrate the type of variation that is possible between companies.

The first graph is for Auto Liability.

[SLIDE]

There are five curves on the graph. They represent the composite loss development pattern and the endpoints for the 50% and 75% confidence intervals about the composite pattern. Therefore, 50% of the companies in the survey have a loss development pattern within the 50% confidence interval, and 75 percent within the 75% confidence interval. It should be noted that only the larger RAA companies were used to create this graph. This was done in an attempt to show that variation in loss development is not due solely to the size of the companies.

Even for a faster reporting line like Auto Liability, the possible variation in loss development between companies is large.

At the lower bound of the 75% confidence interval, reported accident year losses evaluated as of the end of four years are approximately 58% of ultimate. At the upper bound, approximately 96% of ultimate is reported.

Next, consider the variation in loss development between companies for General Liability, excluding asbestos.

[SLIDE]

The confidence interval is wider for General Liability. At the lower bound of the 75% confidence interval, reported accident year losses evaluated as of four years is approximately 17%. At the upper bound approximately 57% of ultimate is reported after the same amount of elapsed time.

[SLIDE]

I have created two examples to illustrate the possible impact of the magnitude of the variation in loss development by company on an estimate of ultimate losses. In both examples, we will use the composite pattern for General Liability to estimate an ultimate value for accident year losses which are evaluated as of 4 years from the start of the accident year. Note on the slide that 37% of ultimate losses are reported after 4 years on the composite pattern.

In Example A, even though we will use the composite pattern to estimate ultimate losses, let's assume that reported losses will actually develop in the same manner as the upper bound of the 75% confidence interval. Our estimate is calcuated as follows:

Ultimate losses = 1 / 37% X 57% equals 154%

If we had selected a loss development pattern that reflected the true situation, our estimate of ultimate losses would have been equal to 100%. Since we have chosen a development pattern that is too slow, our estimate of ultimate losses is 54% too high.

Now consider Example B. Let's assume that reported losses will actually develop in the same manner as the lower bound of the 75% confidence interval. Our estimate is calcuated as follows:

Ultimate losses = 1 / 37% X 17% equals 46%

If we had selected a loss development pattern that reflected the true situation, our estimate of ultimate losses would have been equal to 100%. Since we have chosen a development pattern that is too fast, our estimate of ultimate losses is 54% too low.

I would like to conclude this section on the RAA loss development study by reiterating the some of the main points:

[SLIDE]

- The loss development pattern for casualty excess of loss reinsurance appears to have been gradually lengthening or at least changing in shape over time.

- Losses develop much more slowly for casualty excess of loss reinsurance than for primary casualty insurance.

- The possible variation in excess of loss casualty loss development between companies is not insignificant The actual loss development pattern for a given company may not be approximated well by the composite RAA loss development pattern in any of the lines of business.

If you are interested in acquiring a copy of the RAA study, it is available to the public at a nomial charge. Mike will have more information later.

For the second part of my talk, I want to briefly discuss the environment in which reinsurance loss reserving takes place, and then I would like to discuss some of the basic loss reserving methods which are commonly used for reserving casualty excess of loss reinsurance. Each method will be described, the assumptions underlying the method will be noted and the method's strengths and weaknesses will be discussed. A point that I want make is that reserving for reinsurance is more difficult and less accurate than reserving for primary business. Finally, I want to talk briefly about the data used as input for some of these methods.

One point that I want to make right up front is that the process of reserving for excess of loss reinsurance is much less of a science than the process of reserving for primary lines of business. Loss data that is accurate, complete and credible is hard to come by in reinsurance. You will find that the kind of data needed to perform more detailed analyses with more esorteric methods, such as counts of claims closed without payment or report year losses or even exposures, is unavailable. Either because the data is not kept track of, or its impossible to keep track of it or even if you tried to keep track of it, it would not make any sense when you used it. Therefore the analyst is limited to using some very basic reserving methods.

When estimating an ultimate loss value for an accident year, the loss reserve analyst will use one or, preferably more methods to make the estimate. All methods contain certain assumptions that must be valid to some degree or the methods will not produce accurate estimates. The validity of the assumptions underlying a method are violated to a greater degree when reserving for reinsurance losses as opposed to reserving in a primary loss situation. Therefore the confidence that the reinsurance loss reserve analyst has in the estimate produced by a given method is lower. I will demonstrate this later, when I discuss specific loss reserving methods.

Data tends to report more slowly for reinsurance business. Paid losses develop so slowly that no losses may be paid for several years after the start of an accident year. The development factors determined from paid loss data tend to be quite large at early evaluation points, and tend to vary widely. As a result, paid loss development data is not much help for reserving reinsurance.

Incurred losses can take as long as 25 years to develop to ultimate. So if your company wrote medical malpractice excess of loss reinsurance on top of a carrier that wrote on an occurrence form back in 1965, losses from that year may still be developing. And if 1965 is the first year your company wrote this business, then you may have to rely solely on judgement to determine the remaining amount of development for accident year 1965. This "tail" factor will also be applied to all subsequent accident years as well, and therefore may represent a significant part of your overall estimate of IBNR.

Even the ultimate amount of reinsurance premium for an accident year may not be known when the year is over. There is a lag in premium reporting which occurs beacause of the time lag during which the ceding company reports results to the reinsurer. Some of the lag may be due to premium audits or retrospective adjustments to premium, as well. Usually the reinsurance underwriter will estimate the amount of written premium, and then the estimate is updated as results are reported. Estimates can vary widely from the final result, especially if the ceded premium is from a new program, and no one is really sure of the amount of direct premium it will generate. The lag in premium reporting exists for pro-rata reinsurance as well as for excess of loss and is especially bad for retrocessionaires, ie companies that reinsure reinsurers. Premium development factors need to be calculated and applied to reported premium. Even though the premium may not be reported, that does not mean that it is necessarily unearned. The underlying exposure may be earned and if the unreported premium is not accounted for, loss reserving methods that rely on premium as an indicator of exposure may underestimate IBNR for the earned exposure.

Underwriting results vary much more widely for reinsurers than they do for primary writers, and can change more rapidly. Both reinsurance rates and underlying primary rates change quickly in response to competition and changing interest rates. The changes in both reinsurance and primary rates affect reinsurance loss ratios. In reserving for personal auto, 1.0 minus the expense ratio may be a suitable estimate of expected loss ratio. Or the estimate for the previous accident year may be used for the current year with some confidence. This may not be the case when reserving for reinsurance. I have seen large casualty excess of loss treaties with loss ratios greater than 1000%. Also I have seen some lines of business where a company's loss ratio for an accident year has been 300% or 33% of the previous accident year.

Even if you have a triangle that contains many accident years, the underlying distribution of the type of business in the triangle or the environment in which the business was written may have changed so much over the years that the development pattern from the earlier years is unsuitable for application to more recent years.

Lets talk about loss reserving methods. In my experience, the three most widely used methods for reserving reinsurance are:

- Incurred Loss Development
- Expected Loss Ratio
- Bornhuetter-Ferguson

I will not go into a detailed description of these methods, as they will be covered in great detail in the basic reserving sessions. I will assume that you are generally familiar with them, and I will only discuss their applicability to reinsurance reserving.

First, I want to quickly review the Incurred Loss Development method. The Incurred Loss Development Method is perhaps the most basic loss reserving method, and it works in the following manner. Incurred losses are sorted by accident year or policy year, and each years' losses are evaluated at regular points in time. Losses laid out in is this manner resemble the familiar triangular format.

From this triangle of losses, a triangle of loss development factors is calculated. These loss development factors are then averaged in some manner. The averaged factors are accumulated and loss development factors to ultimate are determined. Once these loss development factors to ultimate have been calculated, ultimate losses by year are estimated as follows:

[SLIDE]

(Loss Development Factor to Ultimate (LDF)) times
(Incurred Losses to Date) Equals Ultimate Losses.

and

(Incurred But Not Reported (IBNR) Losses) are equal
to (Ultimate Losses) minus (Incurred Losses to Date)

I am defining IBNR as all unreported loss dollars, not just the dollars on unreported claims.

It is important to note two major assumptions which underlie this particular estimation model:

- Claims are reported in a consistent manner over time;
- and case reserves are evaluated in a consistent manner over time.

Let's take a look at the assumptions and compare them for a reinsurer as opposed to an primary insurer. The first assumption is satisfied for primary insurers when claimants report claims to the primary insurer in a consistent manner over time. For all accident years, the distribution of claim reportings over time must not change in a significant way. If this happens, then the assumption will be valid. When reserving for reinsurance, this condition must also be met, but in addition, the reporting lag between the insurer and the reinsurer must be consistent over time. The timing of the reporting of claims to the reinsurer is subject to other conditions besides when the insurer was first notified of the claim. The report lag between reinsurer and primary company is a function of when claims of a large enough size to exceed the primary insurer's retention are reported to the reinsurer. Inflation and other items that change the size of claims may change the timing of when these claims are reported to the reinsurer. Also if the point at which reinsurance coverage attachs is changed from one accident year to the next, the relative timing of claims reporting can be affected. So it appears that in order for this assumption to be valid for a reinsurer extra conditions must be met. However. in an inflationary environment, how often will these extra conditions be met?

The second assumption is that claims are case reserved in a consistent manner over time. A loss reserve analyst at a primary company would be aware of his company's case reserving practice's and any changes that have taken place in these practices. If changes occur, the analyst can make adjustments to his data to compensate for these changes. Some of these adjustments may call for the use of extra data or sophisticated techniques. On the reinsurance side, case reserves are initially set by the claims departments of the various primary insurance companies. Each primary company claims department will have its own claims handling philosophy. The reinsurance reserve analyst may not be aware of the various philosophies or the changes that have taken place in them over time. Even if none of the primary companies in the world ever change their case reserving philosophy, the "composite" philosophy which underlies the reinsurer's loss development data can change, if the distribution of claims by ceding company changes. So the reinsurance analyst is in a situation where the manner in which claims are being case reserved may be constantly changing and there is probably no simple way of being aware of what the change is or adjusting the data to compensate for the change.

A major strength of the incurred loss development method is that it is not necessary to estimate an ultimate loss ratio to use it. A weakness is that it may not be very accurate for accident years that are not very mature.

The second loss reserving method is the expected loss ratio method. This method is more straight forward than the incurred loss development method. All that is needed to calculate IBNR for an accident year is earned premium, incurred losses to date and a selection for expected ultimate loss ratio. IBNR can then be determined in the following manner:

[SLIDE]

IBNR equals (Earned Premium) X (Ultimate Loss Ratio)
minus Incurred Losses to Date

The two assumptions underlying this method are:

- The choice of ultimate loss ratio is correct;

- and the amount of earned premium is correct.

Again, let's take a look at the assumptions and compare them for a reinsurer as opposed to an primary insurer. The selection of an accident year ultimate loss ratio for a primary company is easier, simply because the range of reasonable loss ratios is smaller. As stated previously loss ratio experience for reinsurance is much more volatile. Accident year loss ratios for primary business tend to cluster within 20% to 40% or so of the expected loss ratio, whereas I have seen accident year loss ratios for a large general liability book of excess of loss reinsurance vary between 60% and 250% in the span of a couple of years.

Earned premium for primary business is generally known at the end of the year. Reinsurance premium generally must be estimated in some manner, for example, premium can be developed to ultimate value with the use of premium development factors.

The combination of estimated premium and a wider possible range of ultimate loss ratios implies less accuracy when reserving for reinsurance.

A major weakness to this method appears to be that the analyst is selecting the ultimate loss ratio, and that is one of the items that is supposed to be estimated. The key is to make an informed loss ratio guess.

In making that loss ratio guess, there are a couple items that the reserve analyst should consider. Casualty excess of loss reinsurance pays out over a very long period of time. During this time the reinsurer earns investment income on the funds held. The amount earned can be considerable. This investment income can be used in conjunction with the premium received to offset losses and expenses. I have depicted this situation on the following overhead:

[SLIDE]

Notice that the amount of losses is greater than the premium that was collected. The implication is that because of the effect of investment income, a loss ratio greater than (1.0 - expense ratio) can be profitably written. All other things being equal, an ultimate loss ratio equal to (1.0 - expense ratio) will probably be too low.

How large a loss ratio is implied by the fact that a large amount of investment income is earned? That would depend on the payment pattern for the line of business and the investment rate at which the funds will earn. To get a feel for the possibilities, you could determine a loss reporting pattern from RAA data, lag it for some period of time to reflect the time lag between reporting and payment and create a loss payment pattern. Then discount the estimated payment pattern using some assumed interest rate. Take the total of the discounted pattern, load it for expenses and profit load and divide the figure into 1.0. The result would be a guess at an ultimate loss ratio accounting for the effect of investment income.

Competition is another major influence on the ultimate loss ratio. At various times during the underwriting cycle, the competition can be intense or virtually non-existant. During competitive times, loss ratios are likely to rise. During periods of scarce capacity, they are likely to drop. The analyst should be aware of rate level changes in the primary market as well as rate level changes made by his own company as both affect reinsurance loss ratios. If the change in overall rate level from one year to the next and the change in reinsurance pure premium can be resonably estimated, then a loss ratio estimate for a year can be derived based on the loss ratio for the previous year using the following formula:

[SLIDE]

(Loss Ratio, Year t) * (Pure Premium Trend) / (Change in rate level) equals (Loss Ratio, Year t+1)

The key here is to determine a rate level change and a pure premium change that is as accurate as possible. Also your guess will be dependent on the accuracy of the ultimate loss ratio guess for the prior year. The people who are underwriting the business that you are reserving for may be of help in obtaining an estimate of rate level change. But remember, when you are reserving an underwriter's book of business you are grading their work in a sense. Expect that the underwriter will be partial towards his work.

A major strength of the expected loss ratio method is that it is totally insensitive to any unusual amount of reported losses. So the more immature a year is, the more helpful this technique can be.

However, as time wears on this strength becomes a weakness. Reported losses ultimately equal ultimate losses and unless your original loss ratio guess was exactly correct, At some point in time you may still show positive IBNR, when you should have none, or at some point, the estimate of IBNR may be negative.

The expected loss ratio method serves very well when reserving for very high layer treaties, where loss reports are more sporatic.

The final method that I want to work with is the Bornhuetter-Ferguson method. This method is an amalgamation of the previous two methods. IBNR and ultimate losses for an accident year are calculated in the following manner:

IBNR equals (Earned Premium) X (Selected Ultimate Loss Ratio) X {1.0 - 1 / (Loss Development Factor)}

and

Ultimate Losses equals Incurred Losses to Date plus IBNR

This method has the strengths of both of the previous methods. When an accident year is relatively immature, this method gives an estimate of ultimate losses that is nearly equal to the expected loss ratio method estimate. As an accident year matures this method's ultimate loss estimate moves closer to the incurred loss development method estimate.

One minor drawback with this method is that both a loss reporting pattern and a value for expected ultimate loss ratio by accident year must be determined in order to implement this method.

As stated for the first two loss reserving methods, the range of the parameters needed to implement this method is far greater for reinsurance than for primary insurance. Thus, as for the two previous methods, the accuracy of the estimate provided by this method when reserving for reinsurance is less than it would be when reserving for primary business.

Incurred loss development triangles are a very important input to the incurred loss development and Bornhuetter-Ferguson methods, so it is important that I mention a few items concerning the construction of these triangles. We desire that loss triangles be both homogeneous and credible. A loss development triangle is homogeneous, if the loss emergence characteristics of the claims underlying the triangle do not change from accident year to accident year. If a triangle is not homogeneous, the use of it would violate a major assumption of loss reserving methods that utilize a loss emergence pattern as input. A triangle is credible, when it contains enough data, so we do not consider the loss development that is indicated to be spurious or meaningless.

Reinsurance loss triangles can be constructed in two different ways, information can be assigned to a line of business by type of loss or by treaty. A loss triangle that is constructed by type of loss contains losses which are the result of exposures insured under the same line of business. As losses are reported, the line of business of the exposure that caused the claim is identified, and the loss in put in that line of business' loss development triangle. These triangles are more homogeneous, and therefore probably produce a better result when used in conjunction with the incurred loss development method. Also, these triangles can be composed of accident years instead of policy years.

A weakness in organizing loss triangles in this way is that premium must somehow be allocated to each triangle, so that the expected loss ratio method or the Bornheutter-Ferguson method can be used and loss ratios can be calculated by accident year.

The alternative is to assign each treaty to a line of business. When the treaty is written, the underwriter determines which line of business is the predominant one, and assigns the treaty to that line. Constructing loss triangles in this manner avoids the problem of having to allocate premium by line of business. However, most reinsurance treaties cover more than one line of business. The lines of business that are included in a treaty may develop very differently, and therefore the triangles constructed in this way may not be sufficiently homogeneous. Also the underwriters initial impression about the dominant line of business in the treaty may be wrong. Or different underwriters may have different standards for assigning treaties.

The treaties can also attach coverage in at least two different ways; on a losses occurring during basis and a policies written basis. A losses occurring during treaty provides excess coverage to primary losses which occur during the term of the treaty. A treaty that attaches on a policies written basis covers all losses from all primary policies written during the term of the treaty. It is apparent that the development time for an accident year composed of treaties that attach coverage on a policies written basis is longer than a year composed of treaties attaching coverage on a losses occurring during basis. In summary the reserve analyst should be aware of the composition of triangles that are constructed by assigning treaties to lines of business.

Another limitation of triangles constructed in this manner, is that these triangles are policy year triangles and not accident year triangles.

I would like to summarize this section on loss reserving methods, and loss triangle construction. The major points to remember include:

[SLIDE]

- Due to data limitations, the loss reserve analyst is limited to using a few basic loss reserving methods;

- due to the greater violation of the assumptions underlying loss reserving methods, the estimates that are obtained when reserving for reinsurance are less accurate than those for primary business;

- the analyst should be aware of the manner in which loss development triangles are composed;

In addition, no estimate of IBNR should be dependent solely on the estimates provided by any loss reserving method. The analyst should consider qualitative inputs such as:

- The results of other reinsurers, if available;

- the quality of the reinsurer versus the rest of the market (e.g. Does the company have a long history of operation? Is its reputation solid? Is the company well capitalized?);

- the stability of the book of business (Are they still searching for a profitable niche?);

- the stability of management (Do the people involved with the company believe in it?);

- the technical ability of the company;

- is the company a lead market or a following market? A lead market underwrites and prices the reinsurance contract, while a following market accepts a portion of a treaty underwritten by the lead, based on the following market's faith in the lead's ability to underwrite.);

- where does the business come from? Does the reinsurer have any control over the production of the business? Has it ceded underwriting authority to the producers?

- the financial condition of the ceding companies. If they are not making profits, will they cede business to you that will?

The third section of my talk will include a few terms that are important to know when reserving for reinsurance.

[SLIDE]

ADDITIONAL CASE RESERVES (ACR'S) - Additional Case Reserves are amounts which are added by the reinsurer's claims people to the case reserves already established by the ceding company.

ACR's can have the effect of standardizing the claims-handling philosophies of the various ceding companies' claims departments, and lead to case reserves that are more consistently valued over time. Of course, this assumes that the reinsurer has a consistent ACR policy over time. The analyst should be aware of his or her company's policy towards ACR's and if any changes in policy have occurred.

An additional point to be aware of is that some reinsurers may consider ACR's to be part of their reserve for IBNR and not part of the case reserve.

NOTICE OF LOSS CLAUSE - This is a clause in excess of loss reinsurance contracts that requires ceding companies to notify reinsurers of claims that exceed the ceding companies' retention within a certain time period, for example, 45 days. This clause may be expanded to include notification for certain types of injuries, regardless of the value placed on them by the ceding company. Included among these types of injuries are head or spinal injuries.

The expansion of the The Notice of Loss clause allows the reinsurer an opportunity to participate in the reserving and the adjustment of potentially explosive claims in a timely fashion.

If the Notice of Loss clause employed by the reinsurer is expanded or changed, it can have an impact on reserving for IBNR. The reinsurer may receive earlier notice of some types of injuries, or may make greater use of ACR's. This can distort incurred development triangles.

SUNSET CLAUSE - The Sunset Clause is a clause that is somtimes inserted into the reinsurance contract. It sets a limit on the amount of time, starting at the effective date of the contract, that the ceding company has to present a claim under the contract.

Obviously a year where many treaties contain sunset clauses will not have the same amount of loss development as a year where treaties do not contain them. So the application of loss development factors from a year where treaties do not contain sunset clauses to a year that does will overstate IBNR for the latter year.

ANNUAL LOSS LIMIT or LOSS RATIO CAP - Some contracts limit the amount of losses will be covered under a treaty. The limit can be a flat dollar amount (Annual Loss Limit), or a percentage of reinsurance premium (Loss Ratio Cap).

Just as with the Sunset Clause, a year where many treaties contain a loss limit will not have the same amount of loss development as a year where treaties do not contain them. So the application of loss development factors from a year where treaties do not contain annual caps to a year that does will overstate IBNR for the latter year.

LOSS CORRIDOR - A Loss Corridor forces the primary company to share in the experience of the reinsurer. A typical Loss Corridor works in the following manner: The reinsurer will cover the primary company for all losses up to a certain loss ratio limit (reinsurance loss ratio), then for a specified number of loss ratio points above the limit, all losses revert to the primary company. Above that, the reinsurer resumes coverage.

Treaties that employ Loss Corridors will have development missing from the middle of the loss development triangle. All losses in the corridor should be captured in the database and then subtracted out after ultimate losses are projected.

ANNUAL AGGREGATE DEDUCTIBLE (AAD) - If the reinsurance contract has an annual aggregate deductible, the ceding company will retain all losses up to the dollar amount proscribed by the AAD, before making any cessions to the reinsurer. Thus the AAD has the effect of slowing down the reporting of reinsurance losses, relative to treaties that do not contain this feature.

In years where AAD's are used extensively, The amount of losses reported at early evaluation points is low, and therefore large development factors to ultimate result. This can add great variability to a estimate of ultimate losses made using a development technique.

Or if AAD's are used extensively in some years, and not in others, the loss development factors which are derived from the data may not be appropriate for all years.

A technique that I have seen used is to include all losses eliminated by the AAD's in the loss triangle database. The usual projection can be made, and then the losses eliminated by the AAD's can be subtracted from the ultimate loss estimate as a final step.

INDEX CLAUSE - The dollar amount per occurrence retained by the ceding company is not always fixed. If an index clause is included in the reinsurance contract, the ceding company's retention will rise with inflation, according to a formula stated in the clause. The purpose of the Index Clause is to minimize the impact of the leveraged effect of inflation on the reinsurer. Loss development for polices with an Index Clause will be less than those that have a fixed dollar retention.

COMMON CAUSE - The reinsurance contract may contain a clause which limits the amount of claims which can be reported, where the claims are due to a common cause. This clause can have a significant impact on a company's loss development pattern. In years where this type of clause was not used, significant loss development may have occurred in later evaluation periods, due to asbestos or some other cause. If the use of this clause eliminates a recurrence of these types of claims, then applying loss development factors from years where the clause was not included in reinsurance contracts to years where it was used would probably result in an overestimation of IBNR for more recent years.

COMMUTATIONS OF REINSUANCE TREATY - Treaty commutations occur when the parties to the reinsurance agreement agree to terminate their relationship. When this occurs, the reinsurer returns all of the ceded reserves to the ceding company, and obviously the reinsurer does not incur any further loss development from this treaty. If the loss experience to date from this treaty is not removed from the reinsurer's loss development triangles, then the triangles will become distorted.

Any question or comments?

CHARLES HEWITT: I have a couple of comments and a question. Our keynote speaker sounded the note of the day with pessimism with respect to loss reserves. And I would like to comment on two specific areas. First, in determining your selected loss ratio, one of the worst persons to give you an absolute selected loss ratio is the underwriter who wrote the business. He is mentally and emotionally committed that he wrote that business at a good rate. Don't throw him out entirely because he can give you a pretty good idea about whether the business he wrote this year was better or worse than last year or the year before. Relatively he can be consulted, but you should not let that man pick your ultimate selected loss ratios. It should be done by somebody else.

One other comment on that -- from long experience. Once you have found you are underreserved, your first attempt to get to right reserves is never enough. I've never seen a situation where anybody who found he was underreserved corrected it all in one year. In many cases, it takes three, four, or five years to get yourself adequate. One comment or question is a challenge to the last speaker -- on the question of the effect on inflation when you have excess of loss contracts. Of course, inflation does increase your aggregate losses if you're a reinsurer. And of course it increases the frequency, but it doesn't necessarily increase the severity. If your loss ratio distribution is such that you have a lot of claims which are just there at the excess point or the attachment point, inflation pushes them over. You've got a dramatic increase in frequency but you got a lot of small claims as far as the reinsurer is concerned. So it doesn't automatically follow that when you get an inflation increase on an excess of loss contract that severity for the reinsurer go up. They may not go up but the aggregate losses of course do go up.

WAYNE KELLER: Thank you Charlie. As a matter of fact on that last point that you just made -- it really hasn't been mentioned at this session yet but you may often find that actuaries model claim severity for excess reinsurance. There is a characteristic of these distributions that even given inflation that the average claim size remains constant; the effect of inflation manifests itself entirely in claim frequency but not in severity.

M. COVNEY: A copy of the RAA study is available to anyone for $20 and I volunteer to take the names and business cards of anyone here who would like a copy. I will forward your name to the RAA rather than you having to mail them a letter. The final comment before we close is to simply remind you of the evaluation forms in the material that you have. If you would kindly, before you forget, evaluate Session 2D, and I thank you for coming.

1987 CASUALTY LOSS RESERVE SEMINAR

2D - REINSURANCE RESERVING I

OUTLINE

A. MDC REVIEW OF REINSURANCE (Detailed Outline Attached)

1. Forms and Types (Definitions, Terminology)

2. Features with Reserving Significance

   a. The Agreement
   b. Its Subject Business
   c. Its Administration

B. WSK THE 1987 RAA LOSS DEVELOPMENT STUDY

1. What's New? And Different from the 1985 Study?

2. Usefulness in View of its Caveats

3. How Can/Should it be Used?

C. WSK SOME COMMON LOSS RESERVING METHODS

1. Tarbell (1934) PCAS XX

   a. Basic Idea - How it Works
   b. What it accomplishes
   c. Problems, Weaknesses

2. Loss Development ( )

   a. Basic Idea - How it Works
   b. What it Accomplishes
   c. Problems, Weaknesses

3. Bornhuetter-Ferguson (1972) PCAS LVIII

   a. Basic Idea - How it Works
   b. What it Accomplishes
   c. Problems, Weaknesses

4. Comparisons and Contrasts of Above Methods

D. MDC/WSK STRATEGIES FOR IMPROVING REINSURANCE RESERVING (Detailed Outline Attached)

1987 CASUALTY LOSS RESERVE SEMINAR

2D - REINSURANCE RESERVING I

Review of Reinsurance Outline

A. Motivation - to avoid the treachery of terminology
   - different and mysterious, prone to misunderstanding
   - lack of standards

B. Reinsurance (risk transfer) - The process and the players (SLIDE 1)

   1. fundamental terminology
      i. risk, original risk, risk transfer, risk spread
      ii. assume, underwrite, write; business
      iii. primary, secondary: insurer, reinsurer; intermediary; retrocessionaire
      iv. direct, assumed, ceded, net, gross

   2. characteristics -
      i. protracted obligations (the "tail")
      ii. uncertain per risk exposure due to lack of detailed information
      iii. highly uncertain per occurrence exposure
      iv. discretion w.r.t. underwriting selectivity and control (treaty vs. facultative)
      v. discretion w.r.t. the manner of sharing risk (proportional vs. non-proportional)

C. Reinsurance (risk transfer) - The vehicles (SLIDES 2 - 16)

   1. discretion in underwriting selectivity and control
      i. facultative, certificate, automatic, semi-automatic
      ii. treaty; subject business

   2. discretion in the manner of sharing risk (SLIDES 4 - 5)
      i. proportional - quota share (Q/S), surplus share (S/S)
      ii. non-proportional - excess of loss (X/S)

   3. important contractual issues
      i. allocated loss adjustment expense (ALAE) (SLIDES 7 8)
      ii. portfolios accepted at inception, returned at expiration (SLIDES 9 - 12)
      iii. experience rating
      iv. "payback" provisions
      v. important clauses (e.g. INDEX, SUNSET, COMMUTATION, INTERMEDIARY) (SLIDES 13 - 16)

OUTLINE

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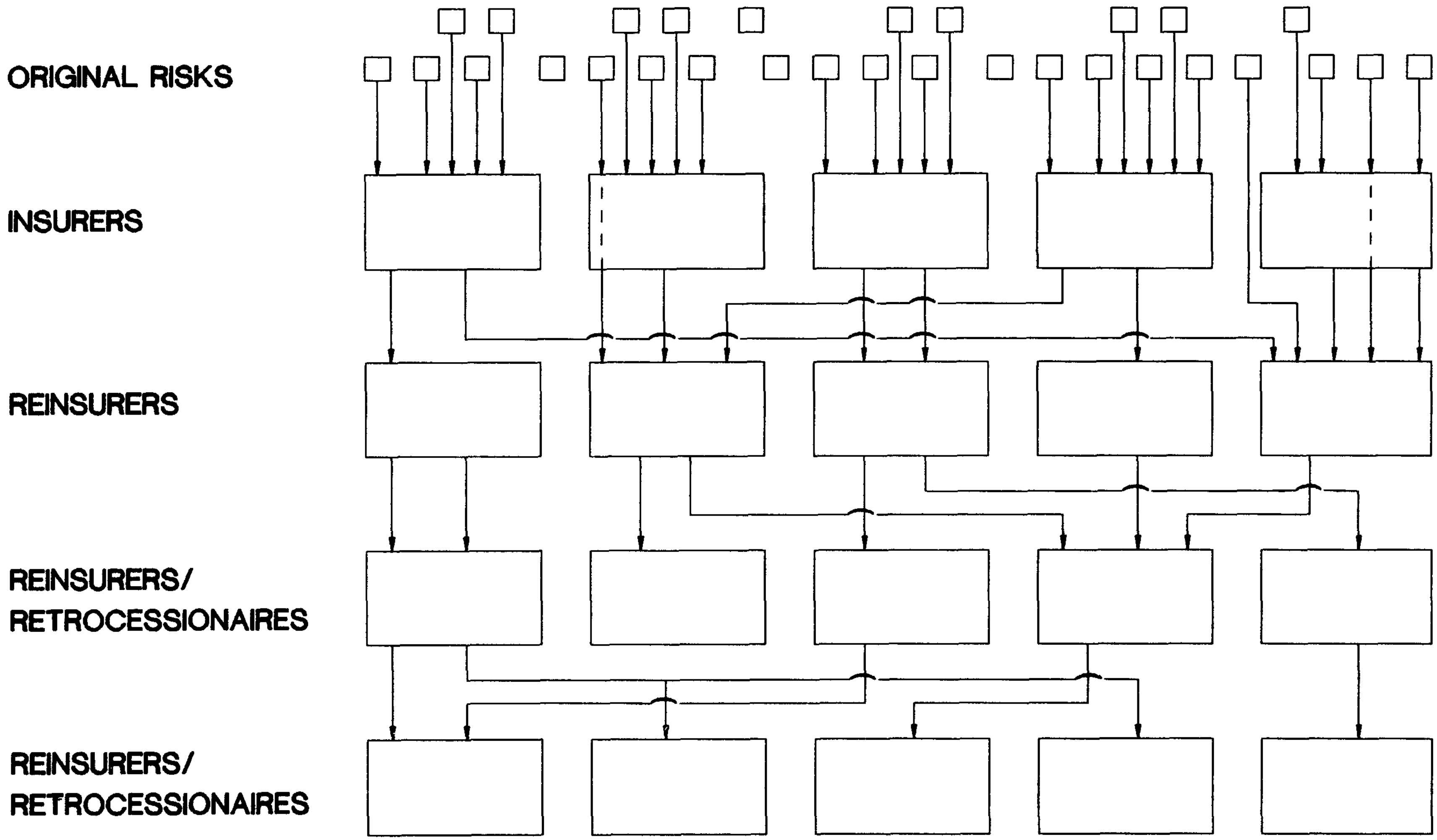
RISK TRANSFER - THE PROCESS AND THE PLAYERS



SIMPLE CLASSIFICATION OF REINSURANCE CONTRACTS

	TREATY	FACULTATIVE
NON-PROPORTIONAL		
EXCESS OF LOSS		
PER RISK/ PER OCCURRENCE	X [1]	X
PER OCCURRENCE	X [2]	- [3]
AGGREGATE	X	X
PROPORTIONAL		
SURPLUS SHARE	X	-
QUOTA SHARE	X	X

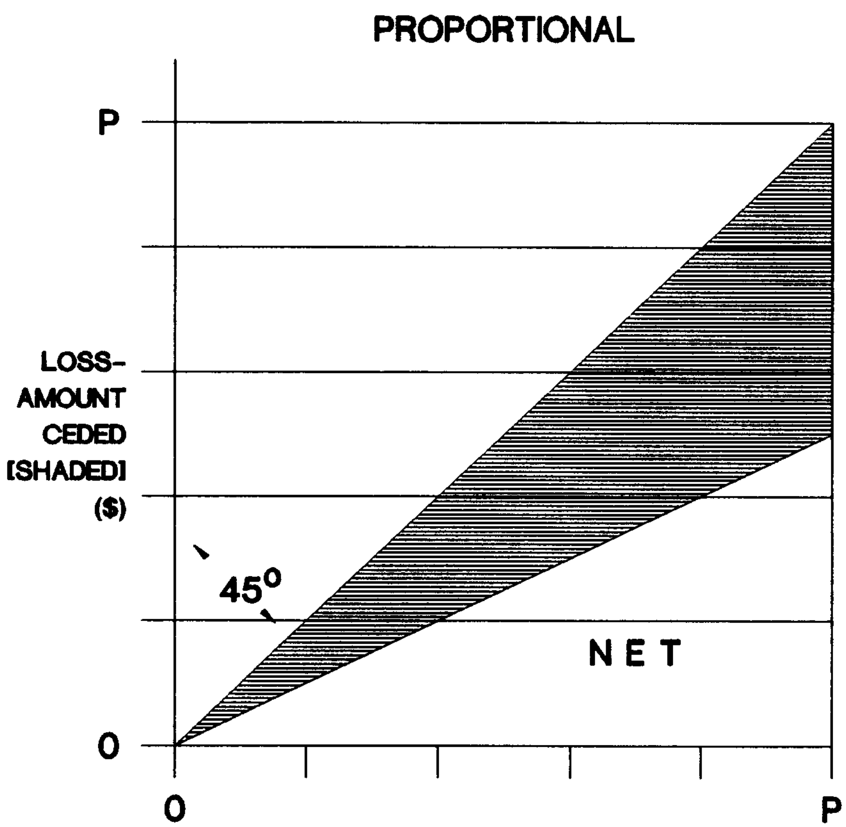
[1] SOMETIMES FURTHER CLASSIFIED INTO WORKING AND NON-WORKING

[2] IN PROPERTY, OFTEN CALLED "CATASTROPHE"
IN CASUALTY, OFTEN CALLED "CLASH" COVERAGE

[3] FUNCTIONALLY EQUIVALENT TO FACULTATIVE PER RISK/ PER OCCURRENCE

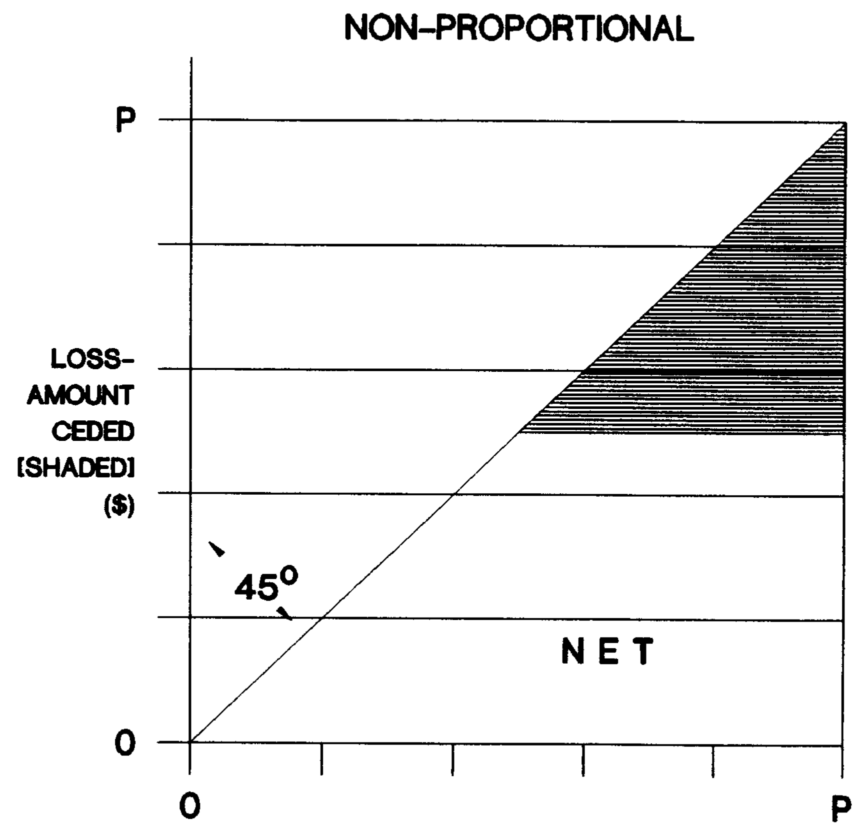
CESSION DIAGRAMS

AMOUNT CEDED VS AMOUNT ASSUMED



LOSS - AMOUNT ASSUMED ($)

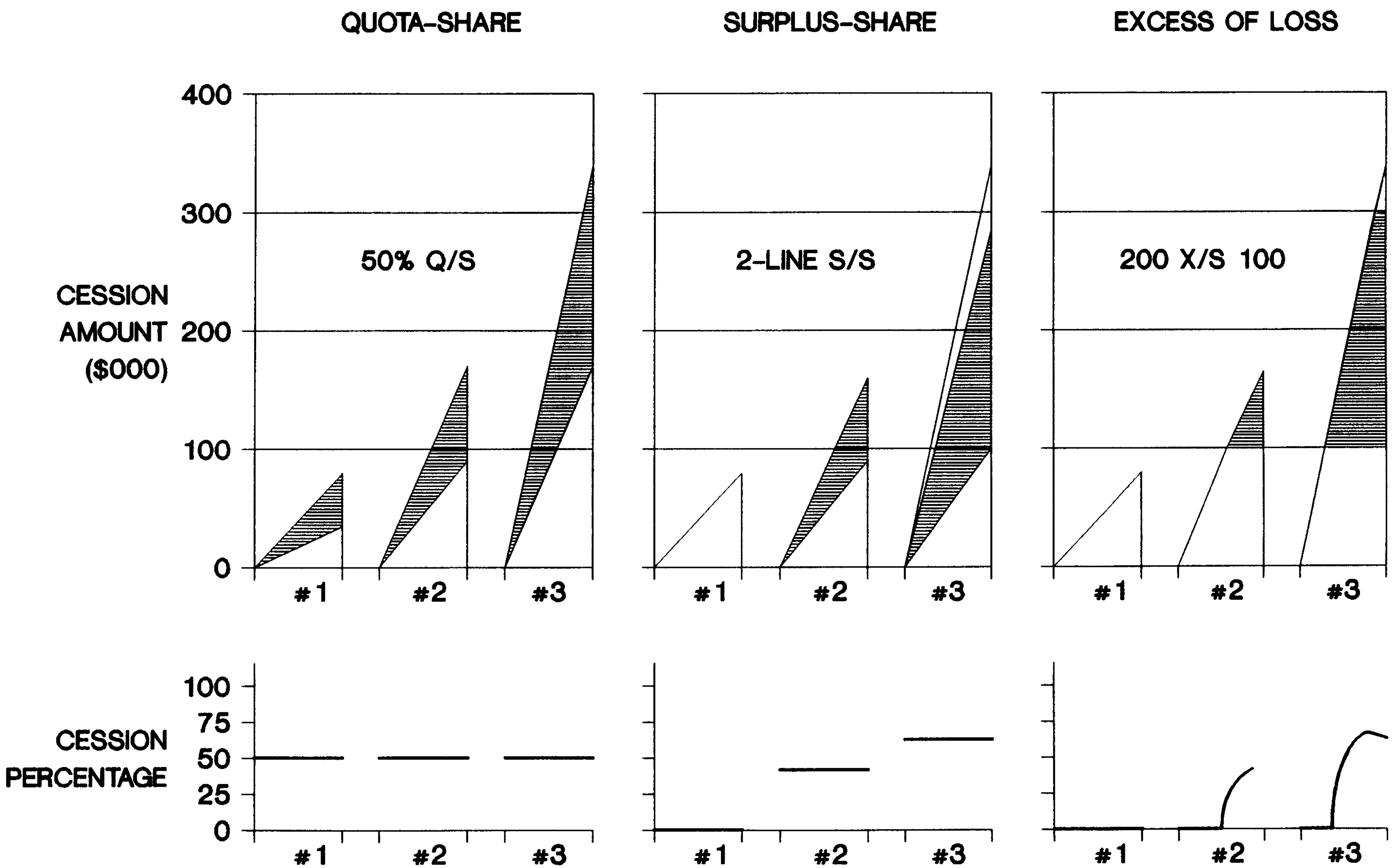
P = POLICY SIZE
(SUM INSURED, LIMIT OF LIABILITY)



LOSS - AMOUNT ASSUMED ($)

P = POLICY SIZE
(SUM INSURED, LIMIT OF LIABILITY)

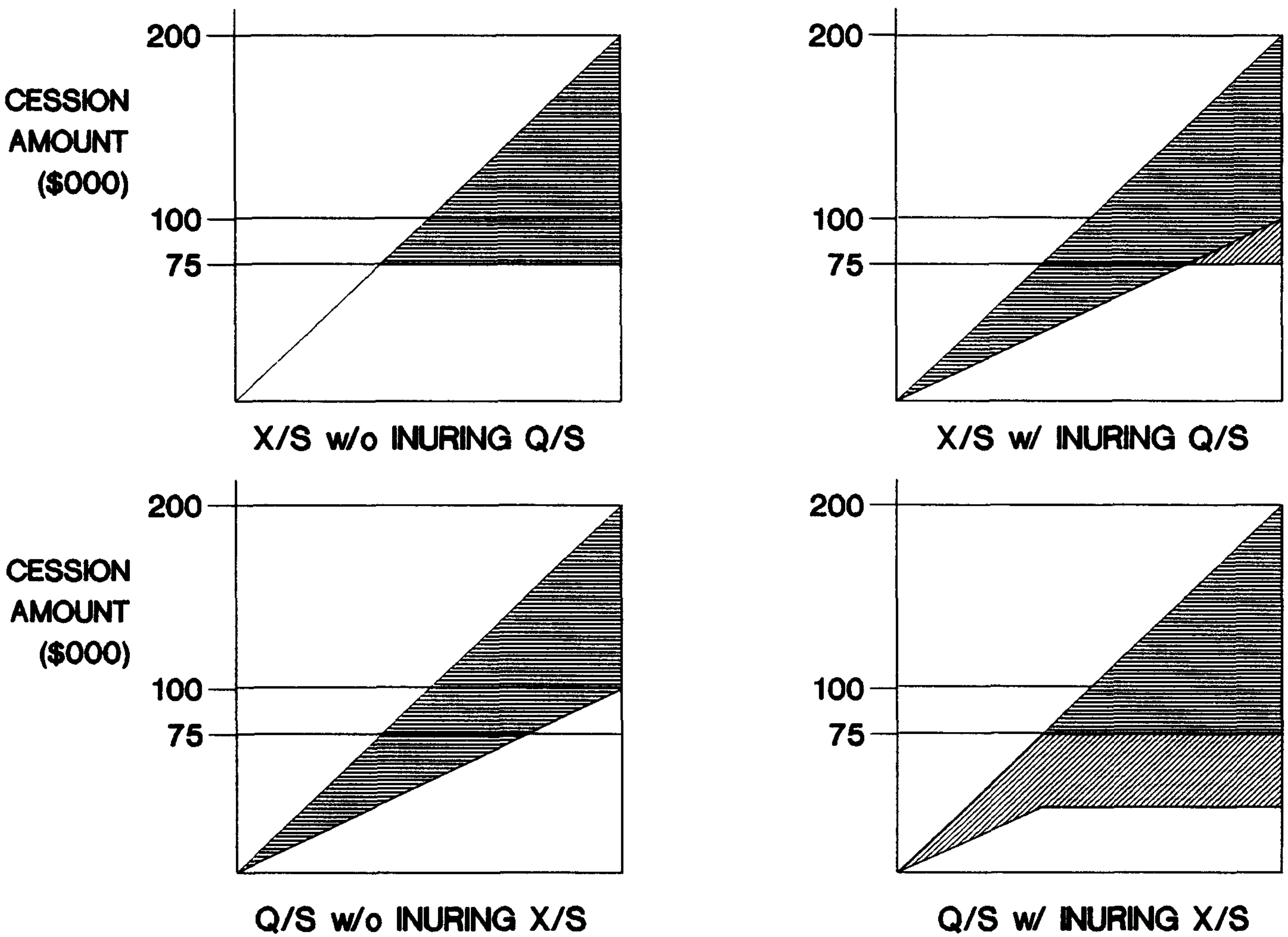
RISK TRANSFER - THE VEHICLES



THE EFFECT OF INURING REINSURANCE

X/S WITH INURING Q/S

Q/S WITH INURING X/S



SAMPLE MEDICAL PROFESSIONAL REINSURANCE PROGRAM DESCRIPTION

CONT	PERIOD	PARTICIPATION	SECTION A	SECTION B	SECTION C
0001	1/01/76 - 6/30/76	10.0 p/o 95	200/ 600 - 25/ 75	100 X/S 25	
	7/01/76 - 12/31/76	12.5 p/o 95	200/ 600 - 25/ 75	100 X/S 25	
	1/01/77 - 12/31/78	17.5 p/o 95	200/ 600 - 25/ 75	100 X/S 25	
0002	1/01/79 - 6/30/83	25.0 p/o 95	200/ 600 - 50/ 150	200 X/S 50	150 X/S 50
0003	7/01/83 - 6/30/84	97.5 of 100	200/ 600 - 100/ 300	700 X/S 100	100 X/S 100
	7/01/84 - 12/31/84*	100.0 of 100	200/ 600 - 100/ 300*	700 X/S 100*	100 X/S 100*

SECTION A LIMITS APPLY PER INSURED, PER MEDICAL INCIDENT

SECTIONS B,C LIMITS APPLY PER MEDICAL INCIDENT

SECTIONS A,B,C ALAE - EXCLUDED

SECTION B FROM 1/01/79 INCLUDES E.C.O. CLAIMS-MADE COVERAGE FOR INCIDENTS OCCURRING ON OR AFTER 1/01/79

SECTION C E.C.O. CLAIMS-MADE COVERAGE FOR INCIDENTS OCCURRING PRIOR TO 1/01/79

* TOTAL LOSSES OF SECTIONS A,B AND C SUBJECT TO 5 MILLION x/s 5 MILLION AGGREGATE PARTICIPATION BY CEDING COMPANY

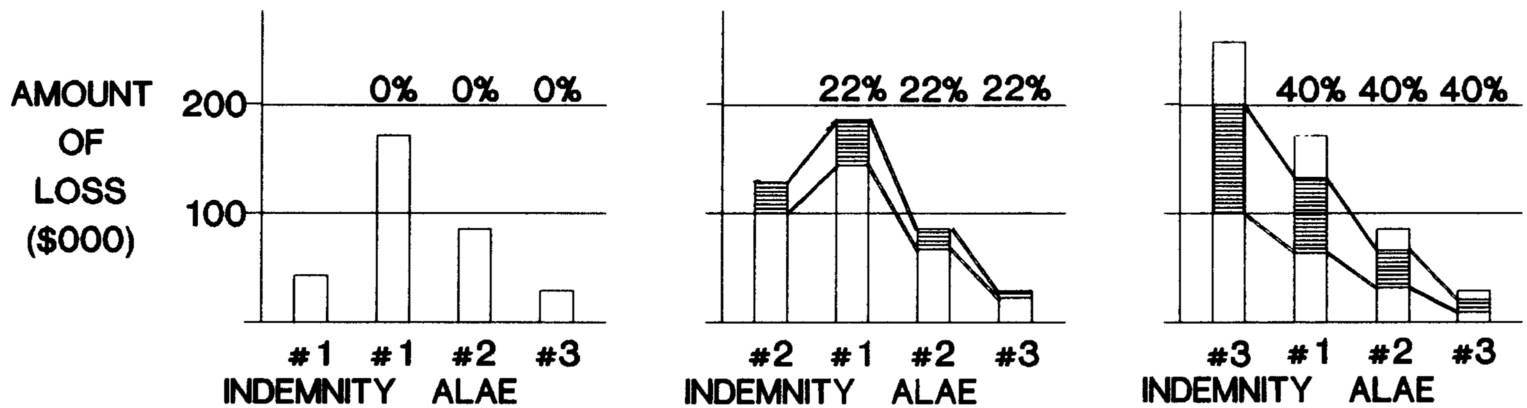
COMMON REINSURANCE TREATMENT OF ALLOCATED LOSS ADJUSTMENT EXPENSE (ALAE)

- EXCLUDED
- INCLUDED
  - distinguished from indemnity
    (shared pro-rata in addition to indemnity)
  - NOT distinguished from indemnity
    (combined with indemnity)

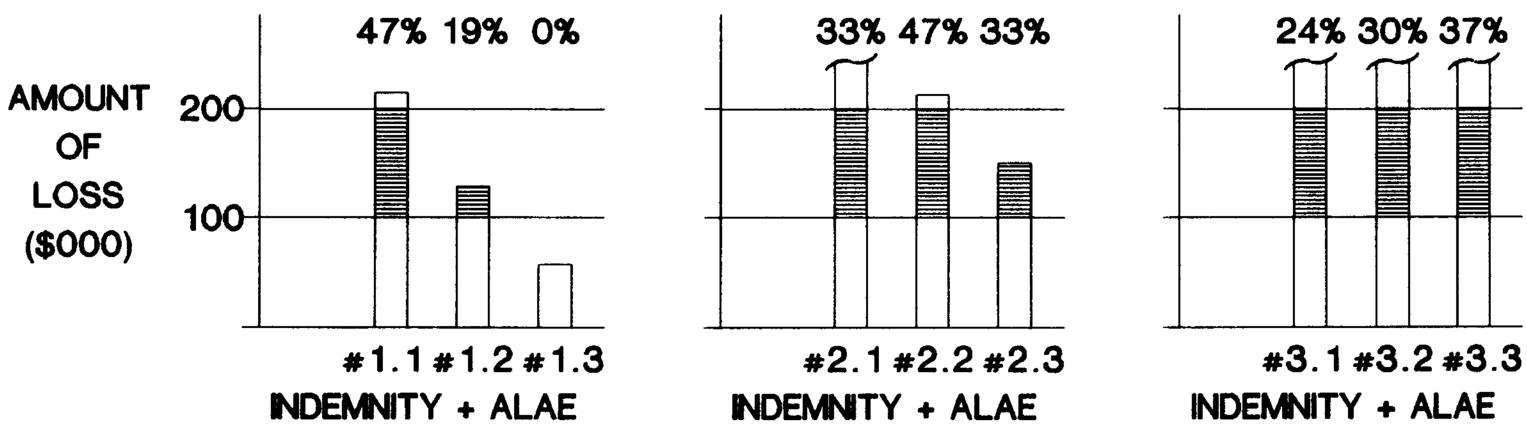
TREATMENT OF ALAE

CESSION PERCENTAGES

PRO-RATA, IN ADDITION



COMBINED



COMMON REINSURANCE TREATMENT OF UNEARNED PREMIUM RESERVES (UPR)

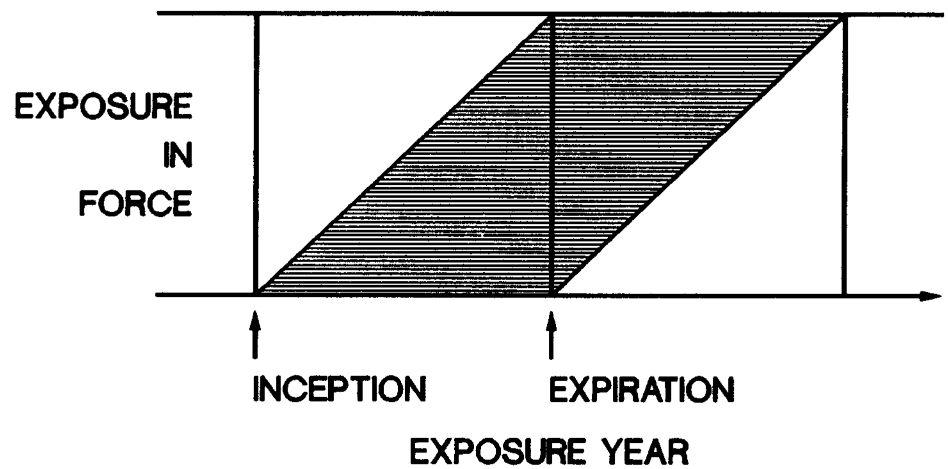
- COVERAGE AT INCEPTION
  - UPR accepted –
    - losses occurring on or after effective date of contract
  - UPR not accepted –
    - losses occurring on original policies effective on or after effective date of contract

- COVERAGE AT EXPIRATION
  - UPR returned –
    - losses occurring on or before expiration date of contract
  - UPR not returned –
    - losses occurring on original policies effective on or before expiration date of contract
      (Date of loss may be subsequent to expiration date)

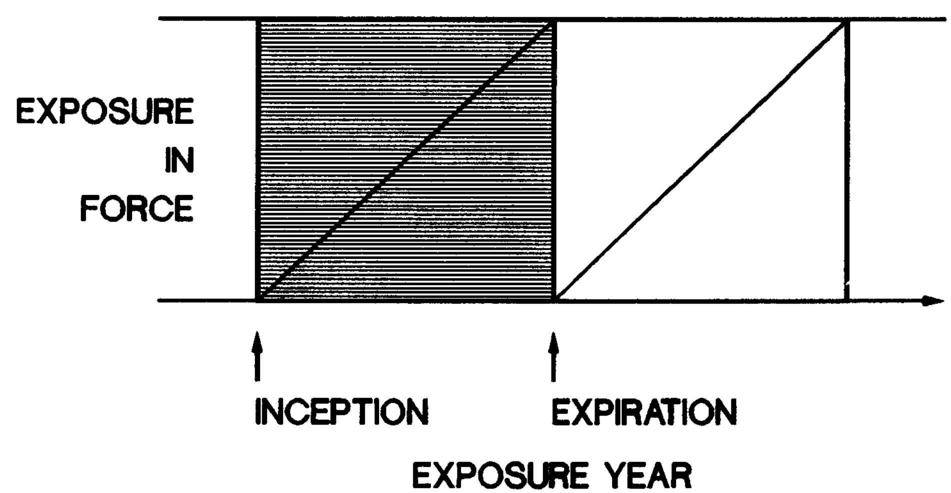
TREATMENT OF UPR

(PREMIUM PORTFOLIOS)

- NOT accepted at inception
- NOT returned at expiration



- accepted at inception
- returned at expiration



COMMON REINSURANCE TREATMENT OF OUTSTANDING LOSS RESERVES (OLR)

- COVERAGE AT INCEPTION
  - OLR accepted -
    - losses occurring before and unpaid as of effective date of contract
  - OLR not accepted -
    - losses occurring on or after effective date of contract

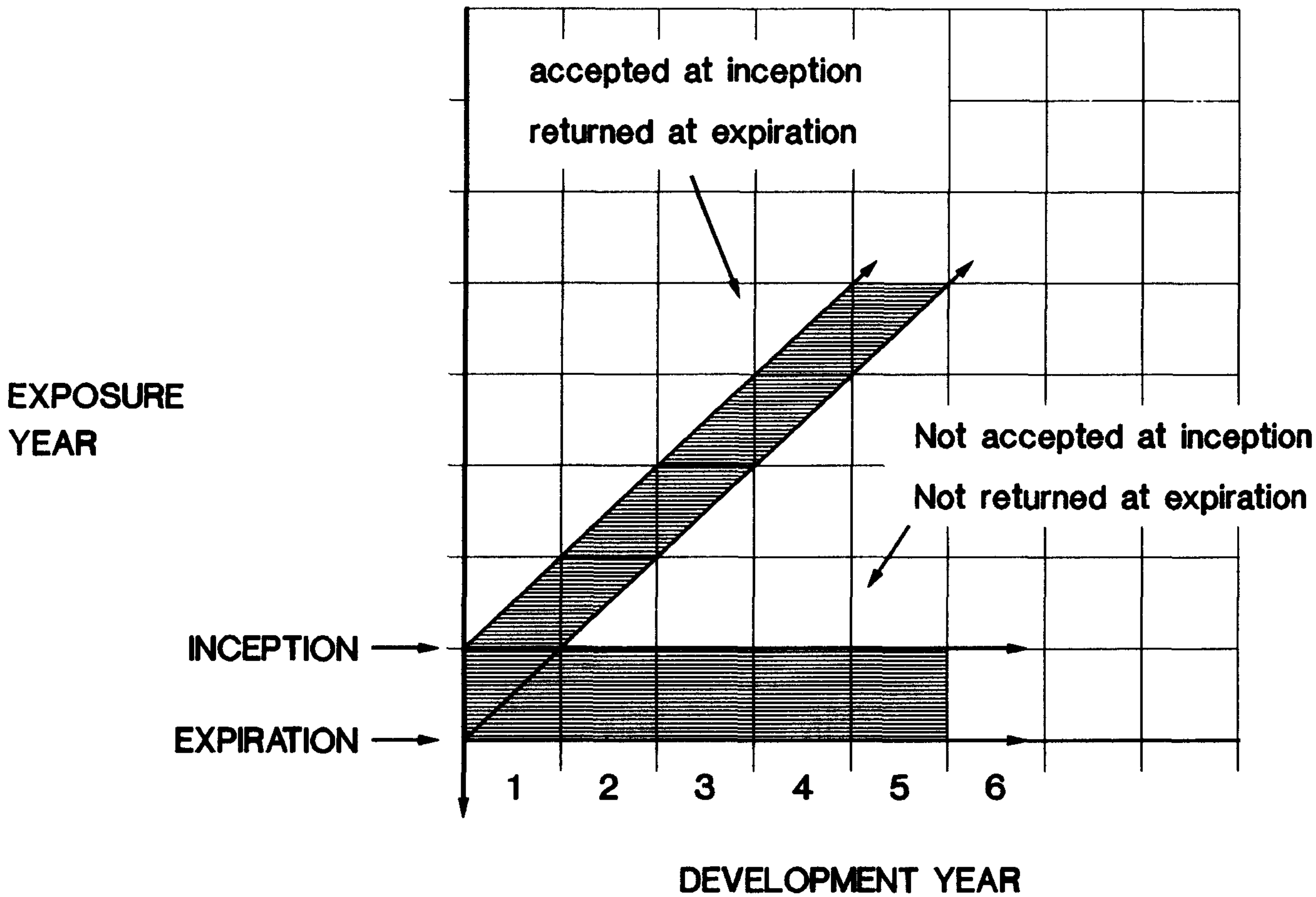
      [DEPENDS upon whether the UPR is accepted or not]
- COVERAGE AT EXPIRATION
  - OLR returned -
    - losses occurring and paid on or before expiration date of contract
  - OLR not returned -
    - losses occurring on or before expiration date of contract

      [DEPENDS upon whether the UPR is returned or not]

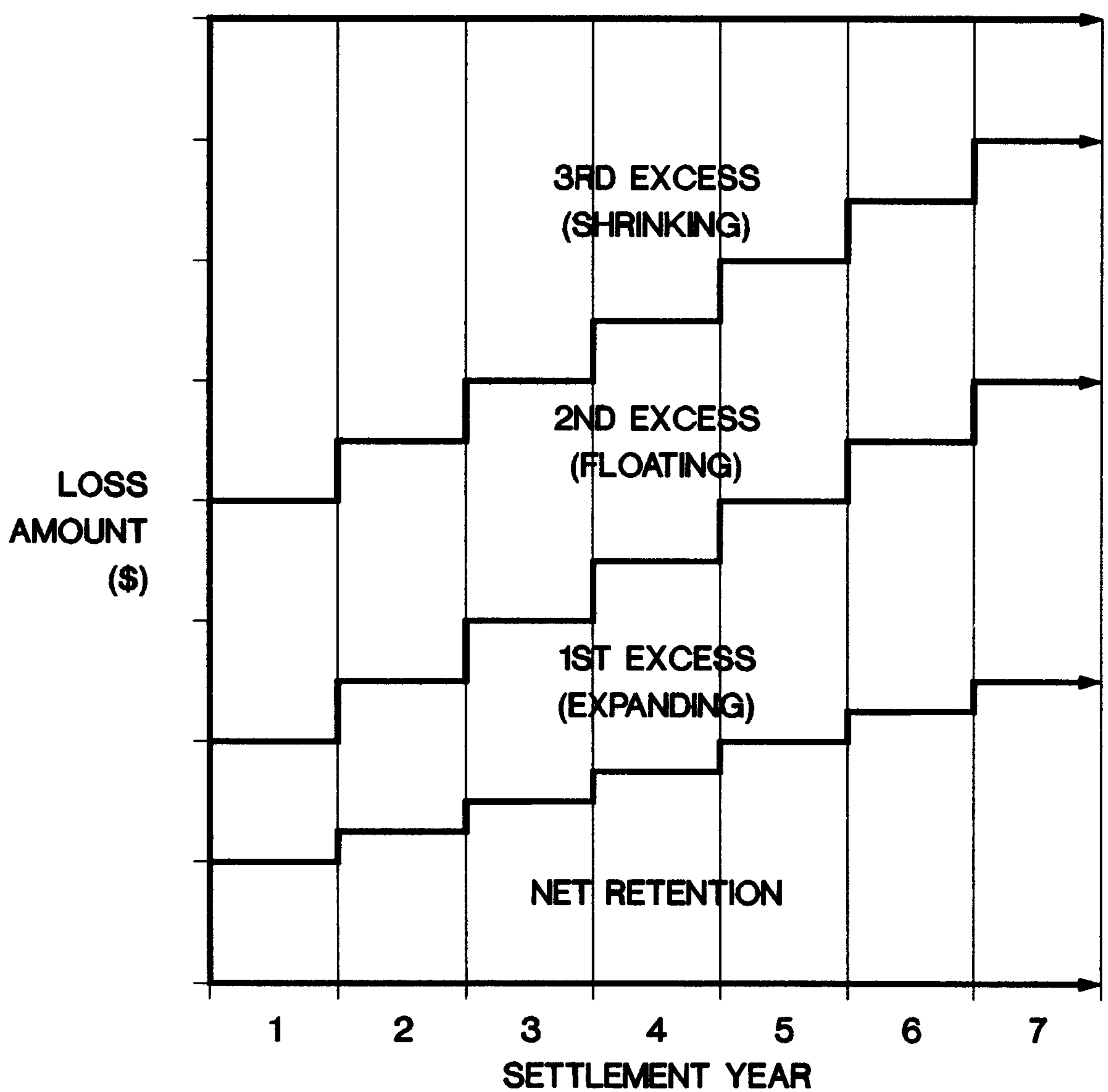
TREATMENT OF OLR

(LOSS PORTFOLIOS)

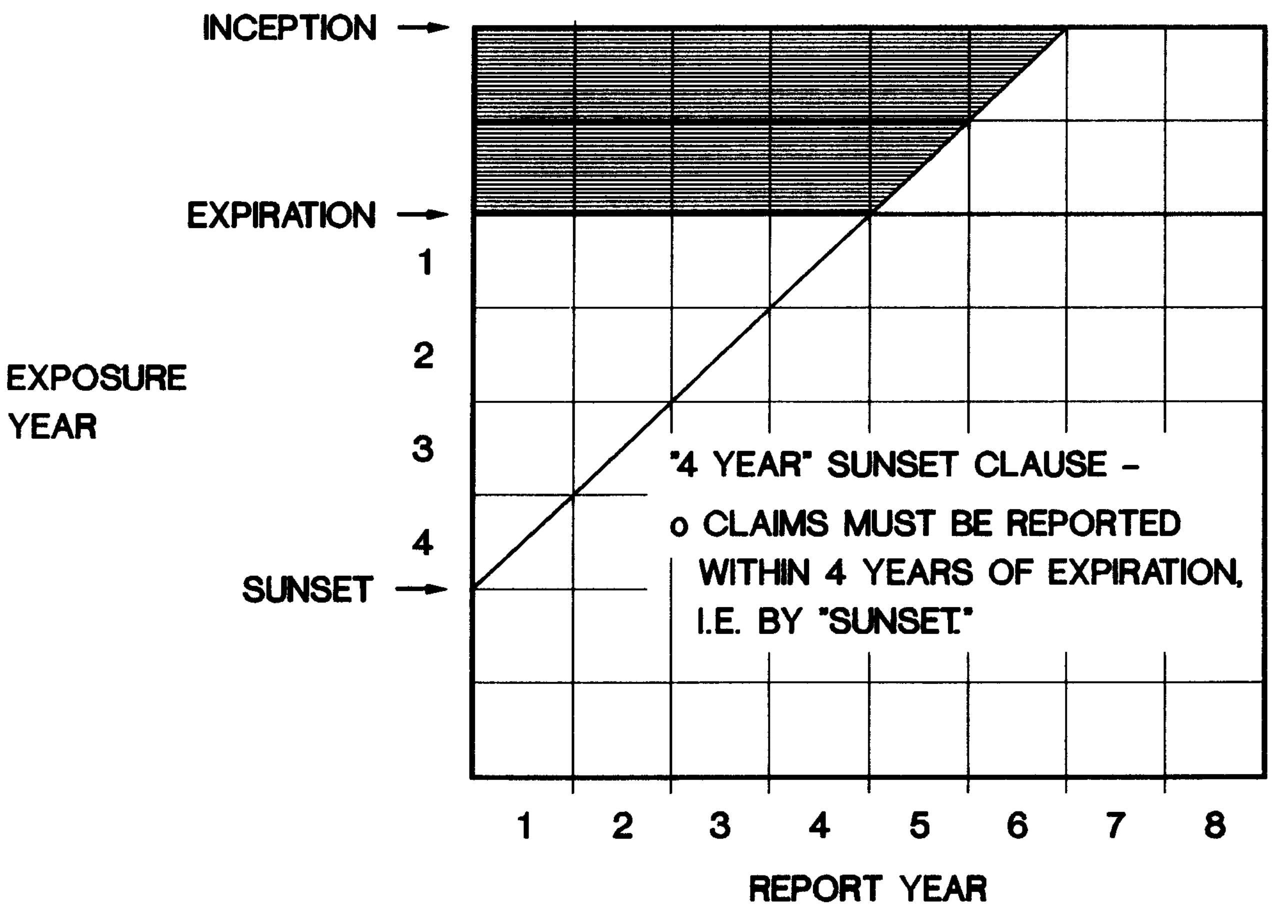
[IBNR AND POSSIBLY CASE RESERVES]



INDEX CLAUSE



SUNSET CLAUSE



COMMUTATION CLAUSE

- Outlines rights and obligations of parties to commute liabilities at expiration of the contract or at other specified time.

- In effect, it authorizes negotiations for the return (to the ceding company) of a loss portfolio.

INTERMEDIARY CLAUSE

- For purposes of cash remittances, the intermediary is deemed to be an agent of the reinsurer.

THUS -

- Payment of premiums by insurer to broker is considered received by reinsurer.

- Payment of losses by reinsurer to broker is NOT considered received by insurer.

1987 CASUALTY LOSS RESERVE SEMINAR

2D - REINSURANCE RESERVING I

Reinsurance Reserving Strategies

- Refrain from "number crunching" at the first appearance of a loss triangle

INSTEAD -

- Understand the company's net exposure, historically and currently (i.e. coverage provided by assumed AND obtained by ceded business)
- Establish the integrity of the data (i.e. it's completeness and accuracy)
- Be mindful of processing lags and snags
- Consider very carefully how to segment the business for analysis:
  - with respect to SUBJECT BUSINESS
    - geographic distribution (e.g. U.S., foreign)
    - lines of business (e.g. 1st party, 3rd party)
    - source/producer (e.g. MGAs, brokers)
    - exposure (e.g. shares, limits, retentions, inuring reinsurance)
  - with respect to the NATURE of the reinsurance contracts
    - treaty vs. facultative
    - proportional vs. non-proportional
    - direct vs. brokered
    - miscellaneous (portfolios, rating, aggregates, special CLAUSES)
- Study case reserve equity margins
  - ceding company claim reporting disciplines
  - claims staff of both ceding and assuming companies
    - expertise, cooperation, diligence
  - use of ACRs, discounted reserves (e.g. Workers' Compensation)
- Relate loss development experience, if possible, to exogenous variables so that the analysis is not essentially "auto-regressive" in nature
- Beware of pressure to use uncertainty as an excuse to "low-ball"

1987 CASUALTY LOSS RESERVE SEMINAR

2E - CLAIMS MANAGEMENT PERSPECTIVES
A TWO-ACT SKIT

Moderator: Michael L. Toothman, Consulting Actuary
Tillinghast/TPF&C

Panel: Margaret Wilkinson Tiller, President
Tiller Consulting Group, Inc.

Michael G. Zipkin, Claims Consultant
Tillinghast/TPF&C

Recorder: Steven A. Briggs, Actuarial Manager
Northland Insurance Company

MICHAEL TOOTHMAN: We're going to introduce some concepts about the interaction of the claims department with the actuarial function and some of the concerns we find in loss reserving. The scene for this is a specialty company and in this case it is a medical malpractice company. The company is purely fictitious and was formed several years ago. To prove it is a fictitious company it was formed as a result of a medical malpractice crisis and the medical and hospital association in the state got together and decided to form one company. That proves that this is fictitious right there. The situations that we're going to describe to you are very much real. They are the kinds of things we see everyday in our consulting practices. This company was formed several years ago and after six seemingly successful years of operation the Chief Executive Officer of our company, which is Professional Reliable, was taken by surprise by his auditors, who got a little bit concerned about the loss reserve levels and decided to do some analysis. They suggested that there were reserve deficiencies totalling $42 million. As a result of some very hard discussions the Chief Executive Officer has managed to get the auditors to issue an opinion but it is going to be a qualified opinion. Unfortunately there wasn't time to get a second opinion at that point, but our Chief Executive is very concerned about the situation so he's called in an outside management consulting firm to provide Professional Reliable with a second opinion on the reserve levels. There is a little bit of typecasting involved here -- not so much with the Chief Executive Officer because I'm going to play that person.

My name is Michael Toothman, I'm a consulting actuary with Tillinghast, and I manage our St. Louis office. Our consulting actuary is going to be played by Margaret Tiller. Margaret is President of Tiller Consulting Group, Incorporated. Margaret is always getting accused of having a lot of initials on her business card. Margaret's business card has more initials than names. I think you're a fellow of the Casualty Actuarial Society; a member of the American Academy of Actuaries; CPCU; ARM; Member of the American Academy of Actuaries. I don't think I've gotten them all, but we're getting close. Mike Zipkin is a Vice President, principal, and claims consultant with Tillinghast in that firm's Washington office. Mike has been typecast also and he's going to play the role of the claims consultant. As the scene opens the consultants have had some preliminary information, and I've talked with them by telephone on several occasions. We're meeting for the first time and they're going to present the results of their analysis to me.

Good morning, Margaret and Mike. It's good to have you here. I hope you've had a chance to review everything now. I'm looking forward to seeing your analysis, and I'm confident that as you present it to me we're going to be able to get lower numbers.

I'm going to get this reserve number down and I'm going to feel a lot better about that.

MARGARET TILLER: I don't think we're here to give you lower numbers. I think that we're here to give you better numbers, which are not necessarily lower but hopefully represent a truer picture of what's happening at your company.

I'd like to start by presenting the auditor's analysis (Slide 3). For the hospital malpractice, you've been holding $11.8 million as your IBNR at year end for last year. This reflects the 80% loss ratio that your rates are based on. The $11.8 million is the difference between your reported losses and what you would have if your ultimate losses resulted in an 80% loss ratio. The audit suggests that this number should really be $28.5 million. For physicians and surgeons you haven't been holding any IBNR reserve on. That, of course, is written on a claims made basis.

MICHAEL TOOTHMAN: Right. That's claims made -- we wrote it as claims-made for a purpose, and by definition we know there is no IBNR on a claims-made policy.

MARGARET TILLER: Well there are two components to IBNR. First, there is the reserve for unreported claims, which is certainly not present on claims made policies, and there is also something called case reserve development, which we'll get into in more detail later. In the meantime, let's continue with the auditor's analysis.

This is a typical development triangle (Slide 4). This is your company's data. It shows that, for example, for policy year one the sum of your payments plus case reserves at twelve months was $1,533,000; at 24 months $2,391,000, and it keeps growing. We have six years of experience that the company has been in business, and we've also shown the earned premium, so you'll get some clue as to how the losses are tied to the premium. What the auditor has done and what actuaries typically do, is begin by looking at the report to report ratios (Slide 5). We look at the ratio from 24 months to 12 months. In other words, how much would you have to increase the numbers at 12 months to get to the numbers at 24 months. If you look down the column you can see that those numbers are all fairly much in the same place. What the auditor has done is simply taken the arithmetic average of the numbers in the columns. Since the company has only been in business for six years, no one really knows what's going to happen after 72 months, and the auditor has decided that they will put in a factor to ultimate of 1.2, indicating that there is going to be an additional 20% development after 72 months.

MICHAEL TOOTHMAN: Margaret, let me interrupt you right there just a moment. I understand from what the auditors told me that that factor is based on industry data. I guess that's one of the places that I have an objection. We're not like the rest of the industry. We started this company precisely because we don't think the industry is doing a lot of things right. We think we're doing things differently than the industry is doing them. I just don't see why that's appropriate in analyzing our company.

MARGARET TILLER: Well, it may not be, and we'll come back to that later. In the meantime let's continue with their analysis (Slide 6). If we take the factors that they have selected, cumulate them to an ultimate basis and project out what your triangle is going to be like, we do what's called squaring the triangle. We're trying to fill in the bottom right hand piece of this triangle with what we expect to happen. Note that going to 72 months, however, is probably not far enough. In addition to completing the square you also have to go as far right as it is going to take to get the reported losses at the ultimate value.

To give you a little more detail about how the auditor got the projected ultimate losses, we take the reported losses -- which is, again, the sum of payments plus case reserves at the last valuation (that's the last diagonal in your triangle) (Slide 7). Multiply these reported losses by the loss development factors to ultimate to get the estimated ultimate value. Now we've also compared those to your premium, and you can see that particularly in years 5 and 6 there seems to be a problem. However, there are some things that the auditor did not reflect. For example, you've changed your retention from $100,000 per occurrence to $250,000 per occurrence in your fifth year.

MICHAEL TOOTHMAN: That's right. We realized that this business was really a profitable business and we decided that we ought to keep more of that profit for ourselves. That's why we did that.

MARGARET TILLER: We're not going to argue right now about whether or not you're making money on that. We're going to continue showing you what we did. Higher retentions usually mean that it takes longer for the reported losses to equal their ultimate value, so we've increased the loss development factors for policy years 5 and 6 to reflect this change in your retention (Slide 8). As you can see, that increases the estimated ultimate value, which increases your IBNR by about $4 million.

MICHAEL TOOTHMAN: This is going in the wrong direction Margaret. I hired you all to come in and get these numbers down.

M. TILLER: No, you hired us to give you a second opinion. This is merely one adjustment that we've made. We've made other adjustments that will make things look a little bit better. For example, in policy year five, there are two very large claims which are atypical of the claims experience of this company. We've decided that rather than using the loss development technique perhaps we ought to use the Bornhuetter-Ferguson technique (Slide 9). That gives you some credit for the 80% loss ratio that you've assumed in your rates. What we do is calculate what we expect the losses to be based on the 80% loss ratio. Then using the development factors to ultimate that we used in our prior analysis, we convert those to the percentage of the losses we expect to be unreported at a particular point in time, multiply those together, and get the IBNR. So now our IBNR has gone from $33 million down to $18 million.

M. TOOTHMAN: Now you're talking -- I like this a whole lot better. What's the name of this technique?

M. TILLER: Bornhuetter-Ferguson. It doesn't always work, and there are some problems with this technique. But in any case, the projections for policy years one through four are not materially different using the two techniques. For policy years five and six, they are down considerably. One of the problems with this application of the Bornhuetter-Ferguson technique is that we based it on earned premium. Earned premium is not necessarily a good measure of exposure. It would be better, for example, if we could get some data on the number of occupied beds.

There's one other adjustment that we've made (Slide 10). We expect that for policy years five and six, not all of the premium has been reported. This is due to some audit premiums that will be coming in. Since we expect some development on the premium we have offset the unreported losses by the unreported premiums.

M. TOOTHMAN: Is this going to get a lower answer?

M. TILLER: Yes, this will get a lower answer. We offset the unreported losses by reducing the expected percentage unreported for policy years five and six. We're down another $2 million to an IBNR of about $16 million.

Now you'll notice that one of the problems that seems to be cropping up, and which we need to address a little bit later, is that policy years five and six still look as if they have considerably worst experience than the prior four policy periods. We may need to look at this on an exposure basis to see if we can determine what's happening. Perhaps your rates need to be increased, or there may be some other things we can do to help you -- but in the meantime let's worry about the IBNR problem.

To summarize where we are, the auditor suggested $28.5 million against the $11.8 million that you're holding (Slide 11). Our opinion at this time, until we get some different data, is that you should have been holding $16.2 million. We've reduced the opinion of the auditor by $12.3 million.

M. TOOTHMAN: That's good Margaret -- I appreciate that. That's $12 million -- if we can get $30 million more we'll be in good shape. If we eliminate all of the IBNR for the physicians and surgeons now, we'll be in pretty good shape -- right?

M. TILLER: As I mentioned earlier, there are two parts to that. Let's look at your company's data on physicians and surgeons (Slide 12). Because this is written on a claims-made basis, the data is by report year rather than policy year. Note that at 12 months for report year one you had $5 million of losses reported. And that's the end of the year, so theoretically all of the claims have been reported. Yet, at 24 months, the sum of the payments and the case reserves was $7 million; at 36 months, it was $8.4 million; ad it continues to increase.

This becomes even more apparent if we look at the report-to-report ratios (Slide 13). You can see there are some substantial increases from the end of the report year almost as far out as the company's experience goes, which is six years. What the auditors did was, again, take a straight average of the report-to-report ratios and cumulate them back to ultimate. Now because there's no development from 60 to 72 months on that first report year, they have assumed that at 60 months the reported losses are at the ultimate value. If you carry this projection through, we square the triangle -- 60 months is ultimate -- resulting in a total ultimate of $107.9 million (Slide 14). The reported losses you are holding are $82.3 million, which says you should have a $25.6 million reserve for IBNR.

There are some problems that we notice. Let's back up one slide (Slide 13). If you look at the last two diagonals, there seems to be something a little funny happening with the claim handling practices. We're not sure how to interpret what we see there, but we don't think that taking an arithmetic average is the proper thing to do even though we have a set of numbers that's consistent, then a high diagonal, and then a low diagonal. So we've asked Mike Zipkin to get involved to see if we can understand what exactly is happening in your claims department.

M. TOOTHMAN: Margaret, I think I follow the analysis you've gone through. In fact I thought I understood it when the auditors' presented it to me. What you've shown me is essentially what the auditors did. But this is just crazy. I don't understand. I follow what you've done on the slides mathematically, but we're writing physicians and surgeons business on a claims made basis. By definition, there is no IBNR on a claims-made policy. You seem to be talking about claims developing differently, but we've hired the best defense counsel in the state. These guys are really hard-nosed -- they're good. We've gotten good claims people. They keep us really informed of what the settlement climate is. They're right on top of the likely verdicts of these cases. I think they've really been on top of things, and you talk about developing my reserves. This is really crazy. I don't understand it at all. Let me show you some data of my own (Slide 15). I looked at some of our cases, and we had about 100 cases open at the end of the year when the auditors did their study. In the last seven months, we've closed fifty of those cases. I put this data together. Those cases had case reserves of $750,000 at year end. They've been settled and they've been settled for a total of $625,000. We had twenty percent redundancy in those case reserves. Not only do we not need the IBNR, we ought to be able to get some credit in our financial statements for all of the redundancy in our case reserves.

M. ZIPKIN: Let me see if I can help clear up some of the confusion. What looks like a discrepancy between what Margaret is saying and what this study is telling you is really not an inconsistency so much as it is the need to understand the very substantial differences between your analysis and the total loss reserving process, which is what Margaret it talking about. That is, the difference is between the actuarial reserving process Margaret is talking about, and the case-basis reserving process which is what this study you conducted speaks to. What you're really talking about is redundancy on closed claims, and I'd like to explain that situation and also point out the very substantial differences between the two types of reserving processes.

[Slide 16]

This is one of your cases that we've taken a look at -- it's a preliminary look at the case, and the facts of the case are not really as important as the relationship this case has to the case-basis reserving process. In this slide, the left hand axis of the chart represents dollars, the horizontal axis at the bottom represents the passage of time in months, and the diagonal axis represents the various stages that a claim will go through from the time that it arises and is reported, and registered, assigned, investigated, negotiated, and settled. What this graph tells us is that for this particular case, and for almost all of the cases that we will look at on your behalf, the older the case gets the more money it's worth. What this reflects is the well known bias on the part of the claim person, which is to err on the low side. What this graph shows us in this particular case is, first of all, the redundancy that you see at the top -- the reserve set at approximately $130,000 with the case selling for about $120,000. That does reflect a redundancy. But keep in mind that these are closed cases. What isn't reflected here is the continuing adverse development on your still open cases-- that is your less closable cases. Stating it differently, Mike, for every case you have that's reserved for $130,000 and settled for $120,000, you have lots of cases which are relatively new and immature. They've just arisen and they're reserved currently for say $15,000 and they're on their way up to the $130,000 level. You must take those into account also.

M. TOOTHMAN: Are you telling me that there's something wrong with my claims department? I hear people talking about stair-stepping reserves and that's a bad thing. Is that what my claims people are doing? They've been told to put full value up on everything.

M. ZIPKIN: No -- stair-stepping reserves is a frequently misunderstood term. What your claim department is doing is what Margaret is talking about -- it's called adverse development. What you've got in this case is that as the investigative development of the case proceeds, the continuing acquisition of facts leads to separate subjective opinions by the claim department as to what the case is worth. And as the case worsens or as additional investigative information comes into the file, a reevaluation of that case points to the need for a higher reserve. That's not step ladder reserving, that's correlating the investigative development of the case with the case reserve development of that claim.

M. TOOTHMAN: My guys couldn't know at the beginning how much this claim was going to settle for?

M. ZIPKIN: I would say that if your claim person had put a $130,000 reserve on this case when it was first reported back at the six month level, you probably would have been very upset, because the file itself -- the investigative development of the case at that point in time would not have supported that type of reserve.

I made the comment that the facts of this case are not very relevant, but let me discuss what happened here. When this case was first reported -- it's a medical malpractice case against one of your physicians -- it wasn't very serious at the time or it wasn't thought to be very serious. When we reviewed this file we agreed early on that the case wasn't worth much money, but then two things happened. First, the plaintiff became a lot sicker than we thought. He went back to the hospital, his condition worsened, and the medical reports we got indicated a much more serious type of injury produced by the alleged malpractice than we originally thought. Second, your doctor unfortunately altered the medical records. It was a trivial change, but when he was questioned by the plaintiff's counsel, he did admit to a slight alteration, and that changed the view of your claim department on this case considerably. So they increased the reserve up to the $130,000 level, but there were some things that happened in that case that allowed them to settle it for less. For example, the plaintiff didn't show up for depositions or interrogatories, and it became very clear that he was having problems with the idea that this case might eventually result in trial. He began to prevail upon his attorney to settle the case. Your claim department saw an opportunity to settle the case at an especially reasonable price and did so. That's what resulted in the case being settled for less than it was reserved for. However, as is typical in these types of cases, you still have the problem of many cases on your books which are not closeable. They're not in the condition that this case is in -- they're on their way up to a higher level and you must understand that while you may take the redundancy on closed claims into account you still have to consider the continued adverse development on your still ope, less "closeable" cases.

M. TOOTHMAN: Mike, I appreciate this. I do understand what you're saying, but the bottom line really is that if we need these kind of IBNR numbers we might as well close up shop because this company is probably bankrupt.

M. TILLER: Now let's not be hasty. Why don't we give Mike the opportunity to talk to your claims department and look at some claim files and get some additional information to find out exactly what has been happening there and whether or not whatever has happened is going to result in a permanent change.

M. TOOTHMAN: I assure you that there is no one that would like that more than I would. You're talking about reserve development and saying that maybe there was a change. We've been in operation for seven years now. We've had the same guy running the claims department the whole time, and he tells me that they've been doing the same thing. What they've been doing is very consistent from year to year, so I don't think you'll find anything, but go look. I hope you do. I hope you can come up with something.

M. ZIPKIN: Let me explain how we go about this. First of all, I want to clarify the key issue here. That is, you're exhibiting through your commentary and perhaps your criticisms some concern about how well your claim department handles its claims and how well your legal counsel handles the litigation that's referred to them. The issue is not how well your claim department or attorneys are handling cases. The important issue is the influence of that claim handling on the data that your actuaries and Margaret are looking at -- that's the key point. Now in evaluating that, what we do is to conduct a claim review (Slide 17) that will shed some light on this issue, as well as on the management operations, organizational and other claim related issues here. In order to get to those issues we do the following things: We interview claim management and supervisory personnel. We try to get inside your claim department to determine how they handle claims and whether or not there has been any recent changes in their claim handling practices which might have an influence on the data the actuaries are evaluating. We also review claim files -- both open and closed.

Lastly, we will review claim procedures, practices, and statistical data which bear on your claim department's case basis reserving practices. Again, the primary thrust of this kind of review is to explore any changes that may have taken place in your claim operation which could influence the consistency or the stability of the data that Margaret and your other actuaries are evaluating.

The kinds of changes that we look for are these: (Slide 18) We look for law or legislative changes that may affect liability, legal defenses or damages. For example, we all know that when the law moved away from contributory negligence toward comparative negligence, a major shift occurred in the thinking of many claim personnel regarding higher case values, ad it became quite clear to many actuaries that case reserving practices changed in conjunction with that legal change.

We also look for changes in jury verdict patterns -- higher awards and so on. We know, for example, that shock verdicts can change a claim department's attitudes. Keep in mind we're talking about subjectivity. When you talk about case-basis reserving, you're talking about the subjective impressions, perceptions, and attitudes of individual claim people as opposed to the more objective actuarial reserving methods that Margaret is talking about.

We look at changes in the procedures and practices for reporting, reserving, and closing claims. Obviously, anything that shortens the life span of the cases, or which changes the procedures by which those cases are reserved, is a change that we want to evaluate very carefully.

Lastly, we look for changes in personnel, workloads, and claim department organization. In particular, we look for anything which may have caused a change in the mix of experienced versus inexperienced claim personnel. If you've got a very experienced claim department which is skilled in consistent case reserving practices and you experience a change in that skill level towards a younger and less experienced group of claim people, you're going to have a change in your case reserving practices.

One of the critical factors that guides us in our review along these lines is that your claim department itself may not be aware of changes which have influenced the data. That's because a claim department does not normally deal with aggregate trends--they handle claims the way we want them to do it, one at a time. It's bad news when a claim manager says he won't settle a claim for $35,000 because his average paid to date is $31,750, and he doesn't want to affect his overall average. What we want him to do is settle that individual case for $35,000 if its worth $35,000.00. On the other hand, the actuarial process deals with aggregates, and most actuaries are aware that claim people don't deal routinely with the aggregate implications of their work. They deal with cases one at a time and we want to proceed with your claim department on that basis, that they themselves may not be particularly aware of the overall effect of changes that they may have interjected into their case reserving practices.

M. TOOTHMAN: Mike, I'm certainly anxious to have you go ahead and do this. I want you to really get to the bottom of this and find out what's happened. I've been told that everything has been consistent, but I'm really hopeful that you'll find some explanation for this. And I hope after you guys get through with this and you understand it better that we'll be able to get some reserve indications a little bit lower than what we've seen today.

M. TILLER: Not necessarily lower but better. There are a few other items that we want to look at also. For example, we think your allocated expenses are a little bit high, and we want to make sure that you're getting what you're paying for.

M. TOOTHMAN: I think we've got some information on that and we'll be happy to give you whatever it is you think you need. Is there anything else you think you might need?

M. ZIPKIN: I assume that your claim department will immediately recognize your concern that they cooperate with this study.

M. TOOTHMAN: I'll talk to them right away. I'll make sure that they know that. How long should this take? When can I expect to hear back from you?

M. ZIPKIN: The claim portion of this review should take 2-3 weeks.

M. TOOTHMAN: Good -- I'll look forward to seeing you then. Thank you very much.

With that I send them on their way and they go and see my claims department -- they get the chance to do their analysis. And while they're gone and doing the analysis, let's take a break and reflect on my situation. I was very successful in another career -- the medical field -- before this medical malpractice crisis hit. I concluded that career and had this opportunity to put together an insurance company. Now I find myself in a different profession, and things seem to be going very, very, well. Everything was going along very smoothly -- we had piles of money coming in. I could have lunch every day with investment advisors who want to manage all of this cash that we have around. I get to play golf on Wednesday afternoons. I could play golf with brokers and hospital administrators all the time if I wanted to. I was a legend in my own time. I was having a good time running this company -- then all of a sudden these reserves blow up on me.

I'm now in a pretty difficult situation, I managed to talk the auditors into filing a qualified opinion last year end, but the problem has not gone away. I certainly am hopeful that if these consultants dig a little deeper they will find some basos for agreeing with my position -- or at least coming a lot closer.

As the scene reopens, we find the actuary and claims consultant coming back to present the results of their further analysis.

Good afternoon Margaret -- Mike. I hope you have some good news for me.

M. ZIPKIN: I've got some good claim news for you but I've got some bad news also. Let's touch on that first. I'd like to deal with this fairly persistent issue of redundancy on closed claims. Remember when we talked last I told you that we could conduct a study which would reflect on the continued adverse development on your still open non-closable cases and compare those side-by-side with those closed redundant cases which closed for less than they were reserved for. We did that. The top line here shows (Slide 19) your fifty closed case review -- the $750,000 that you had up in reserves, and by July of the next year you closed those cases for $625,000. What we did is to identify a sampling of 50 open cases that were continuing to develop adversely during the period that your cases were closed. The development on those still open cases went from $1 million to $1.5 million. Therefore, when you add the two together, as you must do in evaluating all of your cases, you can see that your "redundancy" turns into an inadequacy of 21%. Further bad news is that with regard to the 50 open cases you're not done yet. That is, those cases are currently worth $1.5 million. Next year they may be worth $2.5 million. If you get adverse jury verdicts like you have in the past they could be worth considerably more. Thus, when you combine your results between edundancies on closed claims and adverse development on still open cases, you are likely to find, as we do in our studies, that the continued adverse development on the still open, less closeable cases almost always overtakes the amount of redundancy on closed claims. In our opinion, therefore, it would be a mistake to extrapolate your experience on closed claims to all of your currently opened cases.

Now for the good news. You remember that I told you that your claim department told us that they were unaware of any significant changes in their claim department operations. We pulled a substantial sampling of claim files and did a lotus spreadsheet analysis of them. I want to show you what that analysis looks like. (Slide 20) There are six cases here--there are a good deal more than that in the full study. As you can see we have captured the file number, the accident date or the accident year, the initial reserve and so on. Through the first six columns from file number through the date of the first initial subsequent reserve change after the setting of initial reserves, there's nothing remarkable about these data. The initial reserves are fairly typical of cases of this kind. The subsequent reserve changes -- the one reserve going from $15,000 to $30,000 -- some of these change and some don't -- that's fairly typical also. But take a look at the last two columns. Every one of these six cases has undergone a very substantial reserve change in a relatively short period of time -- June, July, and August of the same year. Now we went to your claim department and they told us the same thing that they told you--there had been no changes. They're still doing things the same way they have always done them. But when we showed them these data, they agreed that there had to be something more than just coincidence that would cause all of these cases to be substantially increased in case reserve value in the same relative point in time. When we explored that point with your claim departmernt in more detail, we found an important influence on the data that Margaret is talking about which has resulted in a substantial and permanent strengthening in your case reserving practices caused by one or two very serious jury verdicts you received this year. You may recall one in which you got a multi-million dollar judgment on a case you were supposed to win.

M. TOOTHMAN: That was the Moore case.

M. ZIPKIN: That's the one where you took a two by four and went down into your claim department looking for somebody to hit and your comment was "what in the hell is going on here." Two things scared your claim department to death -- one is your attitude, I must confess, and the other is the fact that this case was, in fact, substantially undervalued. What your claim department did was to reassess its case reserving practices in light of this decision.

I think they saw that this was not a normal type of judgment and that the jury went a little hairy on this case. Nevertheless, the case was worth a good deal more than they had up on it. As a result they decided to do something which I think resulted in substantial increases in case reserves and represents a substantial influence on the data that Margaret is looking at. That is, they decided to look at all of their cases to see if they had any more bombs in there. They didn't want to get hit by another adverse jury verdict. The point is we know that when claim people look at claim files, case reserves go up. That is, they compress the timeframe within which normal adverse development takes place, thereby producing what appears to be a spike in the data. The question is whether or not that's permanent. In your case it is. What they have changed is not just case reserves on individual cases as indicated by this graph. They've also changed the way they look at their cases. It seems to us that in the later cases we looked at that there is a definite tendency on the part of your claim department to get higher reserves on the file earlier in the life of the case.

M. TOOTHMAN: Does this mean that maybe they've over reacted and there's too much reserved?

M. ZIPKIN: In our individual review of files we didn't see any cases which look to be "over-reserved" in terms of their current case reserves. That is, I don't think they've overreacted. What they have done appears to represent a proper reaction to external events, but they've done so in a subjective manner, without recognition of the aggregate affect that all of this would have on the data being evaluated by your actuaries.

M. TOOTHMAN: The guy in my claims department didn't tell me--was this at his direction?

M. ZIPKIN: It was at his direction but again, he's a good claim person and simply did not realize the aggregate hit that your data was going to take in terms of the activity that was the result of this process.

M. TILLER: Since this was a permanent change and since we now know how to interpret that diagonal, let's go back to where we left off (Slide 21). We've now highlighted the diagonal where the increase occurred and the diagonal after it where the factors seemed to be somewhat lower. Because Mike thinks that this is a permanent change, we've decided that we can realistically select report-to-report ratios that are essentially the same as what's on the last diagonal because that last diagonal reflects the new claim reserving philosophy (Slide 22). This, of course, gives you much lower factors to ultimate. When you carry the projection forward and complete the triangle, we've reduced the IBNR from $25.6 million down to $11.3 million (Slide 23). To summarize, for the hospitals you were holding $11.8 million, the auditors suggested $28.5 million, and we've suggested $16.2 million; for physicians and surgeons, you weren't holding anything, the auditors indicated $25.6 million, and our opinion is that it should really be $11.3 million (Slide 24). The total inadequacy according to the auditor's was $42.3 million. We've reduced that by $26.8 million to $15.7 million.

M. TOOTHMAN: That's a whole lot better than what the auditors were saying. I guess I must say that I think you've convinced me that we do need some additional money on the physicians and surgeons, even if it is on a claims-made basis. I think I understand what you were driving at. I guess I'm sorry I was so hard on you the first time. You've opened my eyes and that's really helpful. You did say there were a couple of other things you wanted to look at. Are we going to get it down any further?

M. TILLER: Not at the moment but there is hope for the future. Specifically, I had asked Mike to look at the allocated expenses, and he found some very interesting results in that area.

M. ZIPKIN: You may remember the last time we were together I commented on your allocated loss adjustment expense results. The implication there was that they were too high. The question that was asked of me by Margaret in conducting this review was to see if I can shed some light on why they were too high and if so, what could be done about it.

M. TOOTHMAN: You mean that they are too high because they are higher than other insurance companies in the industry?

M. ZIPKIN: Absolutely -- they're higher than other insurance companies but they also are too high for you alone.

M. TOOTHMAN: You know the reason they are higher than other insurance companies is that we haven't adopted the same philosophy as other insurance companies have. We're not rolling over and playing dead on some of these cases. We've decided that we're going to defend them. We're not going to pay nuisance claims. I'd rather pay some money to the defense attorneys and get a reputation on the street that we're not a soft touch, that we're not going to pay these non-meritorious cases. We're prepared to spend those defense dollars.

M. ZIPKIN: Be that as it may there are other reasons that our review found why your expenses seem to be so high. First of all, I should say your outside defense counsel are doing a good job. I didn't see any indication that they weren't. Also, you do use on occasion independent adjusters and we found that the work that they're doing is also excellent. You've got lawyers and independent adjusters who are doing good work for you. The problem is you're asking them to do too much.

Before I get to this let me add a point. When I say they're doing too much, what I mean is that we found instances in which a decision was made to utilize the services of an independent adjuster because you don't have claim personnel in the particular area where this loss occurred and you needed some on-site claims help and you went out and got it. But the manner in which you got it bothers us a little bit. You called the independent adjuster and literally threw this case at them. They took the case and ran with it and investigated it. In so doing they did some work you didn't want them to do -- all of which occurred at your expense and drove up the expense of this case. They thought they understood what you wanted. (By the way, we don't think you can really look at this area very well without talking to the lawyers who do the work for you. Generally, they want to remain competitive -- they see you as a valued client -- and they want to cooperate as much as possible in the holding down of defense costs. On the other hand, we have to understand that they have a professional obligation to do what is in the best interest of their client.) When we talked with your outside counsel, it was clear that they were of necessity conducting investigative work that you pay your claim department to do. It was also clear that there were a number of cases where your claim department was very pointed in its efforts to settle the case. They were out actively negotiating the settlement of that case. It was very clear that they did not intend to try those cases. At the same time your lawyer was very busy preparing those cases for trial-- conducting pretrial negotiations, depositions, interrogatories, and a lot of other work which normally comes very late in the life of a case and is inordinately expensive to conduct. What we think you need to do is shown on this slide. (Slide 25) First of all, you need to inject limitations on your independent adjuster investigations. Never, in our view, should you turn a case over entirely to an independent adjuster when you have your own claim personnel who can think their way through the facts. What you should do is conduct a limited assignment or assign the case in a limited fashion to the independent adjuster. Tell the independent adjuster what you want them to do -- have them do it -- send you the work -- enclose their file, thereby cutting off further expenses. It is then your claim department's task to utilize that information to assess liability or special damages, establish proper reserves, and, if possible, negotiate and settle the case. In our view, limitations on legal expense begin with a control on the amount of paper they send you. For example, when they conduct depositions they can send you a letter summarizing those depositions. A five page letter will do nicely, instead of 500 pages of testimony, which is what you're now getting. You don't read it anyway, but you pay for it.

Limitations on investigation and legal documentation -- I've already spoken about the legal documentation side of the issue involves simply asking the question -- do we have enough here folks? Can we make a decision on what the reserve ought to be? What course our negotiations ought to take? What we ought to settle this case for? By terminating the investigative development of that case, whenever it is appropriate to do so, you will also terminate the expenses being incurred on that case.

The direct involvement of claim staff personnel leads to the point I want to emphasize that you cannot reach these kinds of changes superficially. You can tack acronyms up all over your claim department. You can call them -- get the expense down programs -- you can do whatever you want, but that's really not the name of the game. What you have to do is get your own claim staff more directly involved in doing the work that you're paying others to do for you, and that requires some very fundamental changes in your claim department operations. We're convinced that you have a claim department that can do it. It's just that they need to be made aware that they need to do it. They need to come up with an action plan or a remedial strategy in which they present to you how they intend to become more directly and aggressively involved in the claim handling process, and reduce expenses by doing so.

M. TILLER: That actually represents some real money. Let's go through an example of how much you could save (Slide 26). Your allocated expenses are currently running about 50% of your losses. For the physicians and surgeons, the total projected ultimate losses for the six years that you've been in existence split into $62.4 million for indemnity and $31.2 for expense. Of the indemnity portion, 30.4 is currently held in case reserves and the IBNR is $7.5 million. Currently with expenses at 50%, that means you have about $19 million in case reserves and IBNR for allocated expense. If you could reduce that to 40%, you'd save $3.8 million.

M. TOOTHMAN: We could do a lot with $3.8 million. It's clearly a worthwhile exercise. How would we go about doing it? What would you suggest?

M. ZIPKIN: Let me suggest that after this larger issue is resolved after this meeting, I can give you a proposal for follow-up review of your expense situation. I'll give you an opportunity to review that -- the methods we would use, the projected cost of our services and so on -- so you can make your own decision. There's no question that we can do it for less than $3.8 million so I expect you to be somewhat turned on by the prospects of success in this area.

M. TOOTHMAN: I'll look forward to your proposal.

M. TILLER: There are some things that Mike routinely looks at when he goes in to do a claim review. I think there is another area in which he found some interesting results. That has to do with reinsurance recoveries.

M. ZIPKIN: Margaret asked me to take a look at this while we were in the claim department, and it has to do with the accounting that your company does for reinsurance recoverables and also the piercing of aggregate levels both on a policy year and on an individual treaty basis.

What we found unfortunately is something I think you need to change. We haven't conducted an in depth study of this but what we found is that your claim department is currently attempting to account for reinsurance recoverables and aggregates. That is not a particularly inept manner of going about it. Most of our clients who have dealt with the reinsurance issue in this manner have found their results to be less than acceptable. They leave a lot of money on the table or whatever, and the accounting leaves a lot to be desired. Generally, we advise our clients to remove this function from their claim department and we urge you to do the same.

Your claim department should be making precautionary reports to the reinsurers, and it should be doing a lot of work on the reinsurance side. But the accounting function -- the notification of your claim department of reinsurance recoverable amounts or the piercing of SIR's or the aggregate limitations having been reached should not be taking place in your claim department. It should be an accounting function handled by your controller, your accounting department or whatever -- but we urge you to take it out of your claim department.

M. TOOTHMAN: That sounds like something I can handle internally. I appreciate your comments and suggestions. Is there anything else?

M. TILLER: No, that's it.

M. TOOTHMAN: Well thank you very much. I can say you've opened my eyes to some things. It's really been a pleasure working with you, and, Mike, I'll look forward to your proposal on the claim study in due course. Thank you very much.

As they go on their way that's the end of our little two-act skit. Just as a final commentary, I should emphasize again that this is a hypothetical situation. The company is purely fictional and it does not represent any of our clients. However, the situations are situations that we have encountered. Every one of the particular items that were discussed in this skit is something that we have seen on several occasions. I don't believe we have ever had one company where we've seen all of these things, but we see these things over and over again. They are not particularly unusual situations.

We'd like to get your reaction. If you have some questions on some of the issues that we've touched on in the skit, we'd be happy to discuss them with you. If you have some comments or any reaction to the skit we'd appreciate that too. We'd appreciate it if you can get to the microphone just for the benefit of the recording.

LOU FOWLER: In your first comment on control of claim expenses, you talked about limitation on independent investigations; then on the second point you have limitations on legal defense. I assume you mean there that you would suggest to Mr. Toothman that he get a lot more in-house lawyers to do the work and dispense with some of the lawyers on the consulting basis. The question that I have here is if you took this to the Nth degree, which I don't think you would, you would get all in-house lawyers and thus save a lot of money. But there must be some way in which an intelligent answer could be had regarding where you draw the line.

M. ZIPKIN: Where I would draw the line is when you say you save money with in-house lawyers. In such situations, our studies have found that when you do this you may be trading unallocated loss adjustment expense dollars for allocated expense dollars. In other words, by adding to your staff and salaries, which are 75-80% of your total unallocated loss adjustment expenses, you are increasing one type of expense over another. You are also taking the risk that the lawyers you hire may not be as good as the outside attorneys that you have been utilizing.

Thus, when I say control outside or control legal expense, I do not mean that you automatically switch from the use of outside defense counsel to staff lawyers. What I mean is that you sit down with your outside counsel and try to identify those activities which outside counsel is engaging in relatively routinely, that don't need to be done but that are done at great expense -- your expense.

In particular, I think I would encourage the claim department to communicate more closely with its own counsel on an individual case basis. If the claim department has spent the time evaluating one of your cases, has decided what it's worth and thinks it can get it settled for that amount, that needs to be communicated with your counsel so your counsel is not engaging in useless and very expensive legal work in preparing a case for trial that you fully intend to settle. Out of that communication process can come an awareness on the part of both your counsel and your claim department of the need to communicate and coordinate their activities, so the left hand can know what the right hand is doing.

All too often, what we see instead is the dumping of cases on defense counsel. Keep in mind that much of the investigative development of a case in litigation depends upon pretrial discovery, which is a legal function. It is not unusual to find a claim department turning its back on litigation, and saying--oh well the lawyers are handling it. True enough they are, but they're doing it at your expense. What we want is for counsel to understand that the claim department will still remain very much involved.

QUESTION: On Slide No. 18, the last of the items you mentioned in a claim review was the personnel workloads and claim department organization. If you come across a claim department in which in the recent past, some of the most experienced people have left the organization, perhaps there's been a bit of expansion and you've taken in some new younger people, but with less seasoning than their predecessors had, is there a rule of thumb about which direction you would expect the relative adequacy of the claim reserves to go?

M. ZIPKIN: I would expect the reserves to become less adequate, or at least much less consistent. What the senior level people bring to the table with regard to case reserving is an understanding of that company's case reserving practices. Maybe there are tendencies to undervalue cases, and maybe their tendency is to overvalue cases. What you lose is not accuracy or adequacy, but consistency and an understanding of that particular company's case reserving practices and you start getting substantial variation in the case reserving practices of that company.

This is particularly true of those companies who lose seasoned, experienced help and hire seasoned help from other companies. They may hire experienced help from other companies, but that experienced adjuster may bring his or her own knowledge and awareness of case reserving practices with them, and they may not be the same as the case reserving methodology or philosophy of the company that they're coming to. Therefore, you get variability and inconsistency with the hiring of new people. It happens with enough frequency that I think it can be anticipated. It needs to be watched out for very carefully.

QUESTION: Are there any standard workload guidelines in the industry that we can apply on an individual company basis?

M. ZIPKIN: You may apply such standards to an individual company or an individual department basis but not as a matter of general routine or practice. One of the biggest problems in the claim handling business today is that companies have attempted to apply standard workload measurements, and you can't do that. You have to know who the adjuster is. What kind of claims are they handling? What kind of territory, and how long have they been around? What kind of experience do they have in the industry? What kind of experience do they have with that company? Then you can determine how many claims that individual can handle. The question is not how many pending claims can an adjuster or supervisor can handle. The question is how many new arising cases can they handle by month or by quarter. In any event, you have to tailor work load measurements. We are not aware of any workload standards that apply on an industry-wide bases to all claim department operations.

QUESTION: Tell us again, what is the problem with having the claim department account for reinsurance?

M. ZIPKIN: What we find is blown aggregates that aren't recognized -- they're paying claims that they shouldn't be paying. We find that they're not getting the recoveries-- they're not keeping track of them. It's just too hard. It's hard to keep the accounting records straight when you're not an accountant and at the same time handle the claims and do all of the reporting work. I guess what we're finding quite frankly is ineffective performance in that area by the claim department to the point where we just about always insist that that function be removed.

M. TOOTHMAN: Claims departments generally are set up to handle things on a case-by-case basis too. Most claims departments aren't set up to handle those kinds of accounting problems. There's even an occurrence problem. Sometimes if a claim department keeps separate files for claimants associated with one occurrence, they're keeping the data by claimant, and so they don't even know when they've hit the occurrence limits.

M. ZIPKIN: Again, we deal frequently with large companies that are geographically dispersed all over the place. They may have 1500 to 2000 adjusters around. It's hard to keep all of that coordinated. We may all agree that it ought to be done in a more coordinated, centralized fashion, but many claim department operations are involved in substantially decentralized configurations which make it difficult for them to do that in a very effective manner.

JOHN BOYLE: One of your slides shows the normal progression of reserves, whether you call it stair-stepping or not. You didn't go on to point out how the special review of claims accelerated upward development. What ways have you found other than walking through the department swinging a two by four to force the claim staff to take ...

M. ZIPKIN: The problem is that changing case reserving practices is a two-edged sword because we have seen claim departments which have gone a little overboard in doing that. In the first place the advice that we give to CEO's like Mike is if you're going to change your claims reserving practices, please do so only in consultation with your actuaries. And what we ask them to do is if they're going to change their reserves, keep track of them--just don't put them in the system. Show the actuary what kind of hit they are going to take as a result of that change before the take it. It isn't hitting the claim department over the head with a two-by-four that gets this kind of change implemented. Perceptive claim managers and their immediate subordinate staffs are responsible for getting that done. I must say in all candor that they don't need to hire an outside consultant to do that for them. Many of them recognize the need to do this as part of their jobs. That's what management is all about.

M. TILLER: I don't think you want to go so far that the case reserves are higher than the facts will reasonably support. You have the problem that you always want to settle under the case reserve and, if the case reserve is artificially too high, you can actually drive up your loss settlements.

M. ZIPKIN: Let me take a few minutes so to explode a myth that you've raised about step-ladder reserving. It's one of the most misunderstood concepts that I know of in our business today. Step-ladder reserving is not when you go from $5,000 to $10,000 to $50,000 to $150,000 -- that is not step-ladder reserving-- that's called adverse development. When it is coordinated with and done in conjunction with investigative development, that's what we want claim people to do. Step-ladder reserving occurs when the case is clearly worth $150,000, but you put $5,000 on it, and then $10,000, and so on. That is, you incrementally increase the reserve to a higher level when that higher level was clearly discernable much earlier in the life of the case. That is step-ladder reserving and that's what we want to avoid. When senior manager thinks that because reserve levels change over time, that that is step-ladder reserving, and it's not true, then we're got a problem.

COMMENT/QUESTION: When you talk about adverse development, one of the problems that we see is that in getting the adverse development what we want to do is quickly as possible get the basic investigation done so that we have a perceptive idea of what the reserve should be ultimately. One of the problems we see with the quality of people that are outside of the internal department doing the investigation is that this causes a longer delay in getting the information. When you go out do you hear the same problem within the industry as a whole that sometime independent information out there is not available or the quality poor or adjustor information can be slow, which results in later adverse development?

M. ZIPKIN: The answer is yes, we hear it all the time, but unfortunately it keeps coming out in the form of a very weak, opinionated excuse. While it may not be that, and in your case I'm sure it is not, the fact is that we leave ourselves open to the CEO saying, that's why I pay you to manage-not only the claim operation that's under you, but also the resources that you utilize-and if they're not any good, go out and make that better". I'm not saying that claim people are not necessarily adept at what they do, but I will say that claim work is not getting any easier. It's an awful lot harder than it ever was. The medico-legal and socio-economic environment out there has gotten worse, and maybe we haven't kept pace with it. And maybe the independent resources that you're talking about haven't done that either. Nevertheless, it is up to us to strain through what resources we have available to us, identify the better ones, and utilize them, and not utilize the ones that do not do the job.

What I would suggest is that you identify specific individuals in those independent adjuster offices that you have found to do the best work for you, evaluate their work, determine who does the best job, and insist that the independent adjuster use those people on your work. In order to get that done you've got to monitor and audit the work being handled by that office to see that A, B, and C are not handling your claims, and not somebody else. That's where we are missing the point. We're missing the point on the disciplinary audit nature of our follow-up.

QUESTION: How do you explain case reserve development to management, and when do you decide you need a claim administration audit?

M. TILLER: To explain case reserve development, I usually use a chart very similar to the one we had up here that talks about how claims progress and start with an example. I usually use workers' compensation, because I think it's easier to understand. If somebody's fallen down the stairs and appears to be okay. You may not even open a claim file. The next day they don't come in to work, so you set up medical only. I run through the whole scenario, and point out that at every point in time the case reserve was correct given the facts known to date but the facts tend to get worse.

In the absence of any other information I would assume that case reserve development is going to be positive. It is possible for it to be negative if there really is serious overreserving in the case department, but it is rare.

There's another area in which claim administration auditors can be of tremendous help to people looking at loss reserves in addition to determining what has happened that is causing some strange things to appear in the numbers. Sometimes a client will say they have made changes which the actuary doesn't see. The client then says they just made the changes, and they results don't show up in the numbers yet. Then you can send in a claim administration auditor to see if those changes really have taken place. Sometimes they changes are merely in the mind of the person who was talking to you, and other times there are really serious changes that simply haven't flowed through the aggregate numbers yet. How you're going to interpret that situation makes a big difference.

QUESTION: With regard to the Bornhuetter-Ferguson -- why do you suggest that exposures are better than premiums?

M. TILLER: Premium is only a good measure of exposure if you believe that premium is adequate to cover all the losses not excessive. Given the cyclical nature of insurance, it's quite likely that at some point the premiums have been too low and at some point they may have even been too high. The consistent basis that you can use that hasn't changed is some exposure base like number of occupied beds for hospital malpractice. With workers' compensation payroll, you may need to make some adjustments for changes in payroll level. But you can usually find something that is certainly a more consistent measure of exposure than premium. What you can do if you don't have an expected loss ratio is, for the old years which are fairly well developed, go ahead and use the loss development technique to get some clue as to what the loss rates should be. Then use those loss ratios on the more recent exposure data and go through with the Bornhuetter-Ferguson process. I think it makes a lot more sense.

M. TOOTHMAN: Often times you don't have anything except premiums and sometimes what we'll do is bring premiums to a current rate level if information is available to do that, or you can change the expected loss ratio assumptions to reflect the perceived changes in rate adequacy.

We have just about run out of time. I'd like to offer a final comment. I've been involved in these seminars now since their inception. If there is any way to summarize what the message of these seminars is -- I think it can be done in maybe two short sentences. The first is that there is no black box. There's no one method that is magical, and that you can always use that method and sure you'll get a good reserve number. We've tried to show that in some of the things that we've done in this skit. The second is that the actuary or the loss reserve specialist needs to have an understanding of what's going on. You can't just do it by the numbers. You need to understand the environment in which you're working. You need to understand the company. In particular with this session and this skit, we've tried to demonstrate that you need to understand what is going on in the claim function. That's not the only piece of the company you need to understand, but that's what we've concentrated on here today. If we can summarize I think you need to understand the environment that you're working in and you can't just use any one method all the time. You need to understand the dynamics that are being reflected in the numbers.

Thank you very much for your attention.

CLAIMS MANAGEMENT PERSPECTIVES

A TWO-ACT SKIT

CAST
(IN ORDER OF APPEARANCE)

CHIEF EXECUTIVE OFFICER:	MICHAEL L. TOOTHMAN
CONSULTING ACTUARY:	MARGARET W. TILLER
CLAIMS CONSULTANT:	MICHAEL G. ZIPKIN

PROFESSIONAL RELIABLE

Summary of IBNR Indications

($ Millions)

	Held	Audit
Hospital	$11.8	$28.5
Physician & Surgeons	0.0	25.6
Total	$11.8	$54.1
Indicated Inadequacy		$42.3

PROFESSIONAL RELIABLE

HOSPITAL

Policy Year	Earned Premium	Reported Losses @ 12 Mos.	24 Mos.	36 Mos.	48 Mos.	60 Mos.	72 Mos.
1	$ 6,000	$1,533	$2,391	$3,108	$3,636	$4,000	$4,200
2	8,000	1,915	2,949	3,686	4,386	5,000	
3	10,000	2,596	3,971	5,043	5,800		
4	10,000	2,400	3,721	4,763			
5	14,000	3,885	6,798				
6	7,500	6,000					

PROFESSIONAL RELIABLE

Hospital

Report-to-Report Ratios

Policy Year	12/24	24/36	36/48	48/60	60/72	Ult./72
1	1.56	1.30	1.17	1.10	1.05	
2	1.54	1.25	1.19	1.14		
3	1.53	1.27	1.15			
4	1.55	1.28				
5	1.75					
Selected Average:	1.54	1.27	1.17	1.12	1.05	1.20
Cumulative:	3.23	2.10	1.65	1.41	1.26	1.20

PROFESSIONAL RELIABLE

HOSPITAL

POLICY YEAR	EARNED PREMIUM	REPORTED LOSSES @ 12 MOS.	24 MOS.	36 MOS.	48 MOS.	60 MOS.	72 MOS.	PROJECTED ULTIMATE LOSSES
1	$ 6,000	$1,533	$2,391	$ 3,108	$3,636	$ 4,000	$4,200	$5,040*
2	8,000	1,915	2,949	3,686	4,386	5,000	5,250*	6,300*
3	10,000	2,596	3,971	5,043	5,800	6,496*	6,820*	8,178*
4	10,000	2,400	3,721	4,763	5,573*	6,241*	6,554*	7,860*
5	14,000	3,885	6,798	8,633*	10,101*	11,313*	11,879*	14,276*
6	7,500	6,000	9,240*	11,735*	13,730*	15,377*	16,146*	19,380*

*PROJECTED

PROFESSIONAL RELIABLE

Hospital

Projection Method (000's)

Policy Year	Earned Premium	Reported Losses	Loss Development Factor	Estimated Ultimate Value Losses	Estimated Ultimate Value Loss Ratio
1	$ 6,000	$ 4,200	1.20	$ 5,040	84.0%
2	8,000	5,000	1.26	6,300	78.8
3	10,000	5,800	1.41	8,178	81.8
4	10,000	4,763	1.65	7,860	78.6
5	14,000	6,798	2.10	14,276	102.0
6	7,500	6,000	3.23	19,380	258.4
	$55,500	$32,561		$61,034	110.0%

IBNR = $61,034 - $32,561 = $28,473

PROFESSIONAL RELIABLE

Hospital

Projection Method (000's)

Policy Year	Earned Premium	Reported Losses	Loss Development Factor	Estimated Ultimate Value Losses	Estimated Ultimate Value Loss Ratio
1	$ 6,000	$ 4,200	1.20	$ 5,040	84.0%
2	8,000	5,000	1.26	6,300	78.8
3	10,000	5,800	1.41	8,178	81.8
4	10,000	4,763	1.65	7,860	78.6
5	14,000	6,798	2.40	16,315	116.5
6	7,500	6,000	3.60	21,600	288.0
	$55,500	$32,561		$65,293	117.6%

IBNR = $65,293 - $32,561 = $32,732

PROFESSIONAL RELIABLE

HOSPITAL

BORNHUETTER-FERGUSON METHOD (000'S)

Policy Year	Earned Premium	Initial Expected Loss Ratio	Initial Expected Losses	Unreported Percentage	IBNR	Estimated Ultimate Value Losses	Estimated Ultimate Value Loss Ratio
1	$ 6,000	.80	$ 4,800	.17	$ 816	$ 5,016	83.6%
2	8,000	.80	6,400	.21	1,344	6,344	79.3
3	10,000	.80	8,000	.29	2,320	8,120	81.2
4	10,000	.80	8,000	.39	3,120	7,883	78.8
5	14,000	.80	11,200	.58	6,496	13,294	95.0
6	7,500	.80	6,000	.72	4,320	10,320	137.6
	$55,500				$18,416	$50,977	91.9%

PROFESSIONAL RELIABLE

HOSPITAL

BORNHUETTER-FERGUSON METHOD (000'S)

ADJUSTED FOR PREMIUM DEVELOPMENT

Policy Year	Earned Premium	Initial Expected Loss Ratio	Initial Expected Losses	Unreported Percentage	IBNR	Estimated Ultimate Value Losses	Estimated Ultimate Value Loss Ratio
1	$ 6,000	.80	$ 4,800	.17	$ 816	$ 5,016	83.6%
2	8,000	.80	6,400	.21	1,344	6,344	79.3
3	10,000	.80	8,000	.29	2,320	8,120	81.2
4	10,000	.80	8,000	.39	3,120	7,883	78.8
5	14,000	.80	11,200	.53	5,936	12,734	91.0
6	7,500	.80	6,000	.44	2,640	8,640	115.2
	$55,500				$16,176	$48,737	87.8%

PROFESSIONAL RELIABLE

Summary of IBNR Indications

($ Millions)

	Held	Audit	2nd. Opinion
Hospital	$11.8	$28.5	$16.2
Physicians & Surgeons	0.0	25.6	
Total	$11.8	$54.1	
Indicated Inadequacy		$42.3	

PROFESSIONAL RELIABLE

Physicians and Surgeons

($ Millions)

Report Year	Reported Losses @: 12 Mos.	24 Mos.	36 Mos.	48 Mos.	60 Mos.	72 Mos.
1	5.0	7.0	8.4	9.6	10.3	10.3
2	6.0	8.4	10.1	12.9	12.5	
3	7.0	9.8	13.9	15.1		
4	8.0	13.7	15.8			
5	12.0	15.6				
6	13.0					

PROFESSIONAL RELIABLE

Physicians and Surgeons

Report-to-Report Ratios

Report Year	12/24	24/36	36/48	48/60	60/72	Ult./72
1	1.40	1.20	1.14	1.07	1.00	
2	1.40	1.20	1.28	.97		
3	1.40	1.41	1.09			
4	1.72	1.15				
5	1.30					
Selected Average:	1.44	1.24	1.17	1.02	1.00	1.00
Cumulative:	2.13	1.48	1.19	1.02	1.00	1.00

PROFESSIONAL RELIABLE

Physicians and Surgeons

($ Millions)

Report Year	Earned Premium	Reported Losses @ 12	24	36	48	60	72
1	10.0	5.0	7.0	8.4	9.6	10.3	10.3
2	12.0	6.0	8.4	10.1	12.9	12.5	12.5*
3	14.0	7.0	9.8	13.8	15.1	15.4*	15.4*
4	16.0	8.0	13.8	15.8	18.5*	18.9*	18.9*
5	18.0	12.0	15.6	19.3*	22.6*	23.1*	23.1*
6	20.0	13.0	18.7*	23.2*	27.2*	27.7*	27.7*

SIX YEAR ULTIMATE = 107.9*

SIX YEAR REPORTED LOSSES = 82.3

IBNR = 25.6*

*Projected

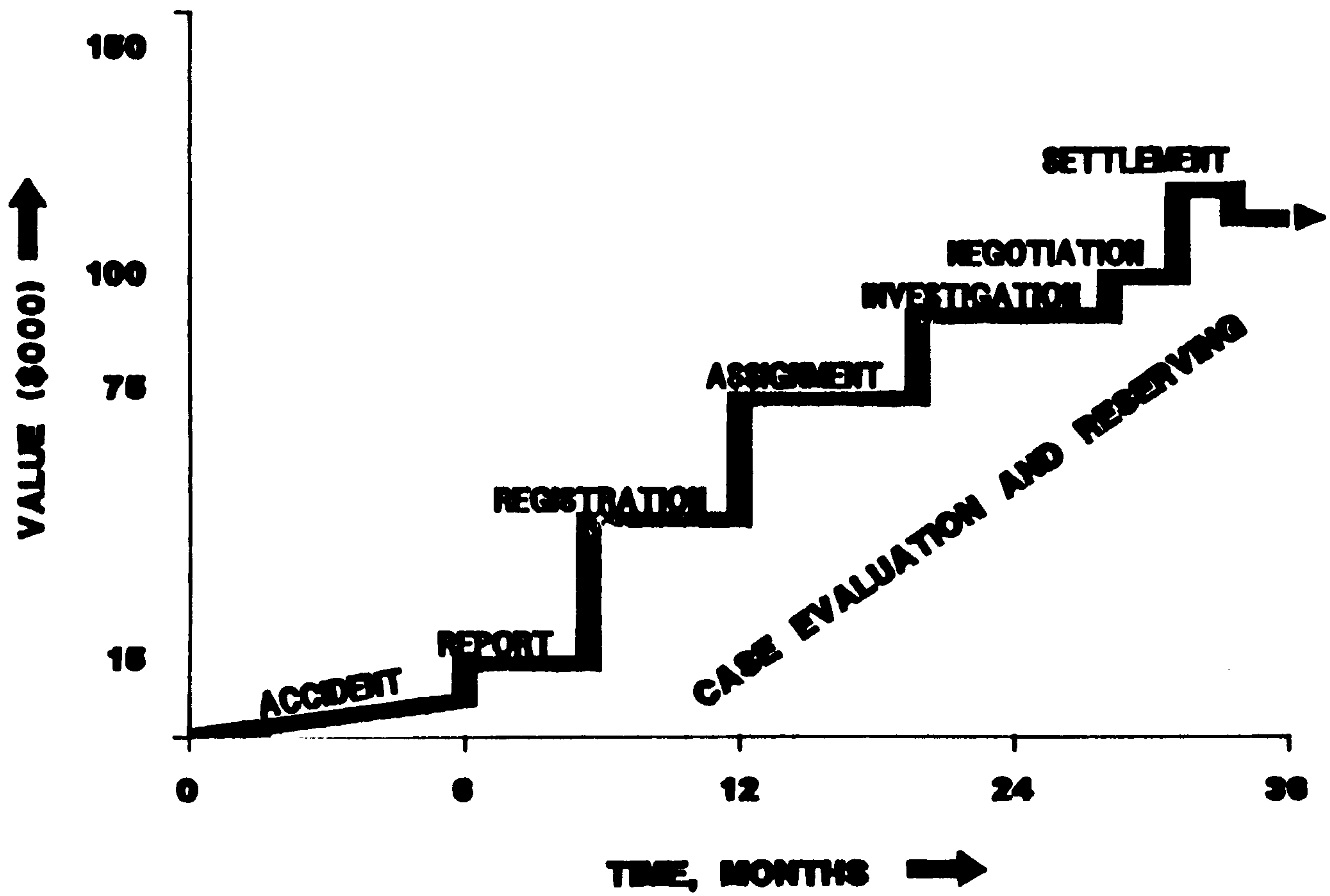
PROFESSIONAL RELIABLE

Physicians and Surgeons Liability

Study of Reserve Adequacy

50 Cases Closed In Last Seven Months

12/31 Estimated Value	750,000
Closed Value	625,000
Reserve Redundancy	20 %



VALUE ($000)
150
100
75
15
ACCIDENT
REPORT
REGISTRATION
ASSIGNMENT
INVESTIGATION
NEGOTIATION
SETTLEMENT
CASE EVALUATION AND RESERVING
0
6
12
24
36
TIME, MONTHS

Claim Review

- Interview Claim Management and Supervisory Personnel
- Review Claim Files
- Review Claim Procedures, Practices, Statistical Data

Claim Review

- Includes Review of Changes in:
  - Law or Legislation Affecting Liability, Legal Defenses, or Damages
  - Jury Verdict Patterns (Higher Awards, etc.)
  - Procedures/Practices for Reporting, Reserving, or Closing Claims
  - Personnel, Workloads, Claim Department Organization

PROFESSIONAL RELIABLE
Physicians and Surgeons Liability
Study of Reserve Adequacy
100 Cases Open @ 12/31 Year Six

	Value @		
	12/31 Year Six		7/31 Year Seven
50 Cases Closed	750,000		625,000
50 Cases Open	1,000,000		1,500,000
100 Cases	1,750,000		2,125,000
		+21%	

CLAIM FILE REVIEW

Professional Reliable

	D/A	D/R	Initial	Subsequent Reserve Change to:			
File	M/Y	M/Y	Reserve	Amt.	Date M/Y	Amt.	Date M/Y
043216	3/3	4/3	15,000	30,000	6/3	90,000	6/5
057392	2/3	6/3	20,000	–	–	60,000	8/5
068973	2/3	8/3	20,000	80,000	1/4	100,000	7/5
084010	2/3	10/3	15,000	50,000	12/3	72,000	6/5
099691	12/2	10/3	15,000	–	–	35,000	6/5
103201	1/3	10/3	15,000	25,000	6/4	32,500	6/5

PROFESSIONAL RELIABLE

Physicians and Surgeons

Report-to-Report Ratios

Report Year	24/12	36/24	48/36	60/48	72/60	Ult./72
1	1.40	1.20	1.14	1.07	1.00	
2	1.40	1.20	1.28	.97		
3	1.40	1.41	1.09			
4	1.72	1.15				
5	1.30					
Selected Average:	1.44	1.24	1.17	1.02	1.00	1.00
Cumulative:	2.13	1.48	1.19	1.02	1.00	1.00

PROFESSIONAL RELIABLE

Physicians and Surgeons

Report-to-Report Ratios

Report Year	24/12	36/24	48/36	60/48	72/60	Ult./72
1	1.40	1.20	1.14	1.07	1.00	
2	1.40	1.20	1.28	.97		
3	1.40	1.41	1.09			
4	1.72	1.15				
5	1.30					
Selected Average:	1.44	1.24	1.17	1.02	1.00	1.00
Cumulative:	2.13	1.48	1.19	1.02	1.00	1.00
Selected Average:	1.30	1.15	1.09	.97	1.00	1.00
Cumulative:	1.58	1.22	1.06	.97	1.00	1.00

PROFESSIONAL RELIABLE

Physicians and Surgeons

($ Millions)

Report Year	Earned Premium	Reported Losses @ 12	24	36	48	60	72
1	10.0	5.0	7.0	8.4	9.6	10.3	10.3
2	12.0	6.0	8.4	10.1	12.9	12.5	12.5*
3	14.0	7.0	9.8	13.8	15.1	14.6*	14.6*
4	16.0	8.0	13.8	15.8	17.2*	16.7*	16.7*
5	18.0	12.0	15.6	17.9*	19.6*	19.0*	19.0*
6	20.0	13.0	16.9*	19.4*	21.2*	20.5*	20.5*

SIX YEAR ULTIMATE = 93.6*

SIX YEAR REPORTED LOSSES = 82.3

IBNR = 11.3*

*Projected

PROFESSIONAL RELIABLE

Summary of IBNR Indications

($ Millions)

	Held	Audit	2nd. Opinion
Hospital	$11.8	$28.5	$16.2
Physicians & Surgeons	0.0	25.6	11.3
Total	$11.8	$54.1	$27.5
Indicated Inadequacy		$42.3	$15.7

Control of Claim Expense

- Limitations on Independent Adjuster Investigations
- Limitations on Legal Expense
- Limitations on Investigation and Legal Documentation
- Direct Involvement of Staff Claim Personnel

PROFESSIONAL RELIABLE

Physicians and Surgeons Liability

Analysis of Claim Expense

CURRENT PROJECTION

Indemnity	=	$62.4	
Expense	=	31.2	(50%)

POTENTIAL SAVINGS

Indemnity Case Reserves	=	30.4
Indemnity IBNR	=	7.5
		37.9
Expense @ 50%		19.0
Expense @ 40%		15.2
Difference		3.8

2F/3F - RESERVING FOR CLAIMS-MADE POLICIES

Moderator: Patrick J. Grannan, Consulting Actuary
Milliman & Robertson, Inc.

Panel: Edward F. Bader, Partner In Charge of Services to the Insurance Industry
Arthur Andersen & Co.

F. James Mohl, Senior Actuary
St. Paul Surplus Lines Insurance Co.
Atwater-McMillian Inc.

William F. Murphy, Actuary
Milliman & Robertson, Inc.

Recorder: Mark Cain, Actuarial Assistant
Milliman & Robertson, Inc.

PATRICK GRANNAN: The name of this session is Reserving for Claims-Made Policies. My name is Pat Granan. I will be the moderator of this session. We have divided our topic into three sections. Our first speaker will discuss accounting issues related to claims made and tail coverage. Our second speaker will talk about how to analyze reserves needed for the claims made policies themselves. And then our third speaker will talk about estimating reserves for tail coverage. We plan to save time at the end for a question and answer period.

I'm supposed to read this official statement to you so bear with me. The views expressed herein are the views of the individuals and not necessarily the views of the American Academy of Actuaries, the Casualty Actuarial Society, or the employers of the participants. Please raise your hand if you're an actuary? Accountants? Regulators? None of the above? Thank you.

Our first speaker is Ed Bader. Ed is the partner in charge of services to the insurance industry with the firm of Arthur Andersen & Company. Ed is located in the Hartford office of the firm. He graduated from Fairfield University, with a Bachelor of Science degree in Economics, and did graduate work in accounting at NYU. He has been involved in the audits of both life and property/casualty companies for most of his career, and currently has responsibility for a number of insurance company clients. Ed is a member of the Connecticut State Legislative Task Force to Study Civil Liability. He's a member of the Financial Accounting Standards Board's Task Force on Specialized Principles for the Insurance Industry, a member of the NAIC Advisory Task Force on Occupational Disease, and a director of the International Insurance Society Incorporated. He is also a former member of the AICPA Insurance Companies Committee, and in what sounds like the most difficult of all former assignments, he was chairman of the AICPA Committee on Relations with Actuaries. He has appeared before the NAIC, the Society of Actuaries, the Conference of Actuaries in Public Practice, and the American Insurance Association, and has spoken at previous Loss Reserve Seminars.

ED BADER: Thank you Pat, it is a pleasure to be here with you today. I'm going to talk about accounting for claims made policies. We have accountants, actuaries, regulators, and some other people in our audience. I have a few slides that will help you follow the major points. They will help focus my talk and move it along. The subject of claims-made policies has been on the Seminar agenda before; three times in the last six years, so it is a topic that we have had on previous agendas, I will be building on previous session materials. The one difference is we have seen is new claims made form. I won't get into the reasons for claims made policies, primarily because it is assumed that you all know what the claims made policy does. I think that we'll talk a little bit about what purchasers think about the claims made policy at the end.

[Slide 1]

The accounting for claims made policies is dependent on the policy form itself. One problems we accountants have is we tend to think that all insurance policies are homogeneous and there is really no difference between them. If you've never looked at an insurance policy before, you should start looking at a claims made form because each one is different and the accounting may be different based. I will amplify on this point as we discuss some of the surveys that we've done. For the most part each issuer of a claims made policy has, in fact, modified them to fit their own needs and determined the amount of risk that they want to assume. Even though many of them started with the CGL policy, they have made modifications.

The mini tail is simply extending the reporting period of claims for incidence incurred during the policy period, but that can be reported up to sixty days after the end of the policy term. Some companies offer what we call a midi-tail extending the reporting period up to five years after the expiration date for incidences incurred during the policy period. We also have an automatic tail coverage. This is generally included in malpractice policies and is effective in the event that a doctor becomes disabled, dies or retires.

[Slide 2]

On Slide 2 we describe the characteristics of various policies including a full-tail coverage option, which is an extended reporting period endorsement (or ERP), and can be offered in the event that an insured converts from a claims made policy to an occurrence based policy. We also have endorsements that deal with retroactive dates, which deal with sort of a nose coverage. I guess you would characterize as more coverage it if you're going to insure something from the beginning of the policy term. Then we have the "space-age" laser endorsements, which are specific exclusions for accidents, products, and other hazards or events that are spelled out in the policy. I've already emphasized that many companies have already developed their own claims made form in lieu of the standard ISO form. Obviously with this trend there tend to be coverage gaps when you go from one carrier to another.

Areas where the forms tend to vary are the trigger point where coverage becomes effective (policy aggregate limits versus individual occurrence limits); the length of time for the discovery period; and specific policy exclusions and retroactive dates. Of course, problems do arise when an insurer switches carriers or does not fully understand what he or she is buying. Some critics believe that litigation will increase due to the potential discrepancies between actual coverage provided by an insurer and the buyer's expectation of what the policy covers.

Some of you may be aware that last week the 9th Circuit Court of Appeals effectively turned a claims made policy that was written in California into an occurrence policy. Not everyone agrees with that interpretation but that was a big headline in the August 31st issue of Business Insurance. The court ruled that a long standing California case law principle that prohibits insurers from denying coverage because of late notice of claim takes precedence over the language in the claims made form contract that required policyholders to give the carrier notice of claim within the policy period. A number of states have this notice/prejudice rule. This case involved an AIG subsidiary. According to the Business Insurance article, the insured became aware of the loss on Thursday, filed the form and put it in the mail on Friday, the date that the policy expired. AIG received it on Monday and denied coverage on Monday on the basis that they had not reported it within the dates of the policy term. It's a relatively short period of time. I think the lower courts had ruled for AIG and then it was reversed in the Circuit Court of Appeals. There is going to be problems with respect to claims made coverage, and we have to be very cognizant of the terms in the policy.

Let me turn to a survey that we did of seven companies who currently write claims made policies; five of which write medical malpractice since 1976. Generally the coverage is being used for medical malpractice. More than ninety percent of all the medical malpractice policies written are in the claims made form. Companies that are writing errors and omissions claims made policies are from one to twenty percent range and in the general liability area it is a mixed bag. Two of the companies surveyed have adopted the ISO form. While five of the companies have developed their own form. Here again, we've got this tailoring of the various policies which means you've got to look at the various characteristics in order to determine the accounting.

[Slide 3]

Let's now turn to the accounting. First I want to talk about the accounting from the insured's perspective. The major issue we have here is how should the insured account for their claims made policy. This is important primarily because there is a lot of misunderstanding. People don't understand what it is they are purchasing. The major issue is when you buy a claims made policy you obviously transfer the liability to the insurance company when you report the claim. If you have purchased various endorsements you obviously have to look at the terms of those endorsements to see whether you have to record a liability or not. So what you don't transfer to a third party carrier is all of the claims that have been incurred but have not been reported to that carrier.

The American Institute of Certified Public Accountants (AICPA) has debated this issue for about two years. Finally in March of this year the AICPA issued a Statement of Position focusing on medical malpractice, claims of health care providers and provided some guidance on how they should account for claims made policies. They made the determination that when you report a claim to your carrier, you do, in effect, transfer liability to that carrier, but for all of those claims that are incurred but not reported, you do not transfer any liability. So what does that mean? That means that under FASB 5, a company has to record a liability if it is probable that a liability has been incurred and it is susceptible of being estimated. What about the tail coverage that I can buy when I terminate the policy? Why can't I use the tail coverage? Why can't I just accrue the cost of that tail coverage and be done with it? I really don't know what my IBNR will be. I really don't care but I'm willing to accrue the cost of the tail coverage.

The accounting profession, after much debate, rejected that approach primarily because you had not executed the contract, whatever you accrued simply remained a bookkeeping entry. You have not transferred any of the liability for those claims that have not been reported to your carrier, and you don't do that until you report those claims. Many people are having great difficulty with that concept because it is not easy to understand. While the formula for determining the cost of the tail coverage is generally in the policy, the actual amount of the tail coverage is to be determined at the time that the policy is terminated, and you turn to negotiate the cost. For those of you who want to be heroes, trying to come up with an IBNR reserve that can be justified; one which is exactly the amount of the cost of the tail coverage. If you can make it fit into this definition you will be heroes with your client. There are some interim reporting issues dealing with insurers but those will be in the written paper.

[Slide 4]

This is the summation of the accounting principle regarding unasserted claims. You have a requirement to accrue that cost and establish the IBNR assuming it is susceptible of estimations. We have been advising our health care clients to start collecting data to be able to make these accruals. For the most part actuaries should be involved in the estimation process. That issue is covered in the AICPA's SOP-87-1.

One of the main issues relating to claims made from an insurance perspective is the accounting for tail coverage and the reporting disclosures relating to writing claims made business. To the extent that you have issued a claims made policy you are not required to establish an IBNR. There are some exceptions, but for the most part you do not need to establish an IBNR reserve. Unless you have the mini tail, you obviously have the responsibility to establish an IBNR for what we call the paperwork delay. If you have issued any of the endorsements that we have talked about earlier. If you've got the midi-tail endorsement and you've got the automatic tail coverage, there is a requirement to establish a reserve and Bill Murphy will talk about some of the methods later on.

The other areas where you have to establish an IBNR is if the insurance company year end does not coincide with the policy year. If you're writing errors and omissions emerge it may be prudent to establish a IBNR reserve for what will be reported. If the policy is on a July 1st to June 30th, and you're on a calendar year, as most insurance companies are, it would be prudent to look at what has been reported in relationship to past experience. If you may find that your insureds are reporting all of their claims two weeks before the end of the policy term. It would be prudent determine if there are reporting delays like that you just don't automatically say you don't need an IBNR.

[Slide 5]

If you are charging a full occurrence rate and you have a claims made policy and you're trying to develop or accumulate surplus, obviously under those circumstances you're going to accumulate a large amount of profit. It is not acceptable under accounting to simply say we really only should have a ten percent profit so therefore we should convert our claims made policy back to an occurrence policy by setting up an additional IBNR reserve. That would not be acceptable. Some other issues include situations where we have a substantial deduction in premiums. That has an impact on the premiums to surplus writing ratio which could mask some of the problems that a carrier would have if they are issuing large amounts of claims made policies.

The mechanics of establishing claims made loss reserves will be covered by the other speakers.

[Slide 6]

Let me talk a little bit about the changes in Schedule P. Some of you know that there is going to be a change in Schedule P in fiscal 1987 which will require those carriers who are writing a significant amount of claims made business to complete an interrogatory that deals with claims made policies and there will also be a parallel Schedule P document required for anyone who writes premiums on claims made policies greater than $100,000 and this portion of the total earned premium related to 1987 claims made business exceeds 15 percent. Those of you who are writing substantial amounts of claims made policies will have an additional burden in preparing Schedule P. If any one has any questions about how one does Schedule P reserving under a claims made form with some of the endorsements, we'll take questions on this subject during the question and answer period.

[Slide 7]

One last subject I want to cover relates to the attitude of purchases towards claims made policies. This was a survey that Business Insurance did last fall you can see what the purchasers of insurance think of claims made policies. For the most part, risk managers still do not like claims made policies. How many were forced to purchase it? Fifty-three percent were forced to accept claims made. Would you choose claims made policies if the occurrence form was available? Ninety percent said no. Was ISO justified in introducing a claims made form? Sixty percent said no. Is the claims made form appropriate for all businesses? Ninety percent said no and ten didn't have an answer. Will claims made coverage ease the tight marketplace? Seventy-four percent said no. In terms of its acceptance in spite of the fact that we'll have a little bit of controversy among our speakers about the place of claims made. From a purchasers standpoint there is still a great deal of non-acceptance of claims made in the marketplace. Thank you very much. (A copy of Mr. Bader's outline is attached as Exhibit I).

SLIDE 1

REPORTING PATTERNS FOR TAIL COVERAGE INCURRED LOSSES

# YEARS IN CM	MATURITY 15	27	39	ULT.
1	.20	.70	.90	1.0
2	.39	.78	.94	1.0
3	.93	.81	.95	1.0
4	.45	.82	.95	1.0

SLIDE 2

LOSS DEVELOPMENT BY REPORT LAG

REPORT LAG	MATURITY 15 MOS.	27 MOS.	39 MOS.	ULT.
1	.150	.180	.198	.20
2	.300	.360	.396	.40
3	.225	.270	.297	.30

TWO YEARS IN CLAIMS MADE

$$\text{DEV. 15 TO ULT.} = \frac{.60}{.45} \times \frac{(.90+.70)}{.60}$$

SLIDE 3

AUTOMATIC TAIL RESERVE STRATEGIES

- Full Occurrence Reserves
- Amortize Over Life of Each Insured
- Amortize Over Life of New Insureds
- Fund When Coverage is Vested
- Fund When Coverage is Issued
- Pay As You Go

SLIDE 4

PRESENT VALUE OF AUTOMATIC

REPORTING ENDORSEMENT COVERAGE

(1) Age	(2) CM Premium	(3) Prob. of Survival	(4) Endorsement Premium	(5) Prob. of Issuing Auto Endorsement
35	$1000	1.000	$1800	.005
36	1100	.999	1980	.006
37	1210	.998	2178	.007
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
65	6728	.702	12,100	1.000

$$\text{PV of Benefit} = \frac{\text{PV } [(2)\text{x}(3)]}{\text{PV } [(4)\text{x}(5)]}$$

SLIDE 5

LOADING FOR AUTOMATIC TAIL COVERAGE

-AMORTIZED OVER LIFE OF INSUREDS-

AGE GROUP	% DOCTORS	LOADING FACTORS RETIRE AT 65	LOADING FACTORS RETIRE AT 75
UNDER 45	40%	15%	12%
45-55	30	25	20
55-65	20	50	35
OVER 65	10	70	40
	AVERAGE	30.5%	21.8%

SLIDE 6

EXPECTED NUMBER OF AUTOMATIC REPORTING ENDORSEMENTS ISSUED

(1) Age	(2) Number of Doctors	(3) Q (x)	(4) D (x)	(5) Other (x)	(6) Number of Endorsements
35	100	.0003	.0007	.0000	.1
36	120	.0003	.0008	.0000	.1
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
79	38	.0559	.0066	.2000	10.5
80	18	.0617	.0067	.3000	7.4
	3500				120

SLIDE 7

LOADING FOR AUTOMATIC TAIL COVERAGE

-PAY AS ISSUED-

(1)	CM PREMIUMS	3500 X
(2)	NUMBER OF REPORTING ENDORSEMENTS	120
(3)	COST OF ENDORSEMENT	1.8 X
(4)	INDICATED LOADING (2)X(3)/(1)	6.2%

Exhibit 1

CASUALTY LOSS RESERVE SEMINAR

SEPTEMBER 10-11, 1987

ACCOUNTING FOR CLAIMS-MADE COVERAGE

Edward F. Bader, Partner

Arthur Andersen & Co.

Hartford, Connecticut

ACCOUNTING FOR CLAIMS MADE
INSURANCE POLICIES
SPEECH OUTLINE

Reasons for Claims-Made Form

- Increase the predictability of losses
- Reducing the risks of having to stack limits on a given occurrence

ISO CGL Form - Attributes of:

- Mini Tail - extends reporting period (ERP) 60 days subsequent to expiration date for losses incurred during policy period but unknown to the insured.
- Midi Tail - five-year ERP for claims incurred during the expired policy and known to the insured.
- Mini and Midi Tail included in the policy at no additional premiums.
- Optional extended reporting period - Full Tail Coverage which can be purchased when an insured converts from claims-made to occurrence-based.
- Retroactive Dates - Potential to limit claims that the policy will cover.
- Laser Endorsements - Exclude coverage for specific accidents, products, work, etc., also can limit losses/claims.

RESULTS OF SURVEY

Seven companies surveyed who currently write claims-made:

Percentage of Written Premium Attributed to Claims-Made by LOB

	Medical Malpractice	Errors and Omissions	General Liability
90 - 100%	4	-	-
21 - 90%	-	-	-
1 - 20%	-	1	2
1%	1	-	2

- o Five of the companies had developed their own form while 2 had adopted ISO. The Policy forms varied from ISO according to:
  - o Exclusions and discovery periods
  - o Tail coverage options
  - o Trigger points on which coverage becomes effective
- o. It was noted that 4 of 5 writing Med Mal included the automatic tail coverage provisions in the event of death, disability or retirement with a 3-5% premium loading for the coverage applied by the companies.

ACCOUNTING BY INSUREDS FOR CLAIMS-MADE

Accounting for IBNR Liability

- o Authoritative Pronouncement, SOP on Accounting for Asserted and Unasserted Medical Malpractice Claims of Health Care Providers in March 1987 which recommends recording an IBNR accrual for unasserted claims if:
  - o It is probable that an asset has been impaired or a liability incurred
  - o The amount of loss can be reasonably estimated (SFAS No. 5)

AICPA Emerging Issues Task Force formed in 1986 to review the accounting for claims-made.

- o Discussion of Interim Reporting of IBNR Losses
- o Determining the yearend IBNR liability - the liability should be reviewed at every interim period and any material unusual losses should be recognized at the interim in which they become known. Any other adjustments to the IBNR liability should be adjusted on a pro rata basis.
- o If a company's fiscal year and policy year do not coincide, the following must be recognized:
  1) IBNR liability for claims incurred prior to yearend but reported after the expiration of the policy.
  2) An asset for the prepaid insurance premiums related to coverage for incidents incurred subsequent to yearend but reported before the policy expires.

ACCOUNTING FOR CLAIMS-MADE BY THE INSURERS

Effect of Claims-Made on the Financial Position of Insurers

- Reduction in the Premium Rate. The claims-made rate is determined by taking a "multiplier" and applying it to the occurrence rate. The multiplier represents the portion of the occurrence rate related to the current year. The claims-made rate is determined based on occurrence rates because the industry lacks claims-made loss experience data.
- Decrease in Premium to Surplus Ratio
- Decrease in premiums earned. Premium should be recognized over the policy period and recognition should not extend into the extending reporting periods.

Effect on Loss Reserves

- Development of a claim is not affected by the policy form used.
- Under claims-made losses are likely to be reported on a report-year basis while Schedule P calls for historical trend information by AY.
- In May 1987, NAIC decided to add to the statutory annual statements to identify those insurers writing significant amounts of claims-made business.
- An interrogatory has been added to Schedule P for medical malpractice, other liability and commerical multi-peril requesting 1987 premium earned on claims-made. A parallel Schedule P will be required for those insurers where:

1. Claims-made premiums earend >$100,000 and
2. The portion of total earned premium related to 1987 claims made (for the particular (LOB) exceeds 15%.

Reserving for Claims Made Losses

- o The reserve should be the ultimate cost of settling those claims reported during the year. An estimate of the average claims-made loss should be determined.
- o The average claim cost can be argued to be the same as an occurrence-based loss. This is conservative since inflation is a large factor in settling occurrence-based reserves which may not be entirely applicable in reserving for claims-made.
- o A second approach can be to apply the multipliers used in pricing the claims-made policy to estimated occurrence-based average claim cost. This will result in temporarily lower reserve to surplus ration.

Survey Results

- o 2 companies - reserve case by case and set up a supplemental reserve to cushion themselves against adverse development.
- o 1 company - applying ISO multiplier to occurrence average claim cost
- o 4 companies - set the reserves using accident year and report year data to determine an expected loss ratio.

TAIL COVERAGE CHARACTERISTICS OF CLAIMS MADE POLICY

- **MINI T[redacted]AIL**

- **MIDI T[redacted]AIL**

- **EXTENDED REPORTING PERIOD ENDORSEMENT (ERP)**

SLIDE NO. 1

CHARACTERISTICS TO CONSIDER IN PRICING AND RESERVING FOR CLAIMS MADE POLICIES

- TAIL COVERAGE PROVISIONS (MINI, MIDI)
- OPTIONAL ERP
- RETROACTIVE DATES
- LASER ENDORSEMENTS

SLIDE NO. 2

CRITERIA FOR ESTABLISHING A LOSS RESERVE SFAS NO. 5

- IT IS PROBABLE THAT A LIABILITY HAS BEEN INCURRED

- THE AMOUNT OF THE LOSS CAN BE REASONABLY ESTIMATED

SLIDE NO. 3

UNASSERTED CLAIMS

- A YEAR-END IBNR ACCRUAL IS REQUIRED SINCE THERE IS NO TRANSFER OF RISK RELATED TO THESE CLAIMS.

EFFECT OF CLAIMS MADE BUSINESS ON FINANCIAL POSITION OF INSURER (INITIAL YEARS)

- DECREASE IN EARNED PREMIUM
- DECREASE IN PREMIUM TO SURPLUS RATIO
- DECREASE IN LOSS RESERVES

DETERMINATION OF CLAIMS MADE LOSS RESERVE

- APPLYING ISO FACTORS/MULTIPLIERS TO OCCURRENCE BASED EXPECTED LOSS RATIO (LIBERAL APPROACH)

- APPLYING OCCURRENCE BASED EXPECTED LOSS RATIO (CONSERVATIVE APPROACH)

CRITERIA FOR PARALLEL SCHEDULE P FOR CLAIMS MADE

- PREMIUMS EARNED ON CLAIMS MADE > $100,000 AND,

- PORTION OF TOTAL EARNED PREMIUM RELATED TO CLAIMS MADE > 15%

HOW RISK MANAGERS VIEW CLAIMS MADE FORM

	YES	NO	NO ANSWER
WERE YOU FORCED TO ACCEPT CLAIMS MADE COVERAGE AT MOST RECENT RENEWAL?	53%	47%	—
WOULD YOU CHOOSE CLAIMS MADE FORM IF OCCURRENCE WERE AVIALABLE?	7%	90%	3%
WAS ISO JUSTIFIED IN INTRODUCING CLAIMS MADE FORM?	30%	60%	10%
IS CLAIMS MADE FORM APPROPRIATE FOR ALL BUSINESSES?	—	90%	10%
WILL CLAIMS MADE COVERAGE EASE TIGHT MARKET?	23%	74%	3%

SOURCE: BUSINESS INSURANCE
OCTOBER 13, 1986

SLIDE NO. 8

P. GRANNAN: Our second speaker will talk about a method of estimating the reserves needed for claims-made coverage. And then our third speaker will talk about tail coverage. Jim Mohl is a Fellow of the Casualty Actuarial Society, and holds a Bachelor's Degree in Mathematics. He's been employed by the St. Paul Companies since 1970, and was involved in their transition to claims made for medical malpractice. He is currently with Atwater-McMillian, which manages the St. Paul Surplus Lines Company. He co-authored a paper on rating claims made insurance policies.

JIM MOHL: I think I'd like to start by taking an informal poll also. How many of you here are affiliated directly or in a consulting basis with the company that does write claims made policies? Pretty good. How many of you are involved in the actual establishment or evaluation of loss reserves? Pretty good. How many of you have ever heard of the backward recurrence of loss development methodology? How many of you have ever used it? I think that's pretty typical -- that's about the response we got this morning as well. I'm going to try and convince you that it's worth your time to at least take a look at this as a possible approach. The problems that the loss reserve specialists faces when dealing with claims made coverage are less extensive than under occurrence, yet no less challenging. Errors are likely to be smaller but because they show up sooner are likely to be even more embarrassing. The same tools employed in occurrence contract loss development analysis will work here, and in fact they should work better because you have eliminated a part of the long-tail. In my view, traditional tools are no longer good enough. Loss development for occurrence policies involves using information about known claims paid in the past and open today to project unknown IBNR claims into the future. Loss development for case reserves only under a claims made contract is in principle much simpler. All that it requires is us to project is the ultimate value of known claims that are currently open. Their count is known, only their value is uncertain. The value is in principle knowable rather than unknown. In these sense that we can theoretically gather as much information as we want about these claims. In each piece of information we get should give us greater confidence in our ability to predict the ultimate value. Of course, we can never reach an absolute certainty on any given claim. There's always the possibility of a runaway jury making a million dollar reward for the loss of a little toe. The law of large numbers does work for us here. If you have a large enough database of claims you ought to be able to narrow that confidence interval down to any required tolerance. In contrast that simply won't work for IBNR projection because there is no way you can go and gather more information on unknown claims. I have made this point at the risk of belaboring the obvious for an important reason. Loss development techniques should be developed to respond to different needs at hand. You wouldn't want to neuro-surgeon operating on you with a chain saw. Reserve analysts should use tools that meet the particular needs of the problem at hand. Dealing with the unknown under occurrence policies leads to broad aggregations of the data since there is no way to no the characteristics of future IBNR claims. Dealing with the knowable under claims made leads to segregation of the data by claim characteristics. The first and most obvious segregation of known claims is the distinction between closed and ultimate claims or paid and outstanding claims. That's the basis for the backward recursive loss development approach, which will be the primary focus of this presentation.

[SLIDE]

Considering the following loss development triangle. Now this is on a reported year basis rather than an accident year basis. The way to see that immediately is that the numbers develop down over time. This is to remind you that it is in fact possible to get savings on your reserves. The numbers are obviously unrealistic. They are there to make a point -- even claims made doesn't behave this well -- I wish that it did. But you can see in this particular example everything is constant all across the page, so it is very easy to estimate the age-to-age development factors and compound them to get to the ultimate values. Things are not quite as simple as they may seem. Let's just put a little twist on this example. We'll segregate the claims into paid and outstanding. Now we see that in the midst of the parent's stability we really have a big change going on. At age twelve months, the paid goes from 15% of the total incurred down to ten percent, five percent, and finally zero of the most recent year. Similar things are happening throughout the whole period. What we're saying here is simply a lengthening of the payout pattern. These numbers may be a little extreme but this kind of thing does happen in the real world all the time. If we simply use the incurred loss development approach you would totally ignore this phenomenon because you would only be looking at the total incurred. Obviously, you want to use this information somehow in your analysis. How do you do it? One way would be to do a paid loss development analysis. That's a popular technique among actuaries, so let's try that. Here we have a paid analysis. Once again the factors work out very well. Age twelve to twenty four months in every case is two. Twenty-four to thirty-six is also two, and thirty-six to forty-eight is -- we will assume that holds true over time. It would seem that the paid analysis is also going to be very simple. Let's see what happens when we apply our loss development factors to our paid-to-date.

Nineteen eight one is already at forty eight months, so we don't have to worry about it. In 1982 we have $400 times the factor 1.25, it gets us to 500; 1983 is at $100 times 2 times 1.25, that gets us to $250; 1984 is zero times two times two times 1.25. It seems we have a trend here. In 1981 it was $750; 1982 was $500; 1983 was $250, and 1984 was zero. Does anyone care to bet that 1985 came out at minus $250? Again, I want to emphasize obviously this is phony data made up to prove a point, but it's not that unrealistic. This kind of thing happen in the real world all the time. I realize there are a number of techniques that actuaries have developed to fix up this kind of data, so that you can proceed with a sensible looking analysis. I'm not concerned with fixing up the data here so much as saying you really don't have to use those techniques. There are other ways you can go. To understand the rationale behind backwards recursive case reserve development. It is necessary to accept the fact that once a claim has been closed, it is a thing of the past. It no longer has any power to influence the future. I would caution you about applying these techniques to workers compensation. Aside from that, only outstanding claims have any affect on future development. The paid development method that failed us so badly here assumes just the opposite. Mainly that only the paid to date tells us anything about future development -- the outstanding is ignored completely. I could have plugged in any outstanding numbers that I wanted to up there in the chart and it wouldn't have made any difference. Now the traditional incurred development method does a better job, but it makes a different error in its underlying assumption. It uses the outstanding in the development triangle alright, but it treats it as if it were undistinguishable from the paid. Whatever development factor we give is applied equally to both components, even though we know that closed losses don't develop -- only open claims do. What should we do? What I believe we should do at least in the case of claims made where we're dealing only with open claims, and also probably other areas as well -- is essentially forget about what has already been paid and merely develop the outstanding. It's not quite that simple. We must develop the losses in two parts. The incremental increase in the paid from one age to the next, and the ending outstanding. Both of those items expressed as a percentage of the beginning outstanding. Let's illustrate this with development from age twelve to twenty four months. Here's 1981 and we started out with $150 paid and $850 outstanding. Twelve months later the paid had increased to $300, so that's an incremental change of $150, and the outstanding had dropped to $600. Now we have two development factors instead of one. I suspect that this is a major reason why the method is so unpopular. You have a change in paid factor of $150 divided by $850 or $176, and an outstanding factor of $600 over $850 or .706. Now you can add those two together and you get essentially an incurred factor of .882. That incurred factor is essentially the same as the earlier incurred factor that we had, except that the initial paid has been subtracted from both numerator and denominator. Let's complete the table at age twelve to twenty-four development factors. Here we have the same thing for '82 and '83. You can see quite clearly by looking at the paid factors over to the right this downward trend affect -- $176 in '81 -- $111 in '82. Of course, the outstanding is increasing in a corresponding amount. So the total factor remains pretty much constant around .89. But you can see that a lot is going on here, that is masked by looking at only the total development factor. Now we have an opportunity to apply our judgment. What will we predict for the 1984 factors. We could assume that the apparent trend will continue and fail a line through the factors. But that's dangerous because that would forecast a negative incremental paid for 1984 in '85, or we could assume that there's no trend -- only random fluctuation and take a simple average. The average of the three numbers on the previous page turns out to be .113, and that's probably a pretty good estimate, although it does seem high in light of the more recent experience. My personal preference is to take a weighted average approach. Something like this. All I have done here is sum the paid on the top for the three years and divided it by the corresponding outstanding sum. I've got a 111 instead of a 113. There's not much difference in this case, but I would point out it could make a big difference if your volume of business is growing very rapidly. This method would put much more weight on the more recent experience relative to the older experience. I've shown a second technique here which is really just a variation of the weighted average technique. It puts even more weight on the larger and more recent experience. It is exactly the same formula, only now we're using the beginning outstanding as a weighting factor in both numerator and both denominator. In this case it doesn't make a whole lot of difference which method you use, so it seems reasonable to take an average and determine it.

[SLIDE]

Here's a complete table of age-to-age factors together with the two averages. We're now ready to develop the losses to ultimate. The development of the outstanding to outstanding is straightforward compounding at the age-to-age factors, just as it is with the traditional incurred loss development method. In this case age twenty-four to forty-eight is .467 times zero, which is of course equal to zero. The same thing for age twelve to age forty-eight because we're assuming that everything is closed by age forty eight. Of course, if we were really doing an analysis on this data we would have to decide if we believe that all claims would really be closed age forty-eight, based on the flimsy evidence of one year's development, and in the light of the lengthening payout pattern that we've assumed. But that goes beyond the point of this presentation.

At last we come to the backwards recursive part of the method. We only need it for the paid part and that's on the next slide. I've expressed it algebraically here and have also illustrated it with some of the numbers from the example. If we want to develop the paid from age twenty four to forty-eight months, that's equal to the paid from age twenty-four to thirty-six months, plus the outstanding portion of the age twenty-four outstanding that is still open at age thirty-six times the portion of that outstanding that will be paid between thirty-six and forty-eight months. You can see that you have two components to the paid-- the paid in the next period plus the portion that remains outstanding times the paid in the subsequent periods, and the recursive relationship comes in because you use the output of the calculation for twenty-four to forty-eight months. That's one of the inputs to the calculation for the development from twelve to forty-eight months -- and it's backwards because you start at the end. Some people object to the term backwards. It implies that somehow it is reputable I guess. That wasn't the intent of the term.

Since the residual outstanding at age forty-eight is assumed to be zero, all we need to do is apply these paid factors to the current outstanding and add the paid to date to get our ultimate. For 1982, we've got $400 outstanding, and assuming that that's going to settle at 75%, you've already paid $400 so in total the incurred is $700. If you compare that back to the estimate you would get from the traditional incurred method you will see that in every case these turn out to be last. The reason for that is a combination of two factors. For one, the assumption of the length of the payout pattern is being reflected here. Number two, we're assuming that we have a higher savings rate on all cases, so that serves to drive the estimates down somewhat. Are these ultimates necessarily better than the traditional ones. I would say yes in the sense that they first of all make use of all the available information. Namely the separation between paid and outstanding which is ignored in the traditional method. Number two, they recognize that subsequent development does come from outstanding claims, not paid claims. Finally, maybe the best part of it is that it forces us to make explicit judgments where the other methods makes it appear that no such judgment was even necessary. As to the accuracy of those judgments, only time will tell. I ran over this morning and was severely chastised by my fellow panelists, so I will very quickly give you a few other suggestions for other ways of segregating the data besides the paid outstanding segregation. And if you want to we can talk about them more in the question and answer session. First of all, I would strongly suggest that you segregate your case reserves by risk state. The differences in legal climates between states are tremendous and that is bound to influence your loss development patterns. Secondly, I'd segregate by claims office. The reason for that is obvious -- unless your claims

The Backward Recursive Method: An Irrelevant (not Irreverant) Example

Consider the following loss development triangle on a reported (not accident or policy) year basis, simulating claims-made experience (Exhibit 1). I have deliberately chosen to use downward development in my illustration so that no one could possible mistake this for accident year data, and to remind you that it is still theoretically possible to get savings on reserves. (For those of you who have never worked with reported year data I hasten to add that it is rarely this well-behaved, even on claims-made policies.) You don't need an FCAS or MAAA to complete this triangle! You don't even need a PC.

But wait! All is not as it seems. In the midst of apparent stability there is change. Nothing too dramatic, just a modest lengthening of the payout pattern (Exhibit 2). Given this new information, would we want to change our opinion?

First, we need to decide how to make use of this new data. One way would be to do a traditional paid-to-paid loss development analysis. Here are the development factors (Exhibit 2A).

It's amazing how nicely these numbers work out. Now all that remains is to apply our factors to the paid and we have our ultimate losses:

1981	750 x 1.00 = 750
1982	400 x 1.25 = 500
1983	100 x 2.50 = 250
1984	0 x 5.00 = 0

It appears we have a trend. Anyone care to bet that the 1985 losses will be negative.

Of course this is phony data made up to prove a point. But changes in the payout pattern do happen in the real world.

I realize there are a number of techniques for "fixing up the data" to deal with this problem. That's not my purpose here. Indeed, my intent is to show that such fixing is
To understand the rationale behind "backwards recursive case reserve development" it is necessary to accept the fact that once a claim has been closed, it is a thing of the past. It no longer has any power to influence the future. Only outstanding claims have any effect on future development. But the paid development method which failed us so badly assumes just the opposite: namely, that only the paid-to-date tells us anything about future development. The outstanding is ignored completely!

The traditional incurred development method does better, but makes a different error in its underlying assumptions. It uses the outstanding in the development triangle, but it treats is as if it were indistinguishable from the paid. Whatever development factor we get is applied equally to both components, even though we know closed/paid losses don't develop, only open claims do.

So what should we do? Forget about what has already been paid; merely develop the outstanding. It's not quite as simple as with ordinary loss development, however. We must develop the losses in two parts: 1) the incremental increase in the paid from age-to-age, and 2) the ending outstanding, both expressed as a percentage of the beginning outstanding. Let's illustrate this with the development from age 12 to 24 months (Exhibit 3). That is, out of the beginning reserve of $850, $150 or 17.6% was paid one year later and $600 or 70.6% was still outstanding, producing case savings of $100 or 11.8%. Compare the .882 combined development factor to the .900 factor calculated under the traditional incurred method. The only difference is that the paid-to-date (in this case, the paid through age 12 months) has been subtracted from both numerator and denominator.

Now let's complete the table of Age 12 to 24 development factors (Exhibit 3A). Note that even though the combined development factors are nearly constant, their component pieces are very different. This doesn't matter as long as we are developing only as far as to age 24, but it makes a great deal of difference as we go beyond.

Now we have the opportunity to apply our judgment. What would we predict for the 1984 factors? We could assume the apparent trend will continue and fit a line through the factors. But that would forecast a negative incremental paid for 1984 during 1985!. Or we could assume there is no trend, only random fluctuation, and take a simple average. The answer (.113) seems high in light of recent experience. In this situation I prefer to take a weighted average by summing the numerators and denominators (Exhibit 4). This puts more weight where there is more data, usually the most recent years. The effect is reduced here because I have assumed a "no growth" scenario. If you wish to put even more weight on the recent experience, use the technique known as "regression through the origin", which is really a doubly weighted average. That would not necessarily be the case if the reserve inventory was growing more rapidly.

Here is the complete table of age-to-age factors, together with the two averages (Exhibit 5).

We are now ready to develop the losses to ultimate. The development of the outstanding-to-outstanding is straightforward compounding of the age-to-age factors, just as with the traditional total incurred loss development method. In this case, age 24 to 48 is .467 x 0 = 0 and age 12 to 48 is .779 x .467 x 0 = 0. (Of course, if we were really doing an analysis on this data, we would have to decide if we believe all claims would be closed by age 48 based on the flimsy evidence of one year's development and in light of a lengthening payout pattern. That goes beyond the scope of our hypothetical data and this presentation.)

Now, at last we come to the backwards recursive part of the method. Algebraically, it may be expressed as follows (Exhibit 6).

The reason for the name "backwards recursive" now becomes clear. To compute the factors it is necessary to start at ultimate and work backwards, using the result of the calculation at each stage (in this case, Δ Pd (24,48)) as an input to the calculation at the next stage (here, Δ Pd (12,48)). In our example, the paid between ages 24 and 48 is given by the paid between 24 and 36 (.380) plus the remaining outstanding at age 36 (.467) times the paid after age 36 as a percentage of the age 36 outstanding (.750). The factor to go from age 12 to 48 follows in a similar fashion.

Since the residual outstanding at age 48 is 0, all we need to do is apply these paid factors to the current outstandings and add the paid-to-date to get our ultimates (Exhibits 6A). Note that in every case we get lower estimates than we did when our development factors were based on total incurred. This is a result of 1) the lengthening payout pattern and 2) a higher savings rate on older cases.

Are these ultimates necessarily better than the traditional ones? Yes, in the sense that they 1) make use of all the information available, 2) recognize that subsequent development comes from outstanding claims, not those already paid, and 3) force us to make judgments where the other method made it appear none were necessary. As to the accuracy of those judgments, only time will tell.

Exhibit 1

Hypothetical Report Year Incurred Loss Development

Report Year	Age in Months 12	24	36	48
1981	1000	900	800	750
1982	1000	900	800	
1983	1000	900		
1984	1000			

	12:24	24:36	36:48
1981	.900	.888	.938
1982	.900	.888	
1983	.900		
Average	.900	.888	.938
Cumulative	.750	.833	.938

Exhibit 2

Hypothetical Report Year Loss Development
Split Between Paid and Outstanding

Report Year		Age in Months 12	24	36	48
1981	Pd	150	300	600	750
	OS	850	600	200	0
	Total	1000	900	800	750
1982	Pd	100	200	400	
	OS	900	700	400	
	Total	1000	900	800	
1983	Pd	50	100		
	OS	950	800		
	Total	1000	900		
1984	Pd	0			
	OS	1000			
	Total	1000			

Exhibit 2A

Hypothetical Report Year Loss Development
Split Between Paid and Outstanding

Report Year		Age in Months 12	24	36	48
1981	Pd	150	300	600	750
	OS	850	600	200	0
	Total	1000	900	800	750
1982	Pd	100	200	400	
	OS	900	700	400	
	Total	1000	900	800	
1983	Pd	50	100		
	OS	950	800		
	Total	1000	900		
1984	Pd	0			
	OS	1000			
	Total	1000			

Paid-to-Paid Development Factors

	12:24	24:36	36:48
1981	2.00	2.00	1.25
1982	2.00	2.00	
1983	2.00		
Average	2.00	2.00	1.25
Age-to-Ultimate	5.00	2.50	1.25

Exhibit 2B

Hypothetical Report Year Loss Development Split Between Paid and Outstanding

Report Year		Age in Months 12	24	36	48
1981	Pd	150	300	600	750
	OS	850	600	200	0
	Total	1000	900	800	750
1982	Pd	100	200	400	
	OS	900	700	400	
	Total	1000	900	800	
1983	Pd	50	100		
	OS	950	800		
	Total	1000	900		
1984	Pd	0			
	OS	1000			
	Total	1000			

Paid-to-Paid Development Factors

	12:24	24:36	36:48
1981	2.00	2.00	1.25
1982	2.00	2.00	
1983	2.00		

	12	24	36	48
1981				
1982			400 x 1.25	= 500
			400	
			800	
1983		100 x 2.00 x 1.25		= 250
		800		
		900		
1984	0 x 2.00 x 2.00 x 1.25			= 0
	1000			
	1000			

Exhibit 3

Illustration of Backwards Recursive
Case Reserve Development

Report Year		---Age in Months-- 12	24	Development Factor 12:24
1981	Δ Pd	150	300-150=150	150/850 = .176
	OS	850	600	600/850 = .706
	Total	1000	750	750/850 = .882

Exhibit 3A

Illustration of Backwards Recursive
Case Reserve Development

Report Year		---Age in Months--- 12	24	Development Factor 12:24
1981	Δ Pd	150	300-150=150	150/850 = .176
	OS	850	600	600/850 = .706
	Total	1000	750	750/850 = .882
1982	Δ Pd	100	200-100=100	100/900 = .111
	OS	900	700	700/900 = .778
	Total	1000	800	800/900 = .889
1983	Δ Pd	50	100- 50= 50	50/950 = .053
	OS	950	800	800/950 = .842
		1000	850	850/950 = .895

Exhibit 4

Illustration of Weighted Average and Regression through the Origin on Age 12 to 24 Development Factors

<u>Weighted Average</u>

ΔPd:	(150 + 100 + 50)/(850 + 900 + 950)	=	300/2700	=	.111
OS:	(600 + 700 +800)/(850 + 900 + 950)	=	2100/2700	=	<u>.778</u>
Total:	(750 + 800 +850)/(950 + 900 + 950)	=	2400/2700	=	.889

<u>Regression through the Origin</u>

ΔPd: (150x850+100x900+50x950) / [(850)^2 + (900)^2) + (950)^2]=

265,000/2,435,000 = .109

OS: (600x850+700x900+800x950) / [(850)^2 + (900)^2 + (950)^2]=

1,900,000/2,435,000 = <u>.780</u>

.889

Exhibit 5

Illustration of Backwards Recursive
Case Reserve Development (Continued)

Report Year		Age in Months 12:24	24:36	36:48
1981	Δ Pd	150/850 = .176	300/600 = .500	150/200 = .750
	OS	600/850 = .706	200/600 = .333	0/200 = 0
	Total	750/850 = .882	500/600 = .833	150/200 = .750
1982	Δ Pd	100/900 = .111	200/700 = .286	
	OS	700/900 = .778	400/700 = .571	
	Total	800/900 = .889	600/700 = .857	
1983	Δ Pd	50/950 = .053		
	OS	800/950 = .842		
	Total	850/950 = .895		
Wgtd. Avg:	Δ Pd	.111	.384	.750
	OS	.778	.462	0
	Total	.889	.846	.750
Reg. thru Origin:	Δ Pd	.109	.376	.750
	OS	.780	.471	0
	Total	.889	.847	.750
Avg. of Avgs.:	Δ Pd	.110	.380	.750
	OS	.779	.467	0
	Total	.889	.847	.750

Exhibit 6

Illustration of Backward Recursive
Case Reserve Development (Concluded)

$$\Delta \text{Pd} \quad (24, 48) = \Delta \text{Pd} \quad (24, 36) + \text{OS} \quad (24, 36) \times \Delta \text{Pd} \quad (36, 48)$$

$$= .380 + .467 \times .750 = .730$$

$$\Delta \text{Pd} \quad (12, 48) = \Delta \text{Pd} \quad (12, 24) + \text{OS} \quad (12, 24) \times \Delta \text{Pd} \quad (24, 48)$$

$$= .110 + .779 \times .730 = .679$$

Exhibit 6A

Illustration of Backward Recursive Case Reserve Development (Concluded)

$$\Delta \mathrm{Pd}\ (24, 48) = \Delta \mathrm{Pd}\ (24, 36) + \mathrm{OS}\ (24, 36) \times \Delta \mathrm{Pd}\ (36, 48)$$

$$= .380 + .467 \times .750 = .730$$

$$\Delta \mathrm{Pd}\ (12, 48) = \Delta \mathrm{Pd}\ (12, 24) + \mathrm{OS}\ (12, 24) \times \Delta \mathrm{Pd}\ (24, 48)$$

$$= .110 + .779 \times .730 = .679$$

1982	400	x	.750	+	400	=	700
1983	800	x	.730	+	100	=	684
1984	1000	x	.679	+	0	=	679

function is so tightly controlled from the home office that a case reserved in one place would be exactly the same as that case that if it arose in another area. Looking at country-wide loss development is going to fool you, and also these two can interact. If you have one case in a particular state that you expected it to either win or settle for a nominal amount and it blows up into the million dollar range, expect to see all similar cases in that jurisdiction go through exactly the same process. Severity of injury is another thing you can look at. There's a very high correlation between the ultimate damages awarded in a given case and the injury to the plaintiff. And it also influences the likelihood that you'll win or lose it in court. There's a very large sympathy factor involved with a quadriplegic being wheeled into a courtroom. Even if the liability is questionable there's a very real chance that you're going to wind up paying that case.

Finally, claim status -- It's a good idea if you possibly can to track a claim through its entire life cycle. From the time it is just an incident report where no claim has been brought by the claimant to the claim itself before trial, and then the trial phase, and then finally through the appeal phase. Generally speaking the value of that case will escalate every step of the way. If your claims function is not recognizing that then chances are they will get caught short. Others that you might think of that have occurred to me but we haven't actually done anything with them yet are: class of business; age or sex of claimant; and whether or not other defendants or plaintiffs are involved. In conclusion I would say that to be a good reserve actuary it's a good idea to learn to think like a plaintiff's attorney. Thank you.

P. GRANNAN: Thanks Jim. Our third speaker will talk to us about methods of estimating the reserves for reporting endorsement coverage, also known as tail coverage. Bill Murphy is a Fellow of the Casualty Actuarial Society, and holds a Bachelor's Degree from Cooper Union. He's a consulting actuary with Milliman & Robertson and has extensive experience with medical malpractice issues, including tort reform. Previously he was with Insurance Services Office where he worked on regulatory issues and the new CGL policy, among other things.

BILL MURPHY: Thanks Pat. I'm charged with talking about reserving for reporting endorsements, otherwise known as the tail coverage. It's a multi-faceted issue. The best I can do with the time that I've got is to raise some of the issues that are involved, give you some of my thoughts, and tell you how other people have approached the various problems. I'm not here to give you answers, because in many cases there is no one "correct" way to set up loss reserves for tail coverage.

I'll begin by describing two extreme types of tail coverage. The first type, which I'll call a basic reporting endorsement, is the kind which the insured is not obligated to buy, the insurer is not obligated to sell, and the price is fixed at the time that the endorsement is issued. On the other extreme, you've got the situation where a company guarantees the availability of the tail coverage, and even the price, when it writes the underlying claims made policy. The real world is somewhere between these two.

Typically you'll have some kind of guarantee written into the underlying policy. Perhaps it is that the coverage will be available if the insured requests it. It may have a cap on the maximum price that can be charged, or it may have a price fixed by formulaa. Medical malpractice insurers frequently have programs where the reporting endorsement is issued without additional charge in the event that the physician dies, becames disabled, or retires. There may also be some additional requirements. For example, he's got to retire at the age of sixty-five or older, maybe they'll require that he was in the claims made program for a minimum of five ten years.

For the "no guarantee" type of tail coverage that I described first, the who writes the underlying policy incurs no particular obligation with respect to the reporting endorsement. He hasn't made any promises, he hasn't collected any money, he's got no liabilities and therefore no need to set up a reserve. When you start making guarantees of various kinds, that's when you're incurring liability and you need to consider setting up a reserve for that liability. If you're planning on giving away a free tail coverage to some of your insureds, for example, that is an obligation that you should reserve for. The exact method of funding that guarantee and the way you set up a reserve for it is somewhat flexible. I don't believe there is any definitive answer to that problem. I've seen it approached in a couple of different ways and I've managed to think up a few more possible ways that you could approach the problem.

What I want to do is talk about how you might establish a reserve for a basic, no guarantee, tail coverage when it is written. What you might first attempt to do is collect reporting endorsement development data use that to project your reserves. There are a couple of problems with this method. First of all you don't issue reporting endorsements all that frequently so you're not going to have a large body of data to look at. The claims made program itself is relatively new. Furthermore, if you were to collect the data on reporting endorsements for development purposes, you'd have to collect it separately according to the number of years that the insured had been in a claims made program.

Take the example of the insured who had purchased a claims made policy for one year and decided he wanted to get out of medicine and become a lawyer, so he bought a reporting endorsement. [Slide 1] Along the top line you see how one might expect the losses that occurred during his one year of coverage to be recorded in subsequent years. At the first valuation you might see twenty percent of the ultimate losses being reported. In the second valuation another fifty percent would be added, and the third twenty percent more. If the insured has been in the claims made program for more than one year, what you're going to see in the first year of reporting under the reporting endorsement coverage is relatively more mature losses. The reporting patterns that I've generated for the second, third, and fourth years in the claims made program use exactly the same report lag distribution that I used in the first year. I've simply adjusted it to reflect more years of claims made coverage. So you will see a different reporting pattern depending on how long the insured has been in the claims made program. You've got to take that into account. You can't just lump all of your reporting endorsement data together.

These problems mean that it is somewhat impractical to try and collect development data on reporting endorsements alone. Another way that you might try to establish reserves for the coverage would be simply to apply a loss ratio to the premiums. That might be a reasonable method if the amount of reporting endorsement coverage issued is relatively small compared to the total book of business. One thing that you should consider, though, is that even the loss ratio would vary depending on the number of years the insured was in the claims made program, because fixed expenses would eat up a larger portion of the premium dollar for the early years in the claims made program.

A preferable way of getting development data for the reporting endorsement is to collect report lag data from all policies, claims made and occurrence. What you'll ultimately want to get is an array of this form [Slide 2] where you have data sorted according to maturity and report lag. Report lag refers to how long it takes to report a claim. Lag zero is defined as a claim which is reported in the same year in which it occurred. Lag one is a claim that is reported one year after it occurred, and so forth. For each report lag of data that you have, established a development pattern using historical data as you would for incurred or paid development. Once you have information in this format you can manipulate it to determine expected development patterns on your reporting endorsement. I've got an example on the bottom of Slide 2 for an insured who was in the claims made program for two years and then bought a reporting endorsement. What you would see reported in the first year under that endorsement is the lag one claims from his second year of coverage and the lag two claims from his first year of coverage. That's what I've circled. Ultimately, those losses would be valued at .6 --the sum of the other circled numbers. That accounts for the first year of reporting. Ultimately you would expect additional losses to be reported. How much would those ultimate losses be? From the insured's first year of coverage you would see report lags two and three (and possibly four, five, etc) being reported. From his second year of coverage you would expect to see report lags one, two and three reported. The ultimate value of report lags one, two, and three from the second year sum to ninety; report lags two and three from the first year sum to seventy. The calculation on the bottom, ninety plus seventy divided by sixty is the development factor for unreported claims. The product of the first and second terms yields projected ultimate losses under a reporting endorsement from its first year reports.

This method will undoubtedly tend to be somewhat unstable, particularly when you're looking at first year reported claims, if you don't have a large book of business. You might want to use this method for projecting the reported claims to ultimate, but use the loss ratio method for the IBNR portion of the losses. That would tend to produce a more stable answer.

I promised that I would talk a little bit about how to deal with the automatic reporting endorsements, the ones that are somehow guaranteed ahead of time. There are a number of different approaches that can be taken with respect to that. I've listed all the ones I can think of on Slide 3. There very well may be more.

Now take an individual insured, in this example age 35, and ask "what premiums can we expect to collect from him?" That would be his claims made premiums projected out for each of the individual years, times his probability for survival. I use the word survival meaning insurance survival, that is, the insured has not left the program for any reason. The product of those two would give you his expected premium payments to your company over his insured life. You then want to estimate the probability that the reporting endorsement would be issued to him. In the event of death or disability you can use standard mortality and morbidity tables to estimate those probabilities for each individual age. With respect to retirement, it is a little more difficult. You need to get some information on when people retire and how likely they are to retire. You need to consider each of these factors, death, disability and retirement, and whatever other guarantees you might build into your contract.

In the case of medical malpractice you really need to consider the attributes of a doctor population. The probabilities of death and disability for doctors at a given age are very different than the overall population. They have substantially better experience, and you need to take that into account. Doctors also have somewhat different retirement patterns than most of us. They tend to work longer and are less likely to retire. If you're going to get an accurate projection you have to take all of those things into account. Utimately, what you want to derive out of this calculation is the present value of benefits compared to the present value of each insured's premiums, and to take the weighted average of these ratios over your entire book of business.

You can do the calculation for every individual year of age, or group them according to age ranges, which is the example that I've shown here [Slide 5] In this case I've got one group for under forty-five then one forty-five to fifty-five and so forth. The distribution of doctors is shown in the second column. The indicated loadings from the prior calculation are shown in the third and fourth columns. I've deliberately shown here two different retirement ages -- sixty-five and seventy-five. I think what you need to do is to assume several different retirement ages and take a weighted average to get the indicated loading. In this case, the result is that you should be loading your claims made premiums somewhere between twenty and thirty percent to fund the benefits that will accrue to your current book of business. These numbers are made up. They are in order of magnitude, but they're not particularly representative of any specific situation.

A second method for funding is to collect the premiums necessary to pay for endorsements as they are issued. In this case, again we take the distribution of currently insured doctors according to their age. [Slide 6] Age specific information is valuable to a medical malpractice insurer, particularly if you're getting into the business of giving away automatic tails. Clearly the probabilities of death, disability, and retirement are all age related. The American Medical Association has some state specific data on age distributions.

I've shown the decrement functions for death and disability in Columns 3 and 4. Those can be derived from standard mortality and morbidity tables with an adjustment for the fact that doctors have substantially better experience than the general population. The mortality rates might be only fifty or sixty percent that of a group population. The morbidity is similarly discounted. The other decrement in Column 5 is meant to provide for other circumstances where an endorsement will be issued. Adding all the decrements together and multiplying by the number of doctors gives you an indication of how many endorsements you might expect to issue in a year. In total, I've calculated 120 out of an insured population of 3500. You take that information and do a loading calculation. [Slide 7] Total claims made premiums equals 3500 doctors times some average premium "x". The cost of each endorsement is typically expressed is a fraction of a mature claims made policy premium. In this case I've simply picked 1.8X. The indicated loading for your insureds is then the number of endorsements times their costs divided by the total claims made premiums. In this case it works out to 6.2%. Again, that's somewhat representative -- it's certainly not exact for any particular type of circumstance.

These are two methods that I've seen used in a number of states. As I've said, at this point it seems to be somewhat of an open question as to what the "proper" method is. I think that depends a lot on the company's objectives and circumstances.

P. GRANNAN: We'll entertain any questions at this point.

QUESTION: In what cases are you required to segregate claims made in Schedule P's starting next year?

W. MURPHY: The first was premiums made on claims made policies is greater than $100,000. Second, if/and the portion of the total earned premiums related to 1987 claims made business exceeds 15% of total earned premiums.

[COMMENT, INAUDIBLE]

QUESTION: Do you need to provide a reserve for any accumulated individual equity in the reporting endorsement benefit?

W. MURPHY: That would depend on the policy language. You might if the policy guaranteed that a policyholder could access that equity. What you're talking about sounds like life insurance, where the policy accumulates a cash value.

QUESTION: Have you actually had one of these calculation methods approved in any state?

W. MURPHY: Yes I have. We have implemented a program in Massachusetts which was based on the Pay As Issued methodology. In that case there clearly is no accumulation for individual equity.

QUESTION: Are there situations where the unearned premium approach is advisable?

W. MURPHY: There is a certain sense in which the unearned premium approach makes sense. If you use an extended reporting endorsement it's really nothing more than a series of claims made policies going on with less and less coverage because you're continually cutting off any new incidents that might occur. I view it that way and that's what we did when we first started out. We were doing nothing more than extending the claims made policy and the certain coverage of it ...

P. GRANNAN: Are there any more questions? I'd like to thank the audience for bearing with the heat, and the speakers for their presentations.

1987 CASUALTY LOSS RESERVE SEMINAR

2G - ADVANCED TECHNIQUES II: REFLECTING UNCERTAINTY

Moderator: Jerry A. Miccolis, Consulting Actuary
Tillinghast/a Towers Perrin Company

Panel: Roger M. Hayne, Consulting Actuary
Milliman & Robertson

Stephen W. Philbrick, Consulting Actuary
Tillinghast/a Towers Perrin Company

Recorder: Stephen W. Philbrick

JERRY MICCOLIS: Good morning, and welcome to Session 2G, Advanced Techniques II: Reflecting Uncertainty in Loss Reserving. My name is Jerry Miccolis, Consulting Actuary with Tillinghast, a Towers Perrin Company. Joining me on the panel are Roger Hayne, Consulting Actuary with Milliman & Robertson, and Stephen Philbrick, Consulting Actuary with Tillinghast. Each of us will be presenting this morning some prepared remarks. There will be plenty of opportunity during and after our remarks to entertain your questions, and we encourage questions. Our goal here is to get you thinking about some of these issues and hopefully encourage some debate among you, and us, and hopefully among yourselves. The sponsoring organizations have asked me to remind you that any opinions that are expressed by any of us here this morning are our own, and do not necessarily represent the opinions of the American Academy of Actuaries, or the Casualty Actuarial Society, or our respective employers for that matter.

My job here as moderator is to put this topic into some perspective; to discuss some of the implications of uncertainty in the reserving process; to talk about some of the sources of that uncertainty; and to discuss briefly some of the approaches to reflecting uncertainty that have been considered by the Casualty Actuarial Society's Committee on Theory of Risk. My comments will reflect the consensus, such as it is, of the Committee on Theory of Risk. Following me will be Steve Philbrick, who will be speaking as an individual, and will talk about some ad hoc quick and dirty approaches to what we're talking about. And following Steve will be Roger Hayne, who will be discussing more comprehensive models of the risk process. A lot of what I'm going to say is included in the discussion paper by the Committee on Theory and Risk, copies of which are available at the podium. First some background.

Reserving has always been an uncertain process, so why now is this uncertainty aspect of reserving such a hot issue? Largely, because it is tied in, not so much in the theoretical sense but in the practical sense, it is tied in with the concept of discounting of reserves. Of course, discounting of reserves is a very hot issue at the moment. The 1986 changes to the tax law mandate discounting of reserves for tax purposes. Some insurance departments are allowing discounting on selected kinds of business for statutory reporting purposes. The AICPA continues to study the issue of loss reserve discounting for GAAP purposes. Companies themselves have in recent years have effected a sort of indirect discounting by means of financial reinsurance. Some companies have engaged in implicit discounting through simply being optimistic in setting their reserves. Whatever the motivation for discounting, the fact is that when previously undiscounted reserves are now stated on a discounted basis, what has happened is that an implicit margin in the reserves has been removed. And because of that and because of the fact that the underlying liability is no less uncertain, the need to explicitly consider uncertainty, regardless now of how or whether the uncertainty is presented in financial statements, but the need to explicitly consider the uncertainty; to understand it; to measure it; to quantify it; the need for that becomes more pronounced. This is an important point to emphasize and I would like to quote directly from the discussion paper of the Committee.

> "The largest liability item on the balance sheet of virtually all insurance companies is also arguably the most uncertain. Often the dollar amount of the liability for losses and loss adjustment expenses is not known until several years after the liability has been incurred and accounted for. This liability is subject to future uncertain events beyond the control of the insurance company, such as the socio-legal climate, jury sentiments, attitudes towards claim settlements, etc., that will prevail when claims that give rise to the liability reach their ultimate disposition. A loss reserve is simply an estimate of this liability as of a given point in time based on currently available information. These estimates are often in error. Since the amount of the loss reserve is typically several times the company's net worth, uncertainty in the reserve estimate can translate into considerably more uncertainty in the financial well being of the company.
>
> It is generally true that the reserves for the longer tailed lines of business, (that is those with greater than average time lags between claim incident and disposition are the more uncertain. It is also a fact that these same lines of business present the greater opportunity for investment income on the assets supporting the reserves and thus for greater amounts of reserve discounting. There is some correlation then between reserve uncertainty and discount potential, and this gives some support to the idea that undiscounted reserves give implicit recognition to risk. The Committee believes that while this correlation exists, it does not represent a sufficiently fundamental relationship to be used as the basis for measuring risk. It is though, the Committee's position that discounting loss reserves does remove a substantial risk margin, however implicit and imprecise, and makes more pronounced the need to develop an explicit measure of risk.

> Once a method for measuring and representing risk is developed it remains to determine the proper method to report it in financial statements ..."

This issue of how to properly present uncertainty in financial statements is a very important one. However, it is not an issue we will be spending a lot of time on this morning, except to say that the loss reserve itself has no meaning without some sort of financial reporting context. The proper presentation of uncertainty depends on that accounting context. As a matter of fact, the question of how to present uncertainty may have different answers, depending on whether we're preparing a tax return; a statutory annual statement; evaluating a company's potential acquisition; or for some other purpose. The presentation issue will ultimately be resolved by the accounting profession. However, it is the responsibility of the actuarial profession to see that the issues involving risks or uncertainties are raised and considered, and hopefully to provide the tools for quantification of the risk. To this end the Risk Theory Committee has been and will be trying to develop methods of measuring uncertainty that will be flexible enough to accommodate a number of alternative accounting contexts. The focus of the Committee has thus been 1) to identify the sources of reserve uncertainty; 2) design mathematical models for each of these sources of uncertainties and combine these models into a comprehensive model of the overall reserving process; and 3) to use that model to quantify the risk, that is, to express the uncertainty in dollar value terms.

For the remainder of this session we'll be talking about discounted reserves. We will assume we're in a world where reserve discounting is universal. Sources of uncertainty in those discounted reserves arise we think from six elements: 1) The ultimate value of claims reported but unpaid as of the valuation date; 2) the claims incurred but not reported as of the valuation date; 3) the ultimate value of claims closed as of the valuation date but later reopened; 4) the timing of the future payments from the three categories of unpaid claims we just cited; 5) the investment yields on assets supporting the liabilities; 6) future asset values as those liabilities become due. While this list may not be exhaustive the Committee feels that these are at least the six principal elements of reserve uncertainty.

Surrounding these six elements are various factors contributing to the uncertainty. These include future inflation; future judicial and legal climate; past and future changes in company practices with respect to claims administration; asset management, among other things; past and future currency fluctuations; and a whole host of other factors. Complicating the picture is that there are certain potential interactions between these elements and these factors. For example, the possible relationship between interest rates and inflation rates, or the possible relationship between claim severity and payment lag.

In its deliberations on these issues, the Committee structured its thinking by asking ourselves a series of questions. I should point out before we start that a lot of these questions we currently don't have answers for, but it did help structure the debate.

1) Should reserves be determined with an explicit recognition of risk? We want to be careful that we understand what this question means. It does not mean should reserves include an explicit risk margin. It does not address at all the issue of how or whether to adjust the reserve in any way for uncertainty or how to present uncertainty in an accounting context. The question is asking essentially: Is the actuary's job done when he or she develops a point estimate of the liability, or is there an additional responsibility on the actuary to recognize the uncertainty inherent in the development of that estimate and to somehow convey it. We think the answer to this question is yes, and that being the case how do you do it. The Committee looked at several alternatives. The remaining questions you may have seen debated in mock debate format among some of the Committee members at one or several of the past meetings of the CAS or the regional affiliates. What I'll do is kind of give you a little of the flavor of the results of that debate.

2) Should the methodology be the same as that used in developing the risk margin, if any, in the rates? This has some intuitive appeal. Presumably the rates include some provision above the expected losses, expenses, and profits. That is intended as a margin against risk, and it would seem to make sense to establish initial reserves with the same margin in them, and to gradually release this margin into surplus over time as the reserve runs off. However, what happens when it quickly becomes apparent, as it often does, that initial risk margin wasn't enough. Clearly, this approach doesn't allow you when you're reserving to take account of new information as it becomes available.

3) Can a risk-adjusted discounted reserve be derived as the price of a loss portfolio transfer? This also has some appeal, and what we're doing is putting the problem on the financial

reinsurance market and letting them quantify the uncertainty and set the price. This is impractical of course, plus it assumes that reinsurance pricing is well behaved, and it also is just plain is unfeasible to go out and get quotes on portfolio transfers every time you need to set a reserve.

4) Can you quantify uncertainty from an empirical study of loss development history alone? This has been done. There are a number of papers in the actuarial literature that attempt to quantify the variability in historical age-to-age factors and then to fit some theoretical distributions to those factors that model the variability and develop the distribution of possible reserves. It is also done quite often and a lot more simply every time an actuary gives a range of estimates derived from a single set of data. That's a very simple way to use historical variation in development factors to get a handle on uncertainty. It also arises when more than one actuary look at the same set of data and come up with more than one answer. The problem with these kinds of approaches is that development history alone will tend to understate the true variability in the process, since if for no other reason, not everything that could have happened has happened. However, good historical data is invaluable. There is no substitute for it when we try to test some of the more sophisticated and ambitious models that we'll talk about later.

6) The fifth question pertains to whether mean or expected value concepts and variance concepts alone are sufficient to quantify risk. The sixth question is: Are confidence levels sufficient to quantify risk? While we think these items provide valuable information, we don't think they tell the whole story about uncertainty. For example, mean and variance concepts don't say anything about things like tail probabilities. Confidence levels don't say anything about the dollar consequences of exceeding a given confidence level.

7) What about ruin theory? This theory is popular among European actuaries, particularly Scandinavian actuaries. One application of ruin theory might be to determine a risk-adjusted reserve, such that the anticipated probability of ruin for this company is reduced to an acceptable level. There are some problems with this approach as well, not the least of which is getting senior management to buy into this concept of "an acceptable probability of ruin". However, our discussion of this theory did lead us to conclude that when we consider uncertainty, we should be concerned with the entire distribution of discounted liabilities, not just a few moments of that distribution, and not just a few confidence levels from that distribution. Once that distribution is determined it should be incorporated into a stochastic model

REFLECTING UNCERTAINTY IN LOSS RESERVING

CONSIDERATIONS BY THE
<u>CAS COMMITTEE ON THEORY OF RISK</u>

GARY PATRIK, CHAIRMAN

ROGER HAYNE

GLENN MEYERS

JERRY MICCOLIS

STEPHEN PHILBRICK

LEWIS ROBERTS

GARY VENTER

RICHARD WOLL

REFLECTING UNCERTAINTY IN LOSS RESERVING

BACKGROUND

- o SIGNIFICANCE OF RESERVE DISCOUNTING
  - 1986 TAX ACT
  - NAIC
  - AICPA
  - OPTIMISTIC RESERVING/IMPLICIT DISCOUNTING
- o UNCERTAINTY/IMPLICIT RISK MARGIN
- o ACCOUNTING CONTEXT
- o FOCUS OF COMMITTEE
  - SOURCES OF UNCERTAINTY
  - MATHEMATICAL MODELS
  - QUANTIFICATION

REFLECTING UNCERTAINTY IN LOSS RESERVING

FUNDAMENTAL ISSUES

- o LARGEST LIABILITY ITEM

- o MOST UNCERTAIN

- o RESERVE: ESTIMATE OF LIABILITY

    - CURRENT ESTIMATE
    - FUTURE, CONTINGENT EVENTS

- o UNCERTAINTY RE FINANCIAL CONDITION

- o CORRELATION: RESERVE UNCERTAINTY/DISCOUNT POTENTIAL

- o NEED FOR EXPLICIT RISK MEASURE

- o ACCOUNTING ISSUES

REFLECTING UNCERTAINTY IN LOSS RESERVING

SOURCES OF LOSS LIABILITY UNCERTAINTY

THE ULTIMATE VALUE OF:

1. CLAIMS REPORTED BUT UNPAID (NOT CLOSED).

2. CLAIMS INCURRED BUT NOT REPORTED.

3. CLAIMS CLOSED BUT LATER RE-OPENED.

AND ALSO:

4. TIMING OF FUTURE PAYMENTS ON (1) - (3) ABOVE.

AND FOR THE ASSETS SUPPORTING THE LIABILITIES:

5. INVESTMENT YIELDS.

6. FUTURE ASSET VALUES.

REFLECTING UNCERTAINTY IN LOSS RESERVING

CONTRIBUTING TO LOSS LIABILITY UNCERTAINTY

- INFLATION
- JUDICIAL/LEGAL COMMITTEE
- CHANGES IN COMPANY PRACTICES
  - CLAIMS ADMINISTRATION
  - ASSET MANAGEMENT
  - ETC.
- CURRENCY FLUCTUATIONS
- ETC.
- INTERACTION:
  - INTEREST RATES <------> INFLATION
  - CLAIMS SEVERITY <------> PAYMENT LAG

REFLECTING UNCERTAINTY IN LOSS RESERVING

QUESTIONS

1. SHOULD LOSS RESERVES BE DETERMINED WITH AN EXPLICIT RECOGNITION OF RISK?

IF THE ANSWER IS YES, CAN THE LOSS RESERVE BE DETERMINED:

2. BY USING THE SAME METHODOLOGY USED FOR PRICING?

3. AS THE PRICE OF A LOSS PORTFOLIO TRANSFER?

4. FROM AN EMPIRICAL STUDY OF LOSS DEVELOPMENT HISTORY ALONE?

5. FROM EXPECTATION AND VARIANCE CONCEPTS?

6. BY ESTIMATING CONFIDENCE INTERVALS?

7. VIA RUIN THEORY?

8. VIA CAPM THEORY?

9. VIA UTILITY THEORY?

RISK THEORETIC ISSUES IN THE DISCOUNTING OF LOSS RESERVES

A DISCUSSION PAPER BY THE CAS COMMITTEE ON THEORY OF RISK

BACKGROUND

The discounting of property/casualty loss reserves to reflect the time value of money has been a controversial issue for some time and recent activity in this area has been significant. In 1986 Congress passed landmark legislation to require discounting for income tax purposes. The National Association of Insurance Commissioners has formed a study group to further explore the advisability of discounting for statutory reporting purposes. Some state Insurance Departments have already begun to permit discounting in the statutory Annual Statement for some lines of business in which discounting had traditionally been prohibited. The AICPA is also studying the implementation of reserve discounting as it relates to GAAP financial reporting. Many insurance companies have been engaging in de facto discounting to some degree by means of overly optimistic reserving assumptions and/or by the purchase of financial reinsurance.

In the public debate over discounting it has been pointed out, though not always appreciated, that a fundamental feature of property/casualty loss liabilities is their uncertainty. Opponents of discounting have argued that carrying loss reserves on an undiscounted basis is in implicit recognition of this uncertainty or risk. According to this argument the amount by which undiscounted reserves exceed their discounted value provides a buffer against this uncertainty, a "risk margin" of sorts.

For several years now, the CAS Committee on Theory of Risk has been studying and discussing the issue of uncertainty in loss liabilities, particularly as it relates to the discounting of loss reserves. The Committee takes no official position on the discounting issue itself other than to agree with those observers who state that the issue can only be considered in the context of the purpose for which the financial statement is prepared; the issue can conceivably have a different resolution for statutory purposes, for example, than for tax purposes. Moreover, the Committee takes no official position on the proper accounting treatment to reflect uncertainty in reserves, regardless of the accounting context. Rather, our focus has been in the areas of: i) identifying the sources of uncertainty, ii) mathematically modeling and measuring the uncertainty, and iii) expressing the uncertainty in dollar value terms. We hope that this status report on our activities to date will be of value to those professional committees currently debating the discounting issue and its accounting treatment and also to the regulatory bodies ultimately responsible for the resolution of the debate. We also hope to receive feedback from these audiences to assist us in directing and focusing our further research.

FUNDAMENTAL ISSUES

The largest liability item on the balance sheet of virtually all insurance companies is also, arguably, the most uncertain. Often, the dollar amount of the liability for losses and loss adjustment expenses is not known until several years after the liability has been incurred and accounted for. This liability is subject to future uncertain events beyond the control of the insurance company, such as the socio-legal climate, jury sentiments, attitudes toward claim settlement, etc. that will prevail when the claims that give rise to the liability reach their ultimate disposition. A loss reserve is simply an estimate of this liability as of a given point in time, based on currently available information. These estimates are often in error. Since the amount of the loss reserve is typically several times the company's net worth, uncertainty in the reserve estimate can translate into considerably more uncertainty in the financial well-being of the company.

It is generally true that the reserves for the longer-tailed lines of business (i.e., those with greater-than-average time lags between claim incident and disposition) are the more uncertain. It is also a fact that these same lines of business present the greater opportunity for investment income on the assets supporting the reserves and thus for greater amounts of reserve discounting. There is some correlation then between reserve uncertainty and discount potential, and this gives some support to the idea that undiscounted reserves give implicit recognition to risk. The Committee believes that while this correlation exists it does not represent a sufficiently fundamental relationship to be used as a basis for measuring risk. It is, though, the Committee's position that discounting loss reserves does remove a substantial risk margin, however implicit and imprecise, and makes more pronounced the need to develop an explicit measure of risk.

Once a method for measuring and representing risk is developed, it remains to determine the proper method to report it in financial statements. As mentioned above, the resolution of this issue is outside the scope of the Committee's charter, however there are some considerations we would like to highlight for the benefit of those professional committees charged with this responsibility. A fundamental concern is whether a "risk margin" should be derived separately from the loss reserve and whether such a margin should be reported "above or below the line", i.e., as a liability item or as part of surplus. There are two different and somewhat conflicting accounting philosophies that influence the decision on how to report risk margins. According to one, the emphasis is on insurer solvency and on the balance sheet. Including a risk margin as a liability item (separately or not from the loss reserve) would be consistent with the conservatism inherent in this philosophy as it would serve to delay the flow of profits into surplus until the existence of such profits was sufficiently certain. The second philosophy has a going-concern emphasis and the focus is on the income statement. Including a risk margin as earmarked surplus is more consistent with this philosophy as it leaves losses "pure" and allows more direct matching of income and outgo. As is the case with the issue of discounting loss reserves, the Committee believes that the issue of accounting for risk margins depends on the purpose of the accounting document under consideration. A goal of our research is to provide methods of measuring and representing risk that will have sufficient flexibility to accommodate either of the above accounting philosophies.

SOURCES OF UNCERTAINTY

The sources of reserve uncertainty are many and arise principally from the following elements:

1. the ultimate value of claims reported but unpaid as of the evaluation date

2. the ultimate number and value of claims incurred but unreported as of the evaluation date

3. the ultimate value of claims closed as of the evaluation date but reopened subsequently

4. the payment timing of all unpaid claims for which a liability exists as of the evaluation date

5. investment yields

6. asset values

(Note that this list is not exhaustive.)

Contributing to the uncertainty surrounding these elements are:

- inflation

- judicial and legal climate

- changes in company practice, e.g., with respect to:
    - asset management
    - claims administration

- currency fluctuations

- the interaction of the various items, e.g.:
    - interest rates vs. inflation
    - claim severity vs. payment lag

SYNOPSIS OF COMMITTEE ACTIVITIES

The Committee has examined a number of approaches for modeling and measuring risk in loss reserving, some promising, some not so promising. We believe that a discussion of all approaches considered should be included here since the reasons for deciding against some of them may provide some insight to readers.

We have discussed whether risk could be measured by means of an empirical study of loss development history. Some methods along these lines have already been developed by practicing actuaries. These include measuring variations in historical age-to-age loss development factors and modeling the factors by means of distribution functions. These methods are relatively straightforward and the necessary data is easy to obtain. However, methods based only on historical development data are likely to underestimate potential future variation since, in simple terms, not everything that could have happened has happened. On the other hand, the potential for adverse development could be overstated in the historical data since recent adverse development may be more reflective of earlier implicit discounting than of failure to reserve correctly. The Committee believes that historical development patterns alone are not sufficient to measure reserving risk but that this history is invaluable in testing and validating the models we will discuss below.

We discussed whether risk could be measured in terms of mean and variance concepts. We also discussed whether estimating a given percentile of the distribution of losses could be sufficient to quantify risk. For several reasons, the Committee believes these measures are insufficient. Many important aspects of a probability distribution are not captured by the first two moments or by a given percentile. (For example, very different excess loss premium factors can be generated from two different loss distributions that happen to have the same first two moments.) This discussion did convince us of the importance of estimating the complete distribution of ultimate aggregate losses before attempting to quantify risk.

A discussion of the construction of such an aggregate loss distribution including treatment of the risks associated with investment yields and the timing of loss payments is presented in the Appendix.

We have discussed approaches by which the distribution of loss liabilities (discounted or undiscounted), assuming this distribution could be determined, would be incorporated into the quantification of risk. One approach popular in European countries is ruin theory. In the reserving applications of this theory, the loss distribution is incorporated into a stochastic financial model of the entire insurance company and the company's surplus is considered to be stochastic process over time. The appropriate loss reserve incorporating reflection of risk is the smallest amount such that the probability of the company's technical insolvency is reduced to a specified level. One distinct advantage of this approach is that the implied necessary risk load is not independent of the company's current financial condition. There are some practical problems with ruin theory, however. The selection of an acceptable probability of ruin is problematical. U.S. company managements are understandably uncomfortable with the concept of an "acceptable probability of ruin". Also, the risk load determined via ruin theory is extremely sensitive to the choice of the probability of ruin.

One approach which offers the prospect of incorporating what can be learned from ruin theory (for example, the use of the entire loss distribution, and the financial modeling of the entire company) for determining risk-adjusted reserves is utility theory. An acceptable ruin probability need not be specified, since utility theory assigns a utility function to the entire continuum of financial outcomes. Once the distribution of aggregate losses has been estimated, utility theory can be used to compute its "certainty equivalent". This is the loss amount which, if known with certainty, would be regarded as equivalent to the uncertain distribution of outcomes. Specifying the utility function is non-trivial as is the question of whose utility function to model (shareholders, management, regulators, etc. would generally have different utility functions). Moreover, deriving a single utility function to represent a consensus among people with similar viewpoints (e.g., shareholders) is a problem still not fully solved.

[Digression: The capital asset pricing model (CAPM) was discussed by the Committee and discarded as an explicit means of reflecting risk in reserves, however the discussion did identify a concept that might be useful to those committees addressing the issue of accounting for risk margins. In CAPM theory, a central maxim is that "diversifiable risk" should not be "rewarded". In the context of loss reserving, the corresponding rule might be that margins arising from "diversifiable risk" (e.g., due to the use of poor reserving techniques) should not be reported "above the line" but should be reflected in a segregated surplus account.]

SUMMARY OF CURRENT COMMITTEE OPINIONS

As a result of our research and discussions to date, the Committee has formed the following opinions:

- Regardless of the method by which reserves are discounted and uncertainty is measured, and regardless of the accounting treatment, full disclosure in public documents of the methods, measurements and treatments is advisable.

- Measurement of the uncertainty in loss liabilities is an essential part of the estimation of those liabilities, regardless of the context in which the liability estimates and risk measurements are presented. The discounting of loss reserves, by eliminating the implicit risk margin, makes the need for explicit measurement of risk more pronounced.

- While the ultimate application of the theories the Committee is developing may take the form of simple rules of thumb, it is necessary to more fully develop the theory (including a reasonable methodology for estimating the complete distribution of loss liabilities and a start on building a comprehensive financial model) before such rules can be promulgated.

- The development of the necessary theory is a long-term effort, but events, accelerated now by the discounting issue, will not await the perfect theory. The Committee recognizes that, as a practical matter, methods may need to be introduced prior to the full development of the underlying theory. The Committee hopes that the ideas presented herein will assist other bodies (actuarial, accounting, regulatory, etc.) in the development of those methods and further pledges its intention to be actively involved in the effort.

FUTURE DIRECTIONS

The Committee intends to pursue the development of methods for the quantification of risk. To this end, work is under way to:

- estimate probability distributions for the items listed above under "sources of uncertainty"
- develop an overall company stochastic model to incorporate these distributions
- determine a method for calculation of a risk margin from this model

These are clearly long-term projects. In this effort, and in the development of practical alternatives in the intermediate term, we expect to work closely with (at least) the CAS Committee on Reserves, the CAS Committee on Financial Analysis and the AAA Committee on Property and Liability Financial Reporting Principles.

CAS COMMITTEE ON THEORY OF RISK

Gary Patrik, Chairman
Roger Hayne
Glenn Meyers
Jerry Miccolis
Stephen Philbrick
Lewis Roberts
Gary Venter
Richard Woll

of the company over time. That was the lesson that we learned from ruin theory.

8) We also briefly discussed the capital asset pricing model. We quickly decided this was unfeasible. However, there was an important concept that emerged from that debate. That is this, in the context of pricing, which is what CAPM is all about, the model says that diversifiable risk should not be rewarded whether or not the risk has in fact been diversified away. The companion concept in reserving might give some guidance to the accounting profession when it discusses the proper presentation of uncertainty. This companion concept might be that a company should not benefit (for example, by paying lower taxes) because of uncertainty that can be easily reduced or eliminated. For example, the uncertainty that arises from the use of unsuitable reserving techniques.

9) Finally, we talked about utility theory. I won't talk in any detail at all about utility theory right now. We think the approach has some promise as a way to express uncertainty within a model of the entire insurance company. If time permits, and I believe it won't, Roger Hayne has a presentation on a specific application of utility theory to the kind of issues we were talking about. As I said, we will probably not have time to present that at this session, however, there is a wrap-up, open forum workshop tomorrow morning -- Session 5G at 8:30 -- Roger will be happy to present that there.

This sets the stage for our two panelists. First, Steve Philbrick will talk about some quick and dirty approaches to ad hoc methods to achieve what we're talking about. Steve.

STEVE PHILBRICK: Thank you Jerry. Jerry mentioned that he's been asked to say that our individual comments don't necessarily reflect the views of the American Academy or the CAS or other people. I've also been asked to let you know that my views don't necessarily reflect the views of my family or my friends. I also feel almost a need to apologize for what I'm going to say, but let me see if I can put it into perspective. We're going to see some other things from some of the other panelist that are rather sophisticated. What I'm going to do is not at all sophisticated. In fact, some of the things I'm going to talk about have already been denounced, and probably will be denounced further as procedures that aren't appropriate. I want to put this in the context that while it is always desirable to do bottle building, and other sophisticated techniques, one doesn't necessarily always have the time to paraphrase an earlier paper. Sometimes you can't always use the method of the moment, you might only have the matter of the moment. Seriously, there are cases where you may be asked to come up with some results fairly quickly. If it's your own company you may argue that you should have done the work doing the model building, but you may be in the situation of an acquisition. The chairman of a company is thinking of buying another company comes to you and wants your opinion on that company and he wants it within an hour, there's not time to go out and build an elaborate model. You may need to come up with some quick and dirty results. I'm going to try and show you at least some short cuts at doing things like that. I'm going to talk about three things: discounting; risk margins; and aggregate percentiles. I'm really going to talk about two different ways of estimating a risk margin, but the first way involves discounting and so I want to give you some quick rules of thumb on doing discounting.

How should we do it if we have the time? What we would do is go out and get a lot of historical payment data, run that through our loss triangulation or other models that we think are appropriate; select the payment pattern; separately determine the ultimate liability. Then we apply the payment pattern separately, by line of business, by accident year, and with all of that work we can put together a payout schedule. Once we get the payout schedule we can apply discount factors and come up with a discounted matrix of payments and add it all up, and after a few days one has discounted losses. Suppose one has less time than that. I'm going to discuss a method that will work -- it's an approximation -- it works if payment reserves are approximately adequate. And I recognize that some of you would think we can stop there. You may at least have some estimate of how far off they are and you can make that adjustment, so you ought to be able to have some idea of what adequate reserves are or at least numbers you're willing to use for further calculation. This method is based on the assumption that the payment pattern is approximately exponential and you've heard vague references to McClenahan model in an earlier session, if you were at the previous session -- Chuck McClenahan model which is based on exponential pattern. It is my opinion that exponential patterns are not bad as a first cut, more work needs to be done, but I think they work reasonably well for quick and dirty analysis. It also requires that the company growth be reasonably stable. In other words, you're growing at 5-15% per year, and not materially changing from that. It turns out that these assumptions are reasonably robust, meaning if you're growing at 5, and then grow at 7 and then back to 4, that's not a problem. It's a problem if you grow at zero and then 50%, and then back to zero, then you'll have to do something a little more sophisticated.

What does it mean to say the loss payout is approximately exponential? The cumulative paid at any point in time is one minus e to the minus of some parameter. In other words, the unpaid at any point in time is e to the minus at or some parameter A. There is a very nice advantage to assuming the payout is exponential, and that is if you can combine all of the accident years. If you have, say the current accident year, and assume the payout is exponential, that means we expect a certain percent of it to be paid in the next year, and various percentages in the future years. It turns out if you're working with accident year 1975 as of the end of 1986 and looking at the outstanding reserves, those same percentages apply. So one doesn't have to say I used different factors for different accident years. It means one can lump all of the accident years together and talk about the payout of the total reserve. Again, this is only true under an exponential payout pattern. Let me give you an example of fitting. This is auto industry experience, and I've shown the bars. The left hand bars are the empirical patterns, this is the percentage of the ultimate paid in each year, and then I have fitted an exponential pattern to it. Your first reaction is this isn't particularly close because the expected in the first year is significantly different than the actual. The good news is one is often not interested in the payout in the current year. You're often looking at the reserves as of the end of the year and so you're only interested in the subsequent years. And although we're off, it comes out pretty close, and the exponential payout pattern is not a bad assumption. We determine that our payout pattern is close enough to exponential, but I have that parameter "A" in there, how do we estimate it. In words, "1" over "A" is the average length of time to payment. You might happen to know this from analysis that you've done or you have a feeling that in workers compensation that from the time the claim is incurred until the time it is paid is two years. In that case "1" over "A" is "2" and "A" is ".5" and you know your average payout. Suppose you don't happen to know the average payout. We can calculate it fairly easily if we let "R" be reserve and "L" be the latest year's incurred losses. Let's start from a steady state situation so that every year we have $100 incurred. In that situation you'll have a certain amount of reserves under a steady state situation, and suppose in this case we have $500 of reserves and $100 incurred each year. If we assume every loss is paid exactly 5 years after it is incurred, clearly you'll always have $500 in reserves and $100 incurred each year. Clearly the average payout time is 5 years and "A" would be 1 over that or ".2". It also works out with an exponential payout pattern-- actually it works out more generally under steady state situation that the rates of the losses represent the average payout period -- so once you come up with a value for "A" very quickly. Of course, in real life suppose we have a situation we think is steady state, then we can calculate the present value very easily. We know the current year's incurred losses and we know the total reserves, we simply calculate. The present value is incurred losses divided by the incurred losses minus the reserves times log of "D" where "D" is one divided by one plus i. Since this is an approximation we can make a very good approximation that "i" is approximately negative log D. We're talking about an interest of 5% and we calculate negative log "D", and that factor comes out to be .049, that's pretty close to 5%, and that's close enough to what we're doing here. We can simply state that the present value is the losses divided by the losses plus the reserve times the interest rate. There's a quick rule of thumb that will work as long as growth has been small. Unfortunately, that's usually not true so I'll go on to a modification. If you run across a situation -- you can say this company has $100 incurred losses every year and they've got $500 in reserves, so you take $100 over $100 plus $500 times .05 and there you have an estimate of the present value and you get the discount from that. If we have a situation where we've got growth we have to do a little bit more work.

Suppose "G" is a growth rate, you're growing 7% a year -- 10% a year, then we go to some math in the top part, and again this is the one that's more correct, but we can make an assumption again -- let "G" equal log of one divided by one plus the growth role-- approximating "G" this should be minus log 1 over 1 plus "K" if "K" is a growth. I'm getting a little bit sloppy here but if the true growth is 5%, the number you want to use in the formula is 4.9% -- it's close enough -- just come down here. In the numerator you take your incurred losses and subtract the growth rate times the reserve and add the interest rate times the reserves, and that will give you the present value.

I want to give you a quick numerical example. Again, you can get this pretty much from grabbing the annual statement. This company has $30 million up in reserves, their current year incurred losses are 10%. You estimate that they are growing about 8% a year. There's a schedule in the annual statement where you can actually calculate that if you wanted to or you could just have some feeling that they are growing similar to other companies, and pick 8%. And you decide you want to discount at 10%, and we take $10 million minus 8% of $30 million and divide that by $10 million minus 8% of thirty plus 10% of $30 million, and we get .717. In other words, the present value of the reserves is about 72% of 30 or $21 million -- the discount plus the reserves is $8.5 million. Again, the point is that if someone says here's a company, they've got $30 million in reserves -- they're running about $10 million in incurred losses a year. How much discount is there in the reserves. You can come up and say it's on the order of magnitude of $8.5 million-- it's $8-9 million or something like that and feel comfortable that at least that's a starting point for a discussion.

We haven't got into risk margins yet. Historically we've accepted nominal reserves -- nominal meaning not discounted reserves. We've put up the estimated ultimate losses or at least we thought we have or we tried to, and put that up and said that's the reasonable amount to carry. Actuaries have known for some time that the reserves are a random variable and that there's risk, and they haven't done anything about it. Why is that? One argument is that they've been undiscounted so they have an implicit risk margin. This is equivalent to saying that the discount in the nominal reserve is the same as or approximately equal to the required risk margin. Now, interest rates went from 3-4%, they've jumped up to 16%. It's hard to believe that the correct risk margin followed that same path, that when discount rates were 16%, that the implicit risk margin was as high as that. Just to give you an example of the magnitude -- if you're discounting at 3%, and suppose losses pay out an average in 3 years, the implicit discount is 8-1/2%, but at 16% which we had just a short time ago, the discount would be 36%. It's straining a little bit to argue that the appropriate risk margin at one time was 8-1/2% and at another time was 36%. When they say that, well, we can't accept the fact that undiscounted loss reserves provides a correct risk margin. But we might be willing to say at some interest rates it's true. In fact, mathematically it's provable that if somebody else tells me the correct risk margin to put up, I ought to be able to solve for the interest rate that gives me that number. Wouldn't it be nice for a number of applications that interest rate turned out to be that same number, that would give us a quick and dirty way of estimating the risk margins. We would just go in and discount that at the specific number. Let's see if I can convince you that there's some argument for doing that.

I've got long-term government bond yields over time back here for quite a period of time that didn't vary a lot, they ran 2-1/2 to 4%. I will argue that in that period of time people were not discounting and there wasn't much pressure to discount. The pressure to discount came when things jumped way up here. What I would argue is that during that period, prior to 1970, it may have been reasonable to conclude that the implicit risk margin meaning the discount approximately equaled the theoretical requirement. Why could we say that's sensible? Well there wasn't much pressure to discount. Let's try to do this mathematically. Well, suppose that's wrong -- suppose that's the wrong factor. It's the wrong factor if it's too high then there should have been a lot of pressure to discount. On the other hand, if it is much too low, if there isn't enough margin in there we should have seen a lot more companies going insolvent. If we conclude that during that period there wasn't a lot of pressure to discount and there weren't an inordinate number of

RULES OF THUMB

1. DISCOUNTING
2. RISK MARGIN
3. AGGREGATE PERCENTILES

DISCOUNTING

CORRECT APPROACH:

ANALYZE HISTORICAL PAYMENT DATA

SELECT PAYMENT PATTERNS

DETERMINE ULTIMATE LIABILITIES

APPLY PAYMENT PATTERNS SEPARATELY
BY LINE OF BUSINESS AND BY
ACCIDENT YEAR TO PRODUCE
PAYOUT SCHEDULE

DISCOUNT MATRIX OF PAYMENTS

DISCOUNTING

AN APPROXIMATION TECHNIQUE WILL WORK IF THE FOLLOWING ASSUMPTIONS ARE REASONABLY SATISFIED:

- -CARRIED RESERVES ARE APPROXIMATELY ADEQUATE
- -PAYOUT PATTERN IS APPROXIMATELY EXPONENTIAL
- -COMPANY GROWTH IS REASONABLY STABLE

LOSS PAYOUT APPROXIMATELY EXPONENTIAL MEANS, FOR EACH ACCIDENT YEAR

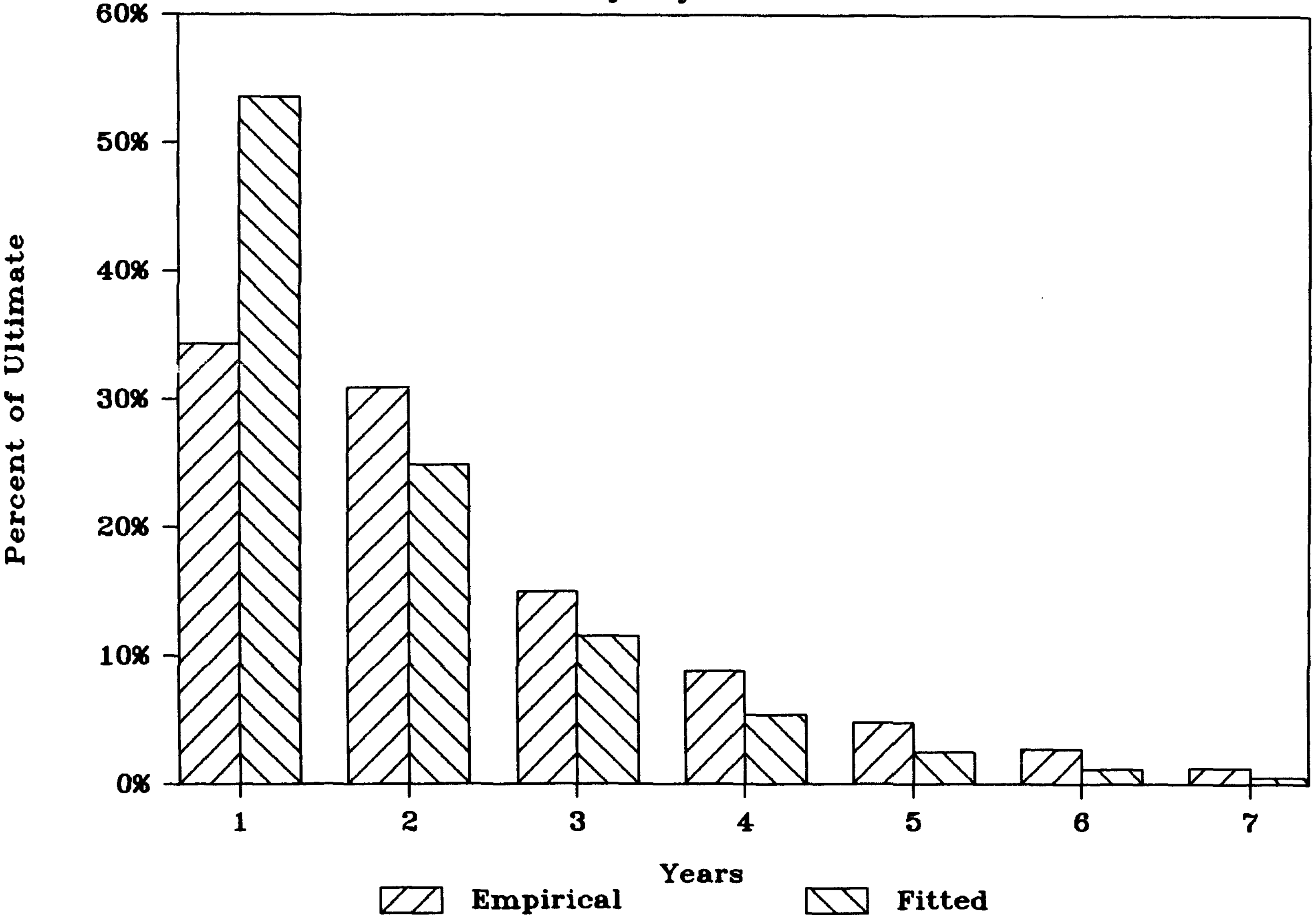
CUMULATIVE PAID = 1 - exp(-at)

UNPAID = exp(-at)

ADVANTAGE OF EXPONENTIAL DISTRIBUTION IS THAT ACCIDENT YEARS CAN BE COMBINED

Automobile Liability

Industry Payment Pattern



PARAMETER ESTIMATION

1/a REPRESENTS AVERAGE LENGTH OF TIME TO PAYMENT

LET R = RESERVES

L = ANNUAL (LATEST YEAR) INCURRED LOSSES

IN STEADY STATE SITUATION,

$$1/a = R/L \quad \text{OR} \quad a = L/R$$

Example: if every loss were paid exactly five years after being incurred, a company with \$100 incurred each year would have \$500 of reserves.

$a = .2$

IF WE CALCULATE PRESENT VALUE OF LOSSES WHOSE PAYOUT IS EXPONENTIAL WITH PARAMETER L/R, THE RESULT IS:

(1) $P.V. = L/(L - R \times \ln v)$ where $v = 1/1+i$

using approximation that $i = -\ln v$

(2) $P.V. = L/(L + Ri)$

In real applications, growth cannot be ignored. If we let g be the average annual growth in incurred losses, we can recalculate our present value.

(3) $$P.V. = (L + (k \times R))/(L + (k \times R) - (Inv \times R))$$

where $k = Ln(1/1+g)$

Again, using approximations $g = -\ln(1/1 + g)$

(4) $$P.V. = (L - (g \times R))/(L - (g \times R) + (i \times R))$$

EXAMPLE:

A company statement shows the following information:

RESERVES 30,000,000

INCURRED LOSSES (current year)	**10,000,000**
AVERAGE ANNUAL GROWTH	**8%**
DISCOUNT FACTOR	**10%**

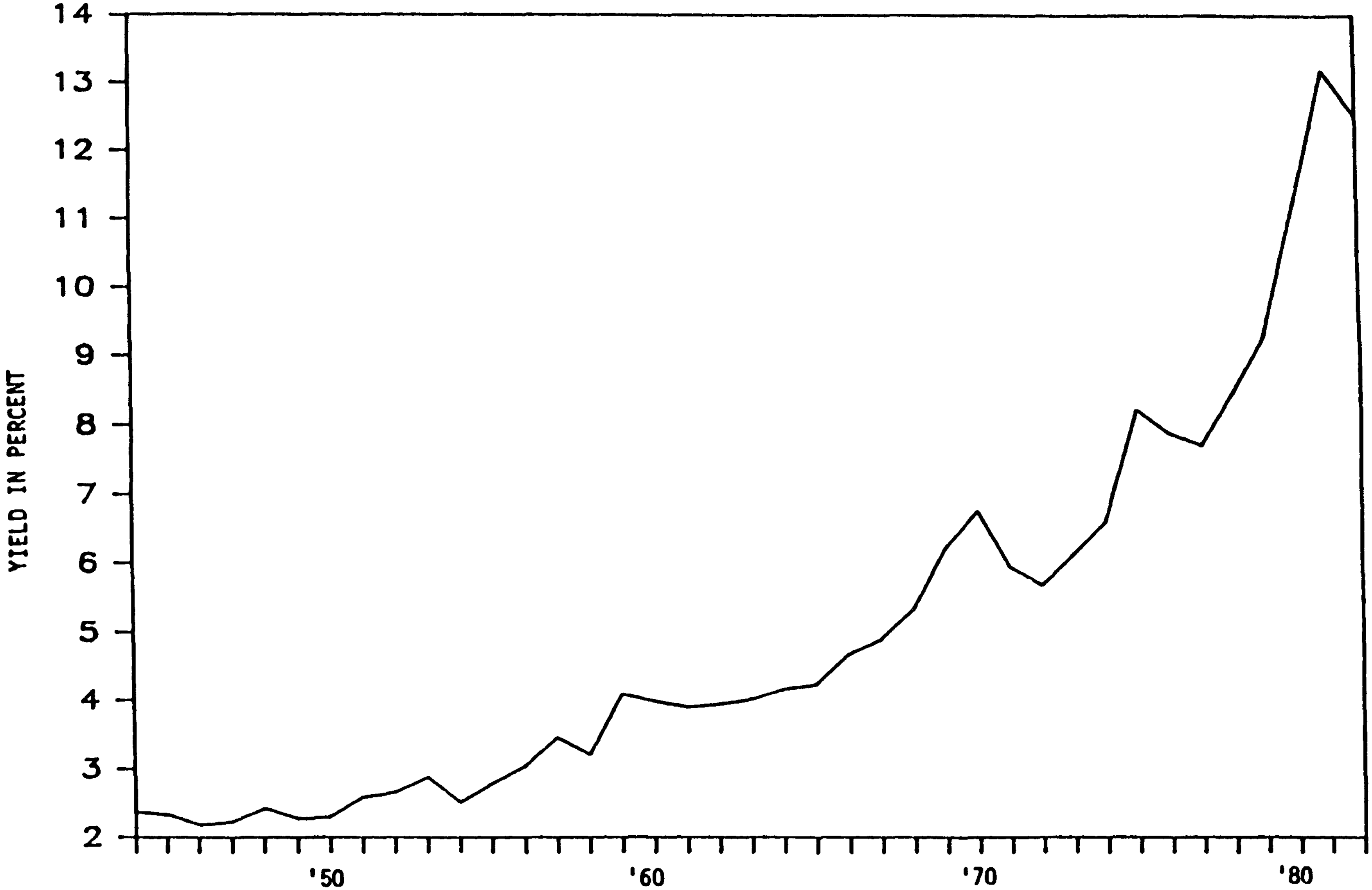
P.V. = (10 - .08 x 30)/(10 - .08 x 30 +.10 x 30)

= .717

Thus present value of reserves is approximately .717 x 30,000,000 = 21,509,400

Discount implicit in reserves is 8,490,600

LONG-TERM GOVT BOND YIELDS '44-'82



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RISK MARGIN

NOMINAL RESERVES ARE ACCEPTABLE BECAUSE THEY PROVIDE IMPLICIT RISK MARGIN

EQUIVALENT STATEMENT:

DISCOUNT $\approx$ REQUIRED RISK MARGIN

THIS APPROXIMATION CANNOT BE TRUE FOR ALL INTEREST RATES.

PERHAPS IT IS TRUE FOR ONE SPECIFIC RATE

ASSUME:

- **HISTORICAL INTEREST RATES WERE IN THE 3% RANGE PRIOR TO 1970**

- **DURING THAT PERIOD THERE WAS:**
  LITTLE PRESSURE TO DISCOUNT
  A REASONABLY LOW NUMBER OF INSOLVENCIES

THEN CONCLUDE:

RISK MARGIN APPROXIMATELY EQUALS THE DISCOUNT IMPLICIT IN RESERVES @ 3%

LINE	Industry Reserve	Discount $(000,000)	Risk Margin
MM	8,529	2,736	907
AL	40,732	4,833	1,830
WC	33,583	8,113	2,715
MP	18,596	2,081	785
OL	26,335	6,781	2,296
	127,775	24,544	8,533

Proposal

Use aggregate loss distribution techniques to estimate variability of reserves.

Advantages

- Objective
- Reproducible
- Documentation
- Simple
- Robust

Example

- Assume Aggregate Distribution Underlying Table M applies to Outstanding Claims.
- Expected Losses are $5,000,000
- Expected Paid at:

12 Months	25%
24 Months	50%
72 Months	80%

Table M was designed for Workers' Compensation but is applied to WC, AL, and OL.

Table M measures variability in upcoming year's losses.

The IBNR portion of reserves may be more variable than Table M, but case reserves should be less variable.

Overall - it may be a reasonable assumption.

RESERVE AMOUNT	Ratio to Expected		Dollars	
	75th	90th	75th	90th
1,000,000	1.306	1.827	1,306,000	1,827,000
5,000,000	1.250	1.623	6,251,000	8,115,000
10,000,000	1.226	1.535	12,263,000	15,352,000
25,000,000	1.195	1.419	29,865,000	35,481,000
50,000,000	1.171	1.332	58,533,000	66,576,000

insolvencies, we might be willing to conclude with some stretch of the imagination that discounting in 3% gave you the right risk margin. What does that mean today? What that means today is that one ought to determine an economic discount rate based on short-term rates or portfolio rates or whatever you want to do-- subtract 3% from that and discount at that rate, and that leaves you with enough risk margins. Let me give you an example -- here are industry reserves for medical malpractice, auto liability, workers' compensation, multi-peril, and general liability -- I think these are the 1985 year-end industry numbers. If I were to discount these at 7.2%, hopefully by now you recognize that is not a number taken at random but the number deemed by the IRS to be the correct rate. I've shown the amount of discount for the entire industry would be $24 billion. If in fact we discount at 7.2% minus 3%, we would get a smaller number and the risk margin would turn out to be these numbers. This would give you some idea of what reasonable numbers might be. Notice that the risk margin applied to medical malpractice is approximately 10% of the industry reserve. This number for auto liability is around 4-1/2% of reserves; for workers' compensation it's around 8%; multi-peril is around 4%; and general liability is 8.7%. It says that the lines are believed to be more volatile would require a larger percent of risk margin. Those with less volatility require a smaller percentage so at least it hangs together reasonably well. Overall, this works out to be 6.7% of this number.

[SPEAKER HAS STEPPED AWAY FROM MICROPHONE]

ROGER HAYNE: As Steve alluded to in the last segment of his presentation, a way to look at uncertainty in loss reserves is to try to figure out what the distribution of those reserves is going to be. Usually we come up with point estimates for the loss reserves and we say that our best guess is that company should have $10, $15, $20 million or whatever. Just simply knowing the point estimate is not enough to figure out how good that point estimate is. If the distribution around that estimate is very tight, you can be fairly certain that the final results will come out close to that estimate, and not have to worry too much about uncertainty. However, if the full distribution is wider, you should have some concern. You might want to look at your surplus to see if you've got enough to support possible- fluctuations. The real key in uncertainty is to try and get a handle on what the full distribution of your reserves look like.

One method that Harry Panjer alluded to in his presentation is the concept of the collective risk process. Effectively what I'll be doing today is walking through the general collective risk framework as it relates to reserves, and then quickly go through a couple of techniques to make some of the estimates that are needed to make that process work. Effectively, the collective risk model simply assumes that you randomly select a number of claims and add them up. The number of claims itself is the random variable and the claims can be chosen from the same distribution or different distributions.

Generally, what happens to make life simple as Harry pointed out earlier, is that you assume that the number of claims has a known mean variance and that all the claims are drawn from the same distribution. If you have a homogeneous enough selection of claims it's probably not so bad. In fact, given these very simple assumptions you can actually get estimates at every moment of your aggregate loss distribution or your final distribution.

You can calculate the mean which is what you would expect with average number of claims versus the average cost per claim. The variance has a fairly simple formula, you can go up to several more moments. These are papers in the CAS Procedures will get you there. Unfortunately, moments really are not enough. They don't give you a good feel for what the tail areas are. One possibility, given the moments, is Gary Venter's approach among others. I think Harry also used the moments. The idea is to take an aggregate loss distribution -- say your aggregate distribution is GAMMA, BETA, or transformed GAMMA, and pick the distribution that matches the moments correctly.

Another approach to estimating the full distribution comes from Monte Carlo simulation. And as Chuck McClenahan said this morning, it's really not all that glamourous, it tends to be rather laborious. It's easy to explain. Basically what you try to do is write a little computer model that says alright, randomly pick this number of claims, and then go through and pick that many claims out of the distribution and then add them up all up and that's one observation."

It's very easy to explain, it's very flexible. You can make whatever assumptions you want about the distributions as long as they are discrete. You can get whatever degree of accuracy you really need. The drawback is that it does chew up a lot of computer time. Another drawback -- you never really know when gone enough. You don't know if the next set of observation is going to change your mind completely about what your distribution is going to look like.

Another approach to estimating the total distribution is what I call "analytic approximation." Again, Harry has got some papers and has done quite of bit of work in this area. One paper that was presented in the Proceedings of the CAS in 1983, is by Glenn Meyers and Phil Heckman. That one makes some fairly general assumptions about what your claim count distribution is, and some very general assumptions about what your loss distribution is.

It then gives you an algorithm that will let you calculate your aggregate distribution given those two pieces. It's a very powerful tool, and given the speed of today's micro-computers, it is actually applicable all the way down to a micro level, even though I think Glenn's first applications were on mainframes. It's a value tool for estimating this aggregate distribution.

But generally, with regard to loss reserves, given the collective risk model itself, what we want to do first is try and get a handle on the distribution. For those of you who do have a handout I am skipping through a little bit. I wasn't sure exactly what kind of generality Harry was going to go through in his presentation, so I gave myself a little bit of slack in the handout. I'm up to Slide 8 for those of you who are trying to follow along. For loss reserves generally what we try to do is estimate what kind of distribution we're going to have on the total reserve amount, based on some sort of estimate of what the distribution of the number of claims is going to look like, and the distribution of what the size of those claims are going to look like. The general collective risk model as it stands, given the distribution for the number of claims, and given the distribution for the size of claims, will tell you how much variability there is in that statistical process itself. It tells you how much random noise you can expect if those two assumptions are met.

However, it doesn't tell you how good the parameter estimates are. It doesn't tell you how to factor in uncertainty about parameter estimates at least not directly. And it doesn't really go into other sources of uncertainty as Harry pointed out, such as the choice of the distribution or the choice of the model itself. Whether or not the collective risk model is really the right way to model this process. As for parameter uncertainty, what is often done, and the techniques that I'll be talking about today will look at some ways to address parameter uncertainty. But there are ways and there is continuing work being done ...

[QUESTION, INAUDIBLE]

Not necessarily so because you use that information in estimating the parameters. This does not bring up any current information.

What is assumed so far is that when you have made your estimates of the claim count distribution and loss size distribution you have somewhat looked at reality as opposed to making your judgment.

In the general framework of the collective risk model, in its applications for reserves what we try to do is select this distribution for your claim size, and also your claim count. There's an excellent text, it is on the CAS syllabus for those folks who have fairly recently taken Part IV. The text is called "Loss Distributions", it is written by a couple of gentlemen--Hogg and Klugman. It presents a comprehensive view on trying to get a handle on what distribution best models the losses that you've got. What you can do on the loss side is take a look at that and make some assumptions about your claim count distribution.

First of all, you pick a distribution. And usually if you pick a distribution it is parameterized by several parameters. The more common ones -- the log normal is parameterized by two, the mean and coefficient of variation depending on what form you're going to use, and Gamma distribution, there are several that can be used. There are methods that are given in Hogg and Klugman which will allow you to estimate the parameters of that distribution given real live honest to goodness data. One thing that you can do is say "let's look at the results of what our normal methods are. Our usual methods give us a reserve estimate of $10 million or $15,000 per claim. You can say I believe that so I'll use that as the mean of my fitted distribution. You can look at other data and try to estimate the variance. If you only have to worry about two parameters you can estimate the variance given historical data. And one way that you can apply this is to simply take the model, use the means from your projections and historical variance to specify the entire distribution. However, this approach as outlined does not recognized any uncertainty in any of those estimates. A couple of things you can do is to use past performance to try to get a better handle on some of the uncertainty within that estimate of the mean parameter or the variance parameter. You can also use Bayesian type approaches to build in parameter uncertainty into your final loss distribution and effectively widen the variance.

In the reserving process you can probably break out reserves into three pieces. I've thrown in reserves for reopened claims into the IBNR category. One is the case reserves where the amounts and -- the number of claims are both known. Whether those case reserves are right or not is another question. And the question of whether or not that's right is handled in something else that is called the development of reserves. The third component that you can look at in terms of reserves is the IBNR. The development reserves are only covering a known number of claims, so that the number of claims is certain and the only uncertainty there is the size. The third component is the IBNR reserve with the uncertainty both in the number and the size of the claims.

Now in the latter two cases the collective risk model can be brought to bear to estimate the overall distribution, and therefore the amount of uncertainty that is inherent there. In the case development reserve and thinking in terms of the Monte Carlo method, you'll always pick a known number of claims. Whereas, with IBNR there is a random number of claims that you're going to pick.

Up until now we've been talking about general framework of the collective risk model and we really haven't gotten into any of the distributions and the uses. What follows is one example, one possible way of approaching the question of parameter estimation. It is an approach which, along with a lot of other approaches in this area, does have its strengths and weaknesses. Here we're going to select the lognormal distribution and it has a lot of nice properties.

One of the nice properties is you take the natural lognormal variable -- you're down to the normal distribution which has a lot of nice properties. The lognormal distribution can be characterized by two parameters. It's mean and variance -- it's mean and C.V. What is often done to the mean and the variance of the distribution of the natural log is to consider the natural log which then is the normal variable. It turns out if you take the natural log of the individual claim and take the mean and the variance of those, you come up with maximum likelihood estimators of two parameters of the log normal, which is a very useful property.

What we're going to try to do is use this approach to try and get a handle on the development reserve distribution. What I'll also do here is include case reserves with development reserves, so we're looking at total reserves on unknown claims. Let's say you're trying to estimate the distribution of those reserves at 48 months. You can look at the current mean and variance at 48 months for your current book of claims. You can do that for older books of claims too. One thing that can be done is say-- well assume the ultimate log mean and variance is somehow related to the information we have at hand. Somehow we can build in what we know about our current claims. Looking at some old years where we're fairly confident in what the ultimate losses are going to be, we can see how the log mean and log variance for those older years at the ultimate level compare with the level at 48 months and try to relate the two.

One way to possibly relate them is to use standard linear regression to estimate what the ultimate is going to be, then apply this regression model to the current value to the log mean and log variance at 48 months for the year that we're worried about and then give an estimate of the mean and the variance for the ultimate distribution. That ultimate distribution can then be used to model the aggregate losses. Now there's a problem with just simply stopping here in that there is still uncertainty in the ultimate log mean and the ultimate log variance. Again, regression theory comes to the rescue. You can estimate the amount of variance in your mean parameter using standard regression theory and the standard error of forecast. You can not only get an estimate of what your parameters are but you can also give an estimate of how uncertain you are about those parameters. If there's a lot of variance or if the standard error is large, you'd want to put a little more variance into the claim size distribution. If it is narrow you might want to stay more with the fitted variance.

As it turns out, again the normal distribution has some very nice properties. And one property which is sort of useful is that if you have a variable that has an unknown mean and a known variance where the mean is normally distributed with unknown "M" and known variance squared. And if you also assume that the mean itself is normally distributed with the known mean "M-0" and the known variance "S2", then the original variable is again normal. It's mean is what you'd expect, "MO", the same mean as the unknown mean parameter. However, its variance is a little bit wider, and it's wider by the sum of the original distribution plus the variance of the mean parameter. We can use this concept to try to build in parameter uncertainty into the estimates of the parameter for the log normal. It's very simple then. What we would do is estimate the future mean using the regression model and the same thing with the variance, but we can add on the variance because of the unknown mean. Just as a numerical example in the handout, by the way there are more copies on the way. In fact, they should have arrived already. We should have them up here for the third session, and if not, I'll take business cards and we'll get you a copy. Just as an example, the estimates here with the log means and the log variances of several older years at 48 months versus what they are at ultimate, and the year we're wanting to project the log mean and the log variances are given. Going through all of the arithmetic -- the fitted parameters are using the regression model gives the parameters for the mean portion, and the parameters for the variance. The variance itself starts out to be about 3.3. However, the added uncertainty with the mean adds a little bit, in this case not too much because the means themselves were fairly consistent, there wasn't too much forecast error. But it does widen the final variance for the final distribution. That's one way to build in parameter uncertainty for the known reserve.

For the IBNR reserves you not only have the problem of what your distribution of claim sizes look like, but you also have the claim count distribution. For the claim size you can apply the same sort of procedure trying to relate the IBNR to the 48 months. What you could do is look at distribution of claims that were IBNR at 48 months, and see how that tracks out and then use that to try and estimate the distribution for the losses. Gary Venter, in a presentation that he made, came up with a very interesting approach to estimate the variance to the claim count distribution, which is the other piece of uncertainty with IBNR. The idea here would be to postulate that the percentage of claims that are reported at any given point in time follows a certain function. The function that Gary chose is given here. It actually does give a decent fit in quite a few situations with long-tails. Even though it looks messy it's not that hard to handle. He tried to fit that distribution to the payout claims for a known period. I think what Gary ended up using was some excess workers' compensation data. Given this distribution of known claims that are reported the distribution to fits this distribution. He'll apply methods that are shown in Hogg and Klugman to estimate these parameters. After a lot of crank turning, he comes up with estimates of the parameters, but also more importantly, we can also look to get estimates of how uncertain these parameters are. How much more uncertainty do we have in this estimation process? After you turn all of the cranks you get these three estimates shown on Slide 21 for the "P, B, and C" parameters. But we can also get the standard deviation of the various parameters and the corresponding correlation coefficients between the pairs. Given these three parameters, then the percentage of claims that are reported by 54 months is 66%. We know that we've got 336 claims reported by this time, so we can expect given this model 507 claims to be reported altogether.

Now we can then use some arguments and certain properties of various distributions to then estimate what the final distribution of these claim counts is going to be. If we assume that the number of claims at 54 months are binomial with a given probability of success of 66%, which is what we've determined, then we can assume that it is approximately normal. The distribution of the total number of claims given this chance of success is roughly normal with variance of 113.5, and roughly an unknown mean of 507. It turns out that you can then approximate the value H, which is a function of the parameter, you can approximate the distribution of that with a normal. And given

The Collective Risk Process

Model the total loss as the sum $X_1 + X_2 + ... + X_N$ where

1. The number of claims N is randomly selected and

2. Each of the claims $X_1, X_2, ..., X_N$ is randomly selected from claim size distribution(s).

Basic Relationships

Assume:

1. The number of claims N has mean E(N) and variance Var(N).

2. All claims are drawn from the same population with mean E(X) and variance Var(X).

3. All claims X_i and the number of claims N are all independent.

Then T has mean

$$E(T) = E(N)E(X)$$

and variance

$$Var(T) = E(N)Var(X) + E(X)^2Var(N)$$

Approximations of the Distribution of T

As a first step define distributions for the number of claims N and the claim size. Then either:

1. Use Monte Carlo Simulation

    Easy to Explain
    Can handle a wide variety of distributions
    Takes up a good deal of computer time
    Not easy to determine enough trials

2. Analytic Approximation.

    Deterministic; approximation does not depend on the number of trials.
    Can be computationally more efficient
    Often requires limiting assumptions regarding distributions
    May be difficult to explain in detail

Monte Carlo Simulation

1. Randomly select the number of claims N from the claim count distribution.

2. Randomly select N claims, X_1, X_2, ..., X_N from the claim size distribution.

3. Calculate one observation from the distribution of T by the sum $X_1 + X_2 + ... + X_N$.

4. Repeat steps 1 through 3 "several" times.

5. Estimate the distribution of T using the points generated in this manner.

Collective Risk Model

If x has probability density function (p.d.f.) f(x) and y has p.d.f. g(y) then the random variable z = x+y has the p.d.f.

$$(f^*g)(z) = \int_{-\infty}^{\infty} f(x)g(z-x)dx$$

The function f^*g is called the convolution of f and g. Similar to multiplication define f^{*n} iteratively by:

$$f^{*0} = 1$$
$$f^{*n} = f^*f^{*(n-1)} \text{ for } n = 1, 2, \ldots$$

With this notation let f(x) be the p.d.f. of the claim size distribution and g(n) be the probability of having n claims, n = 0, 1, ... The p.d.f. of T can then be written as

$$h(t) = \sum_{n=0}^{\infty} g(n)f^{*n}(t)$$

Characteristic Functions

Many analytic approximations make some assumptions regarding the various distributions and then approximate h(t).

Some make use of characteristic functions, denoted here by

$$C[f](t) = E(\exp(itX))$$

where f(x) is the p.d.f. of the random variable X and i is the complex imaginary number. These functions have useful properties.

Under rather broad assumptions there is a one–to–one correspondence between a function (p.d.f.) and its characteristic function. Also

$$C[f^*g] = C[f]C[g]$$

Analytic Approximation

An example of analytic approximation assumes that the claim count distribution is Poisson with mean v. In this case

$$h(t) = \sum_{n=0}^{\infty} e^{-v}v^{n}f^{*n}(t)/n!$$

Under convergence assumptions then

$$C[h](t) = \sum_{n=0}^{\infty} e^{-v}v^{n}C[f](t)^{n}/n!$$

Thus

$$C[h](t) = e^{v(C[f](t) - 1)}$$

Meyers and Heckman in their 1983 PCAS paper have given an approximate "inversion" for this, and other, cases. Their approach makes rather general assumptions regarding the p.d.f. f(x) and is very useful in applications.

Application to Loss Reserves

Given distributions for the number and size of claims, estimates of the distribution of total losses can be made.

Considerations:

This model estimates the variability inherent in the statistical process, sometimes called the process variance.

Not addressed are other aspects of uncertainty:

-- Choice of parameters (parameter uncertainty)

-- Choice of distributions

-- Choice of the model, the collective risk model itself

Parameter uncertainty is often addressed in the parameter selection. The other two aspects are more difficult to quantify.

Parameter Estimation

General Approach

First Approximation:

1. Select a statistical distribution (see Loss Distributions by Hogg & Klugman).

2. Use the results from standard methods to estimate the expected value for ultimate losses.

3. Use loss data, supplemented by judgment, to estimate the variance. Other parameters may be needed and could also be estimated similarly.

4. Recognize parameter uncertainty judgmentally.

Possible Refinement:

2a. Consider past performance to estimate the uncertainty inherent in the ultimate loss estimates.

3a. Compare the parameter estimate for "known" years to estimate variance of the ultimate claim size distribution.

4a. Estimate parameter uncertainty and explicitly include this in the model.

Components of Loss Reserves

	Counts	Amounts
Case Reserves	Certain	Certain
Development Reserves	Certain	Uncertain
IBNR Reserves	Uncertain	Uncertain

Case and Development Reserves

A Possible Approach for Parameter Estimation

Select a lognormal distribution for the claim size variable X. Then ln(X) is normal. The lognormal can be completely characterized by the mean and variance of ln(X).

1. Calculate the maximum likelihood estimators for these parameters by calculating the sample mean and variance of the natural logs of open claims at 48 months of development for "mature" years where ultimate losses are "reasonably" certain. Call these parameters $m_{48,i}$ and $s^2_{48,i}$ respectively.

2. Calculate similar estimates for these same claims at their "ultimate" level. Call these $m_{ult.,i}$ and $s^2_{ult.,i}$.

Case and Development Reserves

A Possible Approach for Parameter Estimation (Continued)

3. Given the parameter estimates from the first two steps use regression to estimate values of a, b, c and p in the models:

$$m_{ult.,i} = a + b(m_{48,i})$$

$$s^2_{ult.,i} = c + d(s^2_{48,i})$$

Then to estimate the parameters for the distribution of the ultimate losses for the current year calculate the parameter estimates $m^*_{ult.}$ and $s^{*2}_{ult.}$.

Case and Development Reserves

A Possible Approach for Parameter Estimation (Continued)

The expected value of $m^*_{ult.}$ and $s^{*2}_{ult.}$ are then taken as

$$m^*_{ult.} = a + b(m^*_{48})$$

$$s^{*2}_{ult.} = c + d(s^{*2}_{48})$$

In addition, the variance of $m^*_{ult.}$ can be estimated as

$$s^2_1 = (n-2)SE^2_f/(n-4)$$

where n is the number of points used in estimating the fit and SE_f is the standard error of the forecast given the observed value for m_{48}.

Case and Development Reserves

Parameter Uncertainty

If Z has a normal distribution with

$$\text{mean} = m \text{ and}$$
$$\text{variance} = s^2_1$$

where m itself is uncertain having a normal distribution with

$$\text{mean} = m_0 \text{ and}$$
$$\text{variance} = s^2_2$$

then Z has a normal distribution with

$$\text{mean} = m_0 \text{ and}$$
$$\text{variance} = s^2_1 + s^2_2.$$

Case and Development Reserves

Parameter Unc~~tainty (Continued)

Applying this to the above estimates $Z = \ln(X)$ is normal with

$$\text{mean} = a + b(m_{48}) \text{ and}$$

$$\text{variance} = s^{*2}_{ult.}$$

If this uncertain mean is assumed to be approximately normal with

$$\text{mean} = a + b(m^*_{48}) \text{ and}$$

$$\text{variance} = s^2_1$$

then Z will be approximately normal with

$$\text{mean} = m^*_{ult} \text{ and}$$

$$\text{variance} = s^2_1 + s^{*2}_{ult.}$$

Case and Development Reserves

Example Calculation

(Log–Mean,Log–Variance)

48 months	Ultimate
Historical Data	
(8.013,3.180)	(8.159,3.334)
(8.272,2.687)	(8.524,3.098)
(8.689,3.296)	(8.889,3.370)
(8.325,2.970)	(8.369,3.219)
(9.343,2.419)	(9.146,2.970)
Data for Projection	
(8.957,3.056)	

Case and Development Reserves

Example Calculation
(Continued)

Fitted Parameters:
$a = 2.315$ $b = 0.739$ $c = 1.853$ $d = 0.462$

Forecasts:

$$m_{ult.} = 8.934 \qquad s^{*2}_{ult.} = 3.265$$

Standard Error of Forecast of $m_{ult.} = .086$
Variance of $m_{ult.} = .022$

Selected parameters:

$$m = 8.934 \qquad s^2 = 3.287$$

Parameter Estimation

IBNR Reserves

Claim Size Distribution

Hypothesize a distribution.

Look at ultimate values for IBNR claims at a given stage of development for "old" years.

Estimate the c.v. for the distribution from this sample.

Estimate the mean from "usual" reserve projection methods or from past averages and distributions.

Parameter Estimation

IBNR Reserves

Claim Count Distribution

A different approach: Estimate the report lag distribution and use this to estimate the distribution of IBNR claims.

Assume that the percentage of all claims reported by time t is given by

$$F(t) = (t^c + pb)/(t^c + b)$$

This is somewhat convenient and often fits well for "heavy tailed" lags.

Parameter Estimation

IBNR Reserves

Claim Count Distribution
Example Data

Reported by 12 months	36
Reported by 18 months	67
Reported by 24 months	112
Reported by 30 months	166
Reported by 36 months	213
Reported by 42 months	259
Reported by 48 months	302
Reported by 54 months	336

Estimate F(t) and then estimate the ultimate number of claims by

$$U^* = 336/F(9)$$

Parameter Estimation

IBNR Reserves

Claim Count Distribution
Example Data (Continued)

Using maximum likelihood estimators (See p.122 of Loss Distributions)

$$p = .0312 \qquad b = 133.2 \qquad c = 2.511$$
$$std_p = .0231 \qquad std_b = 72.45 \qquad std_c = .4097$$
$$cor(p,b) = .8377 \quad cor(b,c) = .9525 \quad cor(c,p) = .8433$$

Using these estimated parameters the percentage reported at 54 months is

$$h = .6623$$

with expected number of claims

$$U^* = 336/.6623 = 507.3$$

Parameter Estimation

IBNR Reserves

Approximate Claim Count Distribution

T = Total number of claims at 54 months. Given h, T is binomial with U trials and a probability of success of h.

Thus T is approximately normal,

$$T|h \sim N(Uh, Uh(1-h) = N(Uh, 113.5)$$

Following from pages 117–118 of Loss Distributions, h is a function of maximum likelihood estimators and thus is approximately normal.

$$h \sim N(F(9), .00954)$$

Parameter Estimation

IBNR Reserves

Approximate Claim Count Distribution (Continued)

Combining these estimates, since $T|h$ is approximately normal and h is approximately normal, T is approximately normal and

$$T \sim N(F(9)U^*, .00954U^2 + 113.5)$$

Finally $U = T/h$ is a function of two normal variables and has an approximate normal distribution

$$U \sim N(U^*,(.00954U^2 + 113.5)/h^2)$$

So

$$U \sim N(507.3,76.5^2)$$

How to Quantify Uncertainty?

Given the distribution of total losses T at what level should the reserves be set?

1. Set reserves at the mean plus a multiple of the variance of T.

    -- Easily understood.
    -- Can be misleading, for example the chance for large losses is greater in a lognormal distribution than a normal distribution with equal means and variances.

2. Set reserves to be adequate a given percentage, say 90%, of the time.

    -- Easily understood.
    -- Percentage is arbitrary.
    -- Sometimes yields "unwanted" results. For example:

$$P(T = 0) = 0.95$$
$$P(T = 1{,}000{,}000) = 0.05$$

Here the 90% "confidence level" is 0.

How to Quantify Uncertainty?
(Continued)

3. Apply Utility Theory

    -- Established theory.
    -- Considers the entire distribution of T.
    -- May be somewhat more difficult to describe.
    -- Choice of the utility function may be "arbitrary".

Utility

If X and Y are random variables representing wealth. The utility function u is a function of a random variable which reflects the usefulness of that level of wealth to a person. Then

$$E(u(X))$$

reflects the "value" of the random variable X. The wealth distribution X is then preferable to that of Y if

$$E(u(X)) > E(u(Y))$$

Assumptions Regarding the Utility Function

1. u is increasing. Greater wealth has greater utility.

2. u is concave down for positive values. For positive wealth each added increment of wealth is worth less than the previous increment.

3. u is bounded above and below.

4. u has "negative relative risk aversion". The aversion to risk decreases as wealth increases.

How to Quantify Uncertainty?
(Continued)

If T is the distribution of total reserves and S is the amount of assets (excluding fixed liabilities) then

$$S-T$$

is the distribution of surplus.

Question:

What amount of certain reserves will "equivalent" to the uncertain distribution of T?

Answer, in terms of the "certainty equivalent":

That value of y such that

$$u(s-y) = E(u(S-T))$$

i.e., the amount of reserves for certain which yields an amount of net wealth for which the decision maker is indifferent as compared to the the uncertain ultimate net outcome as given by S–T.

Utility Example

Loss Variable:

T has a Gamma distribution with parameters

$$b = 5{,}000{,}000 \text{ and } c = 5$$

And p.d.f., with t in millions,

$$f(t)=t^4 e^{-t/5}/75{,}000$$

This distribution has mean

$$E(T) = bc = 25{,}000{,}000$$

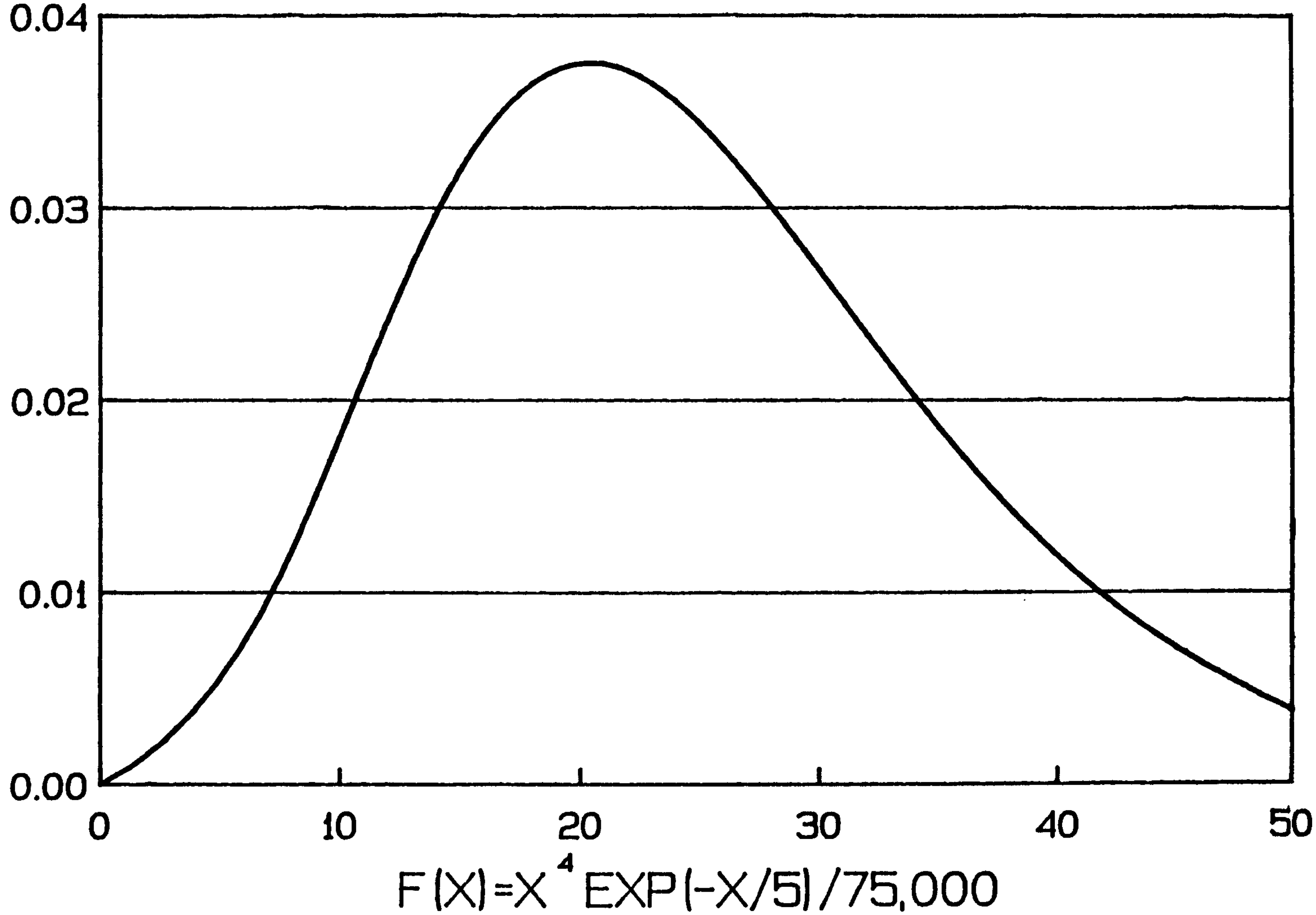
and standard deviation

$$b\sqrt{c} = 11{,}180{,}000.$$

Utility Function:

$$u(t) = \arctan(t/25{,}000{,}000)$$

LOSS RANDOM VARIABLE
X GAMMA IN 5,5



Utility Example
(Continued)

Assume assets, excluding fixed liabilities, are S = 50,000,000

Then

$$E(u(S-T)) = \int \arctan(2-t/25)e^4 e^{-t/5}/75{,}000 \; dt$$

$$= 42.215$$

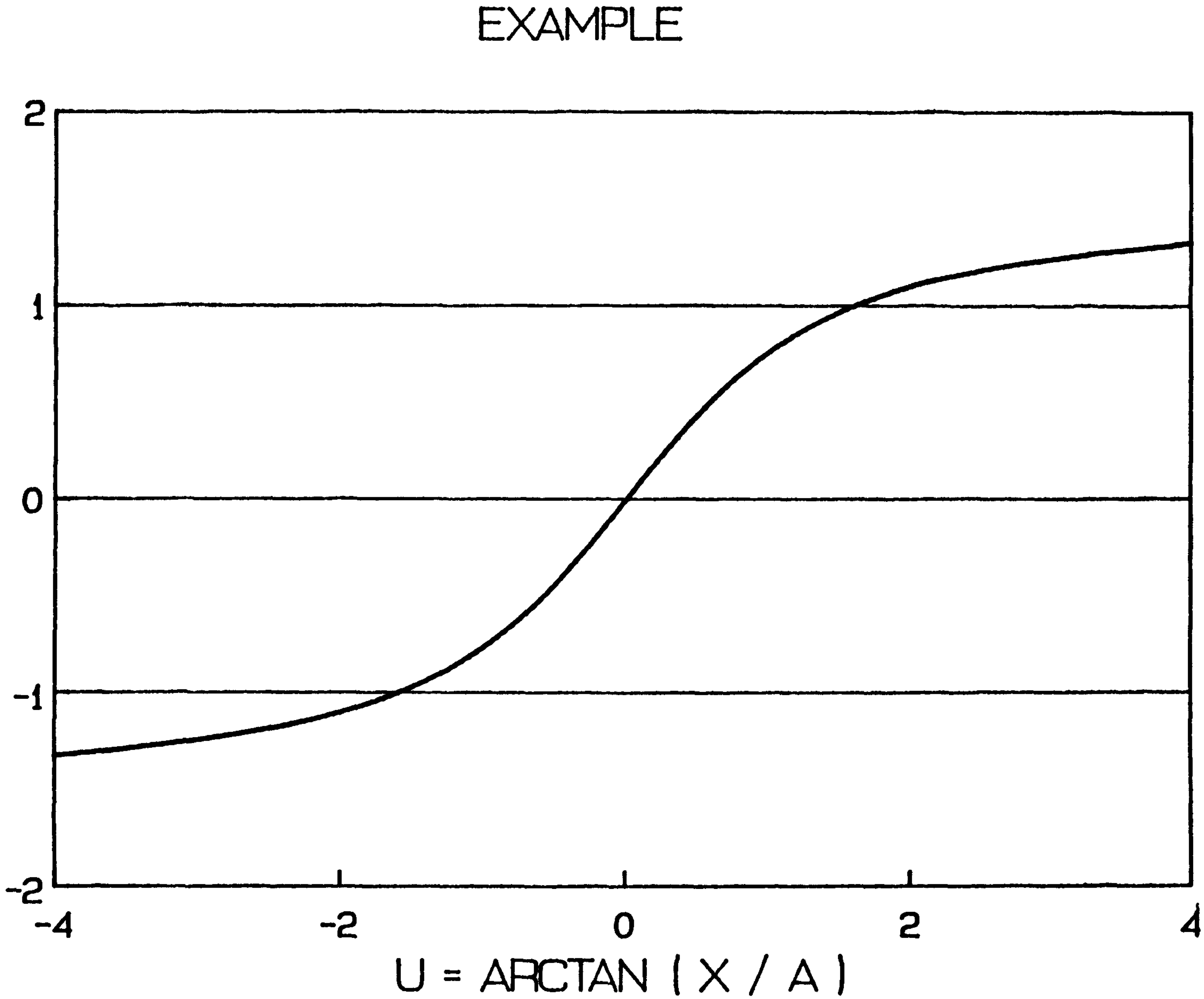
Thus we want

$$u(s-y) = \arctan(2-y/25) = 42.215$$

which is satisfied if

$$y=27.3$$

Thus given the above assets the loss distribution is "equivalent" to 27,300,000 in total reserves in terms of utility theory.


EXAMPLE
2
1
0
-1
-2
-4
-2
0
2
4
U = ARCTAN (X / A)

enough crank turning you can actually find out that thing has an approximate normal distribution with a mean .6623 and small variance of .00954.

Combining these together, you can then approximate the distribution of the number of claims at 54 months by a normal and then given that, you can approximate the distribution for the total number of claims again by a normal with a variance of 7615.

Often, the first step is to assume that the claim count is Poisson, and the Poisson distribution has a variance equal to its mean. In this case we can see that the variance will be quite a bit larger than the mean, so using simply a Poisson with a mean of 507, which is often done, would underestimate the amount of variance. Some of this variance is being added by the parameter uncertainty, some of it is being added by the nature of the distribution itself. I think we'll open it now to questions.

QUESTION: For Steve Philbrick. It has to do with your 3% rule of thumb idea. The idea that discounting at 3% gives you rough idea of what the risk margin ought to be. I guess this is not so much a question as an opportunity for you to caution some of these people not to run out and discount the reserves at 4.2% and think they've got the risk margin in the reserves. In the example you gave, the medical malpractice reserves had a risk margin by this method of 10% of the undiscounted reserves. What happens in a case when those medical malpractice reserves are inadequate from the beginning? It seems like this kind of rule of thumb would give you a risk margin on the low side when it ought to be on the high side.

STEVE PHILBRICK: The risk margin is intended to curve the places where your estimate is low. I would also take this opportunity to stress some things that Greg Taylor has stressed in the past and may stress later today. My approach estimates the margin independently of how one estimates the mean, and that is inappropriate, but as I mentioned this is a quick and dirty method. Greg has, in the past, emphasized the need to do them together so that if the data underlying it are more variable, it will generate higher margins. And so if you're more apt to be on the low side your more apt to be producing larger margins. I would answer Jerry's question by saying that's an argument for going onto more sophisticated models then simply stopping at rules of thumb.

JERRY MICCOLIS: I would like to remind you that all three of us will be available during Session 5G tomorrow morning at 8:30, along with the panelists of the other 3 sessions of this advanced track to answer any additional questions you may have or may occur to you between now and then.

I'd like once more to emphasize the importance of the issue we've been talking about over the last hour and a half. The CAS is in the process right now of codifying a Statement of Reserving Principles. I believe I saw Jim Faber in the audience; Jim is chairing the CAS Committee on Reserves which has responsibility for codifying those principles. The CAS will be distributing an exposure draft of those Statement of Principles shortly. I have had the recent pleasure of joining Jim on that committee, and I think he will allow me to tell you that the principles that you will see in draft form give very prominent mention to this concept of uncertainty in loss reserving, and put the burden squarely on the actuary to deal with that and to convey that in some manner when he provides the reserve estimates. It does not, however, render any advice on how to do that. That is the problem of the committee responsible for developing standards of practice. But we're all involved in this and we all ought to give it some serious consideration. We'll all be asked to provide commentary when those Standards of Practice are developed.

Thank you for your participation and please remember to fill out the evaluation questionnaire.

1987 CASUALTY LOSS RESERVE SEMINAR

LUNCHEON

Robert S. Miccolis, Chairman
Tillinghast/TPF&C

Introduction: Preston C. Bassett, President
American Academy of Actuaries

Luncheon Address: William D. Hager, Commissioner of Insurance
State of Iowa

ROBERT MICCOLIS: I have a few comments to make before I introduce our luncheon speaker. The plan for this particular seminar began three years ago when this city and hotel were selected. The 1987 Program Committee first met about 10 months ago, last December. We had a hardworking group of ten men and women who designed and organized this year's program. Seated at the head table from my left are Dave Hafling, Doug Kline, Howard Cohen, Donna Munt, Dick Falkquist, and Heidi Hunter, and on my far right are Bert Horowitz, and Patricia Furst. Rich Bill, who is also on the Committee was unable to be with us today. I'd like to give my thanks to this group and I hope we can all thank them for their efforts.

I also want to recognize the convention staff of the American Academy of Actuaries, in particular Mildred Prioleau and Audrey Green for their diligence. They have pulled together and pulled us through the second year in a row, where our committee of actuaries have severely inadequately projected attendance. Mildred and Audrey will you please stand. Please give them a round of applause. Also working with Millie and Audrey, and contributing to the success and support and manning the registration booth and helping out with all of the audio-visual equipment that fails in the middle of the session is Joanne Anderson, Gwen Hughes, Rita Marciniak, and Eric Parker, all of them under the general direction of Steve Kellison, Executive Director of the American Academy. Let's also give them a hand for their support.

I also want to recognize various members of the Board of Directors and Executive Council of the Casualty Actuarial Society and the American Academy of Actuaries who are seated at this front table and scattered elsewhere in the room. Even with their demanding commitments and other professional activities, they've been able to help us and also able to be speakers and faculty on the seminar. We hope that they can continue to give us the same guidance and assistance in the future.

There's a couple of first times for this seminar. This is the first time that we've had exhibitors and a literature table at the seminar. We'd like you to view this and put in writing your comments on the evaluation forms on what you think of the idea in general, and any specific comments or constructive criticisms that you may have. It's also the first time we've mailed registration materials to actuaries outside the U.S. As a result we probably have an all time attendance record for individuals outside North America, representing Denmark, Finland, Australia, Bermuda, Puerto Rico, the Philippines, Italy, Germany and England. The loss reserve problems that we face in the U.S. are getting international skepticism.

I would now like to introduce Preston Bassett. Pres is President of the American Academy of Actuaries, and will introduce our guest luncheon speaker.

PRESTON BASSETT: Thank you. It's a real pleasure to be here and thank you Bob. Sorry I missed the session this morning, I was delayed as you heard and missed hearing Commissioner Hatch's talk. I understand his remarks were excellent. The American Academy of Actuaries is very pleased to join with the Casualty Actuarial Society in putting on this seminar. As you know, we have an all time high attendance as this one will be pushing to 800 people, which is certainly a complement to all of those involved in the wonderful job that's been done. The American Academy of Actuaries, as some of you may not know, is an umbrella organization embracing the other actuarial organizations in the United States. Basically, we coordinate the activities within our profession, covering such areas as casualty work, health work, life and pensions. Particularly the Academy is involved with a public relations aspect -- dealing with the public, dealing with the government and state legislators; dealing with other professions such as the accounting profession and legal profession. It is quite appropriate at a meeting such as this which attracts state legislators, accountants and others for the Academy to join with the Casualty group in putting on this program.

I wanted to give you that little bit of background before I introduce our speaker today William D. Hager. He's been the Insurance Commissioner for the State of Iowa for a little over a year now. He has been active in Iowa for many years and is a native of Ashton, Iowa. He started his career there as Assistant Attorney General for the Iowa Insurance Department; moved on to become Chief Deputy of the Iowa Insurance Department, and later he went into practice for himself as an attorney in Des Moines, specializing in employee benefits and insurance law. Along the way I had a chance to meet Bill, when he was our General Counsel and Director of Government Relations for the American Academy of Actuaries in Washington, D.C. for a few years. It has been a pleasure working with him on various occasions since then. Bill also works closely with the National Association of Insurance Commissioners. He's on several committees and task forces. He chairs the Committee on Life Insurance and he vice-chairs the Statistical Task Force in Technical Services Subcommittee. He also serves on many other committees and task forces throughout his profession. Bill attended the University of Northern Iowa, where he got his B.A. degree. He went on to get a masters in Education at the University of Hawaii, and then got his Doctorate in Jurisprudence at the University of Illinois. Bill is a member of the Bar of Iowa and Illinois. It is with pleasure that I introduce to you Bill Hager.

WILLIAM HAGER: Regulators are seldom known for their candidness, but I'm going to be candid today. What I'm going to tell you is Preston made all of that stuff up. Actually, I was making shoes in Iowa before the Governor appointed me to this job; he felt that anybody that had been in that kind of trade could take all of the kicking around that one is likely to get in this job, and he's absolutely right. It's a great background for the job. I had spotted a couple of regulators in the audience that I want to recognize. Hal Elancy is Commissioner of Insurance in Utah; he is a friend of mine and a great Commissioner. One thing I do want to point out is that Hal wrote the speech I'm about to give. I haven't even read the thing, so if you don't like it or you don't like the delivery of it -- speak to Hal, please. Also, I recognize Bill Jean, who is an outstanding Examiner with the Iowa Insurance Division. He's been with the Department for 20 years and is doing a great job in the property casualty area. The one thing I'll point out about Bill Jean -- in addition to being an examiner, also he's written all the orders that come out of the Department and he does all of the commentary work, he advises me on everything. I'm just a front person here. If you don't like anything from the Iowa Insurance Department, see Bill. In recognizing these two dignitaries, I'm not suggesting that non-regulators are not dignitaries. I love giving speeches like this where I don't have to field questions from the audience. I give a lot of presentations to agent groups, company groups and I get questions like -- "what are you doing about replacement" -- "why haven't you run A.O. Williams out". So it's just great to be able to give a speech and not have to field questions. I don't expect anyone to come up and talk to me afterwards. I do want to get off a quick footnote. I'm happy to be here today. I'm very happy to be here. I flew up from Des Moines on Northwest Orient Airlines.

On the way down from my hotel room, 15 minutes ago, ABC had a special report out in regard to the life and well being of the President of the United States. In connection with that tragedy, as I understand the report that just came out today has been designated as World Prayer Day. In Moscow, Gorbachev is praying in London, Margaret Thatcher was praying, and likewise, in Washington, D.C. Ronald Reagan was praying. The whole idea was to generate some world-wide prayer to facilitate peace and economic well-being throughout the country.

According to the report that just came out is that inside the Kremlin Gorbachev was praying. Gorbachev said "God, when I assumed power in the Politburo I promised an efficient agricultural system. Now I'm really under pressure because it hasn't gotten any better. The situation is worse and I have to turn it around or I will be thrown out of power. God said: "don't worry Mikhail, the situation will be better by 1992." Gorbachev replied: "God that's just not soon enough -- I will be thrown-out of power by then!"

In London where Margaret Thatcher likewise was praying, the report was that she was praying and said: "God I need help with respect to unemployment. I promised to fire up this economy based on my conservative pro-business stance and now 25% of the vets have no jobs. God, when can I expect some relief?" God reserved to answer until 1994. Thatcher responded that's not soon enough, I might not be around that long. She had her eye on that recall provision of the British Constitution.

Anyway, in Washington Ronald Reagan likewise was praying and he was not praying as you might expect about the Persian Gulf situation but he was praying about the federal deficit. He said "God you know, back in 1980 as a conservative, I promised to balance the budget. When I came into office the federal deficit was $1 trillion, today it's $2.5 trillion. I never submitted a balanced budget, the current fiscal year is at $200 billion over balance and a $2.5 trillion deficit. If you fund that at 10% interest that's $250 billion a year into the budget just to service for that without amortizing it. When can I expect some relief from this problem. God answered "I won't be around that long."

I want to talk today about a very straightforward subject that I hope will be pertinent to the people in this room. That subject is-- what state insurance departments ought to be able to expect with respect to the work product of casualty loss reserve specialists. What should regulators be able to expect? In terms of framework I'd like to talk about three or four principles. One is the principles relating to loss reserving that I think everybody in this room can concur with. I'm not talking about methodologies. I'm not talking about the technique, but basic overriding concepts. Secondly, I'd like to talk about getting these principles. Specifically, what can the insurance division and any particular state have the right to expect. Insurance Commissioners reflect on some principles of liability in the event of insolvency as they make a determination as to what will mean as to the loss reserve specialist. Those are the decisions that are made daily with respect to every insolvent insurer. On my desk now is a memorandum relating to one of our insolvent insurers and the analysis goes to whether we include as a party defendant the loss reserve specialist that did the work on it. Finally, I have some suggestions relating to loss reserve activities, they're worth exactly what you've paid. One of the principles that all of us can agree on in the broader continuing with the loss reserving activities. First of all, some arguments. Loss reserves, of course, are the largest liability on the balance sheet. Not only are they the largest, they probably present the greatest volatility. The greatest potential area for up or down in terms of adequacy of those loss reserves. It seems to me that it's critical and obvious that those loss reserves be adequately set.

There is a second principle that the public sometimes loses track of and I would hope that loss reserve specialists don't. In any case, between regulators and insurance companies, with respect to reserves, insurance executives manage insurance companies and state insurance departments do not. It seems obvious but occasionally overlooked. Why is that a critical thing? One thing I think we can agree on is this -- insurance executives and the professionals they hire are therefore ultimately and legally responsible for the adequacy of the loss reserves and not state insurance departments.

The third principle is that in a number of insolvency and negligence actions loss reserve specialists have been named as defendants. Obviously, there is a caveat there if there has been a problem in terms of the adequacy of the loss reserves. What should state insurance departments be able to expect? I have chatted with some other commissioners. I have chatted with our examiners in charge that carry out the examination process. Here's a list of provisions that I think all of us as regulators and those who do the work-up would hope I would concur with. We should be able to expect that real estate loss reserves have been set. These are loss reserves that can be demonstrated and substantiated by historical development. It seems like such a simple principle, but you know insurers have become insolvent as a result of management ignoring very, very simple principles. State insurance departments have to be able to expect that loss reserves are realistic based on historical development. We also ought to be able to expect that loss reserves are adequate even after we inspect Schedules O and P. A number of you spend a fair amount of time looking at Schedules O and P -- underwriters do as well. It's outstanding how much deficiency in loss reserve development is reflected in those schedules. We should be able to expect that loss reserves accurately reflect the specific insurers liability for the types of policies under consideration. The operative issue in terms of adequacy of reserves is whether those reserves are set appropriately for the policies at issue. It should be a generic set of policies, not a gross sectional portfolio, but specifically for the types of policies for which that reserve is being set.

Incurred but not reported IBNR is the biggest challenge. State insurance departments ought to be able to expect the IBNR and reserve that has been set up for IBNR has been documented by historic loss patterns. State insurance departments ought to be able to expect with respect to IBNR that the reserve has been established and somehow relative to the gross premiums involved. There ought to be some connection between IBNR and policy count. I had an insurer in my office the other day who we contended after examination had an inadequate IBNR. The IBNR that they used was 4% of the current book of claims. We asked them where they came up with the 4%. It was a number that was simply extracted and hoped that it adequately reflected the IBNR. It did not until we focused into both of our reserves, our technique was very simple. We went back as to prior years and examined the IBNR development. The other day someone said there was no need for IBNR at all. You may find that astounding. I found it astounding -- but again, a number of the challenges that related to insolvency manifest themselves through very, very crude states.

What else should state insurance departments be able to expect of the loss reserve work product -- adequacy of reinsurance? What does that have to do with loss-reserving. Perhaps, from the structured standpoint, not much. From a realistic standpoint quite a bit. It's critical because if reserves are not adequate and if the reinsurance is inappropriate and if there are serious questions about the solvency of that reinsurer. The probability is that the reinsurer is not going to pay off on the losses, then by definition the reserves are inadequate. Does the reinsurance contract accurately reflect, does it take into account frequency and severity beyond company specific issues? What else should regulators be able to expect? You've got to be able to expect that in addition to company specific analysis of the reserves, that the loss reserve specialist also examined industry-wide data as it relates to book of business at issue. Let's take, for example, IBNR. Perhaps the historical development of IBNR for that particular insurer shows that unless the requirement to reserve is less than the industry standard on a nationwide basis. When that insurer becomes insolvent, when the IBNR reserve is examined, and if the IBNR reserves proves to be inadequate, one of the foundations for liability for the loss reserve specialist, by definition, would be if the loss reserve specialist failed to take into account the fact that the industry-wide IBNR development was significantly higher than that experience by a particular insurer by definition. That is an area that is going to be examined.

Finally, what are some principles of liability that state insurance departments look at when they examine the issue of whether loss reserve specialists, their firm, whether it be a consulting firm, accounting firm or whatever; be named as a party defendant when the insurer becomes insolvent. These are real issues and problems--these are not hypothetical. They go on everyday in every liquidation activity. The key component I would hope the loss reserve specialists would keep in mind is a very simple provision. That is--when the old-timers, and I don't mean old timers in age, I mean old-timers in thought. When the old timers try to tell you tot setting reserves is an art and not a science, bear in mind that that's exactly what they're talking about -- the old times. Believe me, if you're sued you'll be the only person who believes setting reserves is an art and not a science. Chat with the folks that have been sued. Anyway, please bear in mind, that's the criteria that state insurance departments will look at in terms of naming a defendant. Very simply, what's the degree of participation of a loss reserve specialist? How accurate is a loss reserve specialist's opinion? If the loss reserve specialists has done their job, it's the degree of reliance on that opinion by management. The management, in fact, sets the reserves at the recommended level. Then there's the degree of cooperation between the loss reserve specialists and the state insurance department. In many instances, we get calls from people that have worked on reserves long before insolvency problems and they say you folks ought to get in here and you ought to take a look at what's going on. You have to make your own decision as to whether you do that, but I can tell you that level of cooperation is very powerful in terms of making the decision from a joining defendant standpoint.

What are some recommendations? Our recommendations from a regulatory standpoint are very simple. Set the reserves or whatever your job assignment is -- set those reserves as if your career depends upon your work product, because it does. Set those reserves as if your personal assets depend upon your work product because they do. Set those reserves as if your employers assets depend upon your work product because they do. Set those reserves as if the accuracy of your work product will determine whether a beneficiary's family has food to eat -- because it does. Set those reserves as if the level of public confidence in the insurance mechanism depends upon the adequacy of reserves, because it does. Set those reserves as if each premium of adequacy depends on accurate reserving, because I can tell you they do. Set those reserves as if the insurers solvency depends on accurate reserves, because it does. And finally, help everyone-- help the regulators, help the public, help your profession, help yourself by adhering to a very simple principle we can all support and that is: don't fool around in this area unless you know what you're doing, an if you don't, please hire someone who does. Thank you very much.

PRESTON BASSETT: I just want to repeat one announcement because some people may not have heard it this morning. Session 6H -- Loss Reserve Certification Standards is in the Lafayette Room on the 8th floor tomorrow. I think it is the repeat session. The other sessions start in about 7 minutes.

1987 CASUALTY LOSS RESERVE SEMINAR

3C/6H - LOSS RESERVE CERTIFICATION STANDARDS

Moderator: Warren P. Cooper, Vice President & Consulting Actuary
Huggins Financial Services

Panel: Douglas J. Collins, Consulting Actuary
Tillinghast/TPF&C

C. K. Khury
William M. Mercer, Inc.

William D. Hager, Commissioner of Insurance
State of Iowa

Recorder: Marlene D. Schustar, Sr. Actuarial Assistant
General Accident Insurance

WARREN COOPER: The one after, Bill Hager, has talked to us at lunch. Unfortunately there was a bit of a mix-up in the program. I originally asked Bill to be on this panel, knowing his background, particularly as general counsel of the Academy and the talks that he has given about professional matters and Congressional responsibilities over the years. Bob Nicholas then asked him to be the luncheon speaker and he agreed to do that but wanted to remain on the panel. I said, "Great, I want you on the panel, but in putting together the booklet they left him off. He is a full fledged panel member and has been so engaged for several months. He has gone down to get some photostats, we'll get everybody here together sooner or later. This is a very serious topic that we're discussing today. It's not something that any of us should take lightly. There is not very much known nor much publicity about the area of actuarial malpractice, but it is indeed out there. There are cases -- they're not getting very much play at the time. You did hear Bill say that he was considering in the case of one now defunct Iowa company, whether he should go after the loss reserve specialist. Just so, we ought to review what has been happening in the last very few years. New York, California, and New Jersey have for some years now required the submission of an opinion by a qualified loss reserve specialist. Last year New Jersey made theirs a lot sharper and put a lot more teeth in it; the others have followed suit. However, despite that we saw earlier this year, a major problem for New Jersey in the liquidation of Integrity of Paramus. They stated, I know perfectly well, having been the person that actually put the requirement in existence in New Jersey, that their statements had come in with an opinion by a qualified loss reserve specialist. New York has also required it for some years for their domestic companies. And yet during that time we saw Constellation, Ideal Mutual, The American Plan Companies, Union Indemnity, Dominion of New York and Midland all go into liquidation in the Empire State after they had been given clean opinions by a loss reserve specialist. California during this period has also made a requirement for an opinion, and yet very similarly we saw Califarm go under, only to be resuscitated in a different guise. But the grandfather of them all that is running just shocks throughout the whole industry is Mission Reinsurance, that has taken or will take other companies along with it which, of not the least, is our little New Jersey company of Integrity. They had 40% or their assets and its affiliated companies. The insurance department had no choice but to bring it under liquidation because there is very little likelihood that that reinsurance will ever be realized. We are talking about very serious matters throughout here, and those of us who are in the profession take it, at least I hope we all take it very, very seriously. Setting that rather glum note, we'll turn to our first speaker, who has just recently changed jobs and became one of us -- a consultant who is Stan Khury. Stan was for several years not too far from me out in Holmdel, but just recently he has come to work for William M. Mercer, Inc. in New York and is building an actuarial consulting operation for Mercer.

STAN KHURY: Thank you Warren. I'm sorry for being late. I didn't have a chance to give Warren the introduction that I wanted, but I wanted the commercial and he already did it. The name of the firm I'm with is not William Mercer, Inc., it's a subsidiary of that firm and it's called Mercer-Future Cost Analysts; formerly known as Future Cost Analysts, headed by Fred Kilbourne.

I like to bid you a good afternoon. I welcome you to beautiful downtown Minneapolis. I would like to share with you a little discovery. It has nothing to do with the subject at hand, but permit me a little indiscretion here. I guess I'm typical in that I tend to find opportunities such as this very enticing. I look forward to them for 100 different reasons. But I always seem to run into a problem, and that is after all the preparation -- how do you bring a subject that is dry, serious, utterly humorless, and establish contact with the audience. After reflection I decided that the best way to do this is that you have to start with something utterly unserious. Without further ado I would like to share with you a letter that a freshman coed wrote home "Dear Mom and Dad: It has now been 3 months since I left for college. I had been remiss in not writing and I am very sorry for my thoughtlessness in not having written to you before. I will bring you up to date now, but before you read on, please sit down. You are not to read any further unless you are sitting down. I am getting along pretty well now. The skull fracture and the concussion I got when I jumped out of the window of my dormitory when it caught on fire shortly after my arrival, are pretty well healed now. I only spent two weeks in the hospital and now I can see almost normally. I get those sick headaches only about once a day. Fortunately the fire in the dormitory and my jump were witnessed by an attendant at the gas station near the dorm. He was the one that called the fire department and the ambulance. He also visited me at the hospital, and since I had no place to live because of the burned out dormitory, he was kind enough to invite me to share his apartment. It's really a basement room but it is kind of cute and quaint. He's a very fine boy and we have fallen deeply in love and are planning to get married. We haven't set the exact date yet but it will be before my pregnancy begins to show. Yes, mother and dad I am pregnant. I know how much you are looking forward to being grandparents, and I know you will welcome the baby and give it the same love, devotion, and tender care you gave me when I was a child. The reason for the delay in our marriage is that my boyfriend has some minor infection which prevents us from passing our pre-marital blood tests, and I carelessly caught it from him. This will soon clear up with penicillin injections I am taking daily. I know you will welcome him into our family with open arms -- he's kind and although not well educated, he is ambitious. Although he is of a different race and religion than ours I know your tolerance will not permit you to be bothered by the fact that his skin color is not like ours. I am sure you will love him as I do. Now that I have brought you up to date I want to tell you that there was no dormitory fire. I do not have a concussion. I was not in the hospital. I am not pregnant. I'm not engaged. I do not have syphilis, and there is no tall good looking man in my life. However, I am getting a D in history, an F in calculus, and I wanted you to see these marks in the proper perspective.

The moral for me, I guess, is that there is life after loss reserve certification. We've got to keep that in mind and keep our perspective. Today I would then like to deal with the subject at hand structurally and would like to do it on two different planes. First of all, I would like to share with you some perspectives and observations on the loss reserve certification process. With that background I would like to move on to the second part, that is, describe the broad elements--the road map to be followed by the loss reserve certifying actuary. You will note here the distinction between the person who calculates the reserves and the person that certifies. They can be the same but these are really two different functions. Those of you who work for an audit type firm will appreciate that difference. But in any event, I am assuming there is a difference and if you find my references roll from one function to another, it's kind of unintentional.

With respect to the first point I would like to ask you to look with me at any estimate of a future happening. Examples, look at weather forecasts, GNP estimates, stock market forecasts, psychic readings, longevity estimates of cancer patients, and thousands and thousands of other estimates of future happenings. I think you will agree that they are all subject to one ultimate test--the test of time. In fact, if you wait long enough you will find out just how good that estimate was. Loss reserve estimates are no different. They are subject to the test of time. Unfortunately we don't have a time machine where we can sit and dial up a future year and see how good is this or that estimate. That just doesn't exist.

To illustrate this point further let me share with you what a surgeon does with a prospective patient for a quadruple bypass. Of course, the statements that the doctor can make can range all the way from "estimating that you will recover completely and return to perfect health" to "you will probably die on the operating table". What does the surgeon have to do here. The client/patient wants assurance. The surgeon, first of all, does not guarantee the outcome of the operation. If he has statistics to point to in terms of "out of so many operations I've done so many have been a success" -- he'll point to those. If the medical procedure is generally successful he will point to that. On the other extreme the doctor can say -- "Well, I am current on all of the relevant technology, I have a great deal of experience with this procedure -- the facilities are terrific and we have great back up and so on and so forth." There is a representation here as to extreme ranges. On one end you have full statistical support. On the other hand, if you don't have the statistics and you have a 30% rate, what does a surgeon have to do. He has to speak of the process itself -- that the process will be the best that is available.

I would like to transplant this analogy, no pun intended, to the insurance problem -- loss reserve certification. Pretend the actuary is a surgeon and the patient is an insurance company or a self-insured plan. In order to assess the possible outcomes here we have two extremes again. On one extreme is if the practitioner turns in a credible performance year in and year out with a long track record, that person doesn't have to do much more than say this is the reserve and you will probably just take it. You really don't have to do a whole lot more. On the other hand, if there are a lot of environmental changes included in the historical data, for example, there is a new claim system in the company or in the self-insured plan, judicial decisions and external environment come in and change the ball game, and there are changes in the contract. What do you do? You have two extremes here again. One, you can refer to the track record, that has met the test of time. If you can't do that then you've got to look at the process. That is the kind of assurance the certifying actuary can give to the client.

I would like to make a brief digression for just a moment and talk about a side issue that tends to operate even though generally only implicitly. I think you'll recognize it immediately. That is, the purpose for which the reserve is being certified. If the purpose is to certify the normal quarterly or monthly update, then that's one thing. It affords great opportunity to recover from bad data, bad judgments, bad methods and so on. You're doing this job every quarter or every month. That's on one extreme. But if the certification is going to serve as a basis for an acquisition or as the basis for a major reinsurance treaty commutation negotiation, you're going to get only that one shot. Money is going to change hands based on what you say. I think that's a place where the actuary is particularly exposed. Again, I harken to Commissioner Hager's comments at lunch. I suppose one can say in a vacuum that under both circumstances (whether you're working on a regular updated reserve or whether you're working on part of an acquisition), the answer should be the same. That is technically true, but I think, only in a vacuum. Reality is when you're dealing with an acquisition situation you have relatively zero chance of recovery. If you made a mistake -- you really have made a mistake. I think that will require a much greater degree of rigor in terms of the activity required by the certifying actuary.

With that digression aside, I would like to now shift to the second aspect of my comments. That is the broad elements of the road map to be followed by the certifying actuary. Let me first remind you that in this segment I'll not be dealing with the situation of the actuary with a great record. If the actuary has a great sustained record of hitting the mark every time. That's really not a problem, and we can go home and rest. The focus here is on the case where the certification of the process is really what is truly required. The same as the surgeon talking to the patient saying "these are the assurances I can give you about the process itself." The method that the certifying actuary should follow should consist of a review and assessment of three broad aspects of the process. One is the data; second is the analysis of the data; and third is the presentation of the results. Let me deal with each of those and I will briefly amplify them and hope that the question and answer period will give us a chance to develop them some more.

With respect to the data issue, I'd like to point out four aspects that the certifying actuary has to examine. One is the actuary has to be certain that the intrinsic data that is available is complete that it is the most complete set of intrinsic data that is available. This is an element of assurance that the actuary has to bring to the process. Second, there has to be assurance that the completeness of the relevant extrinsic data is present. In other words, you have looked at all the data that is relevant to the problem internally and all the data that is relevant to the problem externally. Third, is the quality of data issued. How good are the data you're using? How good is it in terms of the input? When a claim comes in how rapidly is it put into the system? What are the adjustments that have been made to the data by the systems people. And those of you who have dealt with systems people know enough not to assume that the number that went in is the same number that came out. By the time the programmers are done, the numbers change. And there are other elements of quality. Fourth and last, is a very important aspect of all the factors I mentioned earlier, deals with the influences operating on the data. I think the certifying actuary has to ascertain the types and degrees of influence the operational process has on the data. Let me give you an example. Suppose a company puts in a new claim system.

That immediately changes the basis of reporting. What are the structural changes, the changes in the coverage of the contract? History is based on one contract, the future may be based on another. What external pressures are present from the judicial environment? A precedent setting decision comes down that makes all of your history really irrelevant or creates the need for significant data modification. What are the reinsurance retention limits that are applicable to this particular company? Does that influence the reserve setting process? I suspect the answer is yes. To what degree? That's the job of the certifying actuary. You have four key elements of assurance a certifying actuary has to explore before he renders the data to be good data to do the work.

With respect to the analysis I would like to identify six different elements of assurance. I will skip through them quickly. The first one is the appropriateness of the adjustments made to the data to recognize the future conditions that are going to be applicable. What is the quality of that adjustment to the historical data? Second, are the methods that have been selected appropriate for the situation? If a paid loss development method is used on medical malpractice, you'd better look again. It just doesn't apply. For physical damage insurance, you can use some very crude systems to come up with very reliable estimates. Are the methods appropriate for the situation? Are the methods applied properly? If you have a scalpel are you trying to use it as if it is a meat axe? It is just as important that the proper method is applied properly. Another is the judgments that are applied. Are they rational or are they mystical? Again, I harken to what Commissioner Hager said at lunch. Where did that 4% come from? Some actuarial work that I have seen would say the answer is 5, 4, or 7. Is it rational? Does it have a foundation, or is it mystical? I think we have to endeavor as actuaries to avoid the mystical aspect because that gives us all a bad name. We just haven't yet got tp physics doing loss reserve certification. The next one is: has there been sufficient testing of reasonableness of the outcome. Again, versus industry -- what are the reserve levels being set vis-a-vis what the industry has that is available to look at? What is the pure premium versus the pure premium that underlies the loss reserve estimate? What kind of loss ratio does it produce? How does it compare versus history? You can just go on and on. There are reasonableness tests that the certifying actuary should observe in order to render the reserve estimates to be clean. Finally, has there been sufficient sensitivity testing conducted in the process? In other words, if an assumption is changed, what would the outcome be? These are 6 aspects that I think the certifying actuary should evaluate on route to pronouncing the reserves reasonable.

Finally, I would like to speak to the presentation element of the reserve certification work. I have five aspects listed to share with you. 1) Are the correct assumptions clearly spelled out? Does the client know? The client can be an insurance company or a one time client paying for a consulting service. Does the client understand the assumptions that have been made? 2) Are appropriate caveats provided so the client understands the limitations of the work that is being presented? For example, with respect to payability of reinsurance recoverable, Commissioner Hager mentioned that again in his luncheon address. Does this really affect your calculation? Does this affect your judgment? The variability aspects -- all of the caveats that surround the final judgment, have those been communicated to the client? Mind you the client may not like to hear some of that, but it is your duty, if you're going to certify those reserves to make sure that that client has the caveats. The third aspect on the presentation is the consistency between the numerical results and the qualitative statement. I've seen at least one piece of work where after many, many pages of calculations and tables and Lord knows what, and estimates range quite a bit; and then there's a very simple statement at the end that reserves are reasonable. I cannot accept this. You have to mention that the calculations that you performed did not produce conclusive answers. You just can't come out and say it is reasonable. The next item is the sensitivity of the results to change in the critical variables. For example, if you've made a judgment that the number should be 4 or 7 or what have you, does the client know the effect of this critical variable, if you were to assume 5 or 9? I believe the certifying actuary has a responsibility to see to it that the work does reflect some sensitivity testing. Finally, is the best probability statement included in the final work product. The best probability statement is an actual confidence interval: the answer is "x" plus or minus -- epsilon with probability "y". It is indeed a very rare situation that will give you enough history, enough data to be able to produce that statement. At the other extreme is a crystal ball. The question the certifying actuary must deal with -- does the best probability statement exist within this report that can be made?

With this background I would like to sum with a couple of random thoughts here. Maybe some of them are self evident truths. One is I would like to reaffirm that there is no clairvoyance available to the actuary. The temptation to say to a client that this is the answer is great. The practitioner must endeavor to avoid the reference to clairvoyance or any implication thereof. Another point is that a great job can be done on reserves and the estimate can be way off when the final results are in. That doesn't mean that it is a bad job. A great job can produce an answer that can miss the mark. The opposite of that -- a very poor job can accidentally hit the right answer. The test of time, while interesting, really doesn't give you very much to go on. What is the quality of the job that was done on the reserves?

I'd like to share with you two very short stories as to what not to do. This is a company that insures professional liability. Its reserving procedures did not make use of paid data. One can understand that -- if you use paid data exclusively you're going to get in trouble with that. But they paid no attention to it-- their reserve methods were totally independent of that, and when the answer comes out they give it to their accountants to put on the books, and nobody bothered to check actually what was the cummulation paid losses for this particular accident year. The ultimate reserve estimate was less than the amount that was paid to date. The accountants, what did they do, they dutifully put a negative paid on the books. What kind of reserve job is this? I think it really strains the imagination. Another one that's kind of cute is the professional liability company that doesn't know how to set reserves. They don't want to invest in actuarial services so they do their own reserves. How do they do it? They're required to have a premium to surplus ratio of 3 to 1. They divide the premium by 3 and get surplus -- everything else that's left is reserves. From this I would like to quote a famous actuary who, when I related this story to her, said "well, this sounds like in answer to the question: what should the reserve be? The answer is how much money have you got?" I think that's a sobering thought. For a lot of insurance companies that is the answer -- what should the reserve be -- everything you've got.

WARREN COOPER: Thank you Stan. We'll save questions until we complete the session since we did get underway a little late, to make sure everybody gets a chance to say all the important things that need to be said today. When I first put this panel together I had tried to balance it out very nicely by having a regulator, a consultant, and a company person. I also want to note that while it is not listed in the program, Marlene Schustak from General Accident has agreed to be the recorder for this panel. I'm sure that when we get the records out and the transcripts, that you all will be very pleased with what she did. Our next speaker comes from Tillinghast/TPF&C. Doug Collins is in the Connecticut office and he is the quality control officer, peer review officer, what have you, in Tillinghast and has given this matter a tremendous amount of thought which he will now share with us.

DOUG COLLINS: I'd like to shift direction a little bit from looking at the client relationship with the outside world to the opinion letter itself. The main message I would like to get across is that I think the loss reserve opinions need a greater amount of standardization if they are to be meaningful communication tools to the many regulators and accountants, and other people that rely on our opinions. There are an increasing number of states that require opinions and at the same time I think there is an increasing potential for misunderstanding about what those opinions are really saying.

I'd like to start by posing a hypothetical situation in which you are the reserve actuary or the qualified reserve specialist for a company and you've been asked to write an opinion. It doesn't matter if you are an internal employee or a consultant, but you've reached the point in your analysis where you've concluded what you think the best estimate of reserves is and you've got to write the opinion and decide what the opinion should actually say.

If you look around there are several sources of information regarding opinion wording. The NAIC, of course, has instructions to the annual statement which describe the required language and those instructions are utilized by most of the 18 states that require loss reserve opinions currently. You can also review the state reserving laws and the regulations and instructions requiring opinions in the various states. Finally, the American Academy guides include Recommendation 8, which speaks to our responsibilities as actuaries in certifying statutory opinions. Each of these sources of information tell you the standardized wording that should be included in a normal situation. They don't give you any guidance in what you should say if you're not in a standard situation.

You'll learn from these sources that there are as many as six different sections to the opinion itself. There's the opening where your qualifications are presented and your relationship to the company. Following that is the scope section that enumerates the exact loss reserves that you're providing your opinion on. Following that there is a section on data reliance which names the people that you've relied on for the accuracy of the data that you have used. There's the opinion itself which summarizes what you really think of the reserves. There's a section on change in assumptions, which is a disclosure if there's been any major change in assumptions from the previous year's opinion. Finally, there are a number of qualifications or limitations on your opinion that you might include in the letter.

Only by looking at other sample opinions, that would be the only way you could really find examples of wording that you should use in non-standard situations. For example, if you have problems with the data -- if you think the reserves are not reasonably stated -- or if you think the opinion should be qualified in some way. Looking at samples, we'll tell you that you have a lot of flexibility in what you say in the opinion. It will not tell you anything about the facts underlying that particular opinion letter or whether those are relevant to the situation you're looking at. You'll come away knowing that you can use a lot of judgment, but on the other hand, the flexibility that you have in wording those opinions makes them a less effective communication tool.

I'd like to speak further about the three problem areas you might run into in writing a reserve opinion. Those areas are: determining what you should say if you think the data is insufficient -- determining if stated reserves are not reasonable and what you should write in that opinion -- and finally, the various types of qualifications and other limitations that you might include.

Briefly I'd like to talk about the data problems first. There are two basic types of data problems. There may be plenty of data available, but you may not believe it is reliable or accurate. Alternatively, there may be insufficient data available, either because the company is a new company or a start-up operation, or because there may be statistical credibility problems or because in some cases, it may not be reasonable to collect all the data that is relevant. Perhaps, you're dealing with a reinsurer and you can't go to all the ceding companies and get all of the information that would help you in your review.

Is it still possible to provide a clean opinion or an opinion that says your reserves are good and sufficient if you have problems with the data?

In the first situation, if you don't believe the data is reliable, I would have to say no, you should decline to write the opinion. I'm differentiating here between reliability and credibility. If the data is not believed to be reliable or accurate in some material aspect, I think I would refuse to issue an opinion. Alternatively, if the problem is a lack of statistical credibility, I think that the opinion could still be considered good and sufficient but there might be a caveat or qualification stating that some key assumptions could not be verified using the clients data but they are nevertheless consistent with the knowledge of the business being insured.

The next question is -- how do you decide when the company's reserves are good and sufficient? I'm assuming that for one reason or another the held reserves are different from the reserve estimate that you've come up with. Either you actually weren't the person that set the reserves or perhaps you did some initial calculations and someone else had the ultimate responsibility for setting the booked reserves on the balance sheet. In either case I think if you are a reasonable person you would agree that there is some range of uncertainty about your estimate which would include the reasonable reserve level. You would not expect the booked reserves to be exactly the same as your estimate in order to consider them good and sufficient. How do you decide whether to consider reserves good and sufficient? Is there some magical percentage within which you consider reserves to be within an acceptable range of your number? I believe it would be very useful if we had more standardization in this regard. We could use a starting point in determining when reserves are good and sufficient.

There's no common definition of the terminology good and sufficient other than a brief paragraph in Interpretation 8(b), which primarily says you can use your judgment. There was an expansion of interpretation of 8(b) last year that was tabled primarily because of the formation of the Interim Actuarial Standards Board, and potentially the IASB will be considering that sometime in the near future. I believe even the expanded 8(b) which was distributed for comments doesn't go far enough in defining what we mean when we say "good and sufficient."

A very simplistic but practical standard that I've seen in a number of cases would be just to say reserves are good and sufficient if they are within 5% of your best estimate. We could call that the acceptable range. I'm defining this acceptable range as a fairly narrow band, and I don't mean to confuse it with the risk margin, which would certainly be a much larger number and would include all the variation in the assumptions that you've used.

A more comprehensive standard would be to calculate the risk margin and then base the acceptable range as a function of the total risk margin. Other financial measures might also be taken into account. Certainly the acceptable range should depend partly on its relationship to the total surplus of the company. The standard would also have to define the term best estimate. Perhaps it might include a discussion of the mean, the median, and the mode. This would give us guidance in terms of what the starting point would be in determining the acceptable range. The creation of standards such of this would be a tremendous aid to both the users of loss reserve opinions, and also the writers and signers of those opinions.

Getting back to the wording itself, if the booked reserves are not within an acceptable range, the opinion letter must include wording other than good and sufficient -- various possible wordings are possible. If reserves appear to be short one could say that reserves are optimistic. You could say they are not conservative -- you can say they're are reasonable but optimistic or variations on these terms. If reserves appear to be fat, similar wording questions arise as well as the more fundamental question about whether there should be more leeway on the conservative side compared to the optimistic side. Another issue that needs to be addressed is the disclosure of the amount of discrepancy. If booked reserves are outside of the acceptable range, I think the opinion should clearly state what the percentage difference is between booked reserves and the loss reserve specialists' best estimate. This would serve to explain fairly to the reader why reserves are not considered to be good and sufficient.

The final subject I would like to talk about is the various types of qualifications and limitations that appear in opinions. Some people might argue that if reserves are considered to be good and sufficient, and if there are no data qualifications, then the opinion should contain no other qualification of any kind. Others would argue that there are a number of caveats that need to be disclosed to the reader of reserve opinions. Either way you'll find little guidance from the literature on the subject. Clearly if two different actuaries reviewed the same book of reserves and came up with the exact same conclusion, they could still write vastly different clean opinions about those reserve levels.

What types of qualifications are being included in opinions?

Several attempt to clarify what is not being covered in the analysis, such as the fact that assets, their liquidity or timing of payment, have not been reviewed by the actuary. This is an area that is covered in Interpretation 8(b), which speaks to the fact that we are not required to include any mention of assets in our opinion, but nevertheless it's a qualification appears that appears quite often. Another is the contingent liability due to uncollectible reinsurance. Generally, we review reserves net of reinsurance and as a result quite often a qualification appears that says we have assumed this reinsurance is collectable. In other cases there might just be a general statement that all other balance sheet items have not been reviewed, that we've only reviewed the loss reserves themselves.

Other types of statements are really more disclosures than qualifications, such as the fact that reserves might be discounted or that there is a change in methods. The change of methods is an interesting one -- it's one of the few qualifications that is mentioned in the NAIC and the American Academy Guidelines. But it is one that is rarely seen, and I think perhaps that's because there really aren't any guidelines on when a change in methods from previous years is material and when it has to be disclosed.

Another qualification is a statement regarding the contingent nature of reserve estimates and their resulting uncertainty. This is a disclosure that's often seen in actuarial reports but not very often in opinions themselves.

Most all of these have their place in an opinion letter. There are certainly others that can be added to the list. I think it would be very useful if there were guidelines that could be written suggesting when and if it is appropriate to include various qualifications with examples of what the wording might be.

To summarize, I'd like to say if we could improve the consistency of our opinions through more detailed standards they would have more meaning to the various parties, regulators, accountants and other parties that rely on these opinions. These issues are really separate from the standards underlying the reserve calculations themselves. These standards are being worked on by the CAS as well as the IASB, but I am suggesting that reserve opinion standards could also be addressed in greater detail.

WARREN COOPER: Thank you Doug. Our last speaker has spoken to you within the hour, but he has greater information for us at this particular time. I don't think we need to reintroduce him. He's been introduced twice -- once by Pres Bassett and also by himself as to who he really is. I'll let you decide.

WILLIAM HAGER: Thank you Warren. Doug just finished talking about various issues that as an actuary or casualty reserve specialist, you ought to reflect on as you articulate the language you speak. I'm going to zero -- in on the liability that attaches to items and statements that are used in an opinion. To do that I have focused on the instructions set out in the NAIC Casualty blank, relating to opinions. What I'd like to do is go through each component part of that opinion and talk briefly about liability that comes to bear on each provision of the suggested language and the opinion as it is set out. Along those lines I have a handout that I would like you to hold until I finish. In the handout I've set out the analysis I'm about to provide you. The reason I am holding it is because the handout relates to a comparable panel that we did a couple of years ago. The material is about 99% on point but some of the references have been updated, so don't be offended by that. We're talking about liability and a very serious instance of liability happened in my neighborhood just the other day that shows the relevance of malpractice. This guy called home at noon and the maid answered the phone and the guy said I would like to speak with my wife. The maid said that I'm sorry she is upstairs in bed with another man, and the guy says that's outrageous, that's just outrageous. I want you to get my gun and I want you to go up there and shoot both of them. The maid says okay -- the maid sets the phone down on the counter, and about a minute later the guy hears "bang, bang" over the phone. The maid comes back and says -- well I did it. I shot both of them. The guy says that's great -- over the years you have been an outstanding loyal domestic servant. I need one additional piece of assistance from you. I'd like for you to get rid of the evidence -- get rid of that gun. The maid says I've already done that -- I've thrown it in the swimming pool. He says swimming pool, swimming pool -- is this 548-3160? I didn't make it up, we lost some real nice people in the neighborhood. The point is to use care in specificity. I'm going to go through the annual statement, the directions that relate to that opinion. I want to take them one at a time and talk about liability. The first provision, according to the instructions, reads like this --

> "For companies as required by its domiciliary Commissioner, there is to be submitted to the Commissioner as an addendum to the annual statement by April 1 of the subsequent year, a statement of a qualified loss reserve specialist setting forth his or her opinion relating to loss or loss adjustment expense reserves. A qualified loss reserve specialist, as used herein, means a member in good standing of the American Academy of Actuaries, or a person who otherwise has competency in loss reserve evaluation."

What's the relevance of that? The relevance is that in a liability situation, what we're talking about is an insurer who gets into an insolvency or something less, perhaps rehabilitation. Adequacy of reserves is the issue. Who do we join as defendants is the question? One of the questions to be answered when decidiung who will be joined as defendants will be whether the qualified loss reserve specialist is somebody that shows competency as indicated herein. The Academy of Actuaries, for those of you who are affiliated with the Academy, has set out the standards. The standards would be examined. If the individual did not in fact meet the standards you've got a prima facie case of liability. The Academy has standards as follows: Education and experience - A loss reserve specialist should be a FCAS or have mastered knowledge. It sets out a number of topical areas such as general mathematics, probability, statistics, numerical analysis, theory of interest, life contingencies, principles of economics and so on. Obviously the point is that when an individual signs their name indicating they are a member of the Academy, they are representing to the public, to the regulator, to the courts, to the liability system that they meet the educational component as set out in the professional standards. They also have certified that they meet the experience requirements. Experience requirements as set out in the Academy's Qualification Standards, requires at least 3 years of experience with the responsibility for overall reserve level; quantifying overall reserves; and perspective evaluation of the reasonableness of overall reserves. The point is that criteria will be examined with respect to an Academy member who indicates that they have requisite qualifications as required. Non-Academy members may qualify under the phrase that "someone otherwise who has competency." Obviously, if it's a underreserving insolvency situation by definition, both experience and education will be evaluated. The regulators will argue that an individual that has rendered an opinion fails to meet minimum experience in education requirement. I don't think anybody needs a hand calculator to get to that. Anyway, that's the first provision.

The second part of the NAIC instructions reads as follows:

> "One or more additional paragraphs may be needed in individual cases if the specialist considers it necessary to state qualifications of his or her opinion or to explain some aspect of the annual statement which is not already sufficiently explained in the annual statement."

That language is pretty straightforward and Doug has indicated that the loss reserve specialist may qualify their opinion or the opinion should be qualified as needed. There is also authority in that language to explain other actuarial items. Items that are not the direct subject of the opinion rendered. My advice would be to simply to review all the other actuarial items in the annual statement which impact directly or indirectly on the reserves. If you have responsibility for them and you believe that they merit comment, this is certainly the opportunity.

The third component reads like this:

"For a company actuary the opening paragraph of the opinion should contain the following sentence: "I, (name and title of the specialist) am an officer or employee of named insurer and a member of the American Academy of Actuaries." For a consultant the opening paragraph of the opinion should contain the sentence "I (name and title of the consultant) am associated with the firm of *(name of firm), am a member of the American Academy of Actuaries and have been retained by (name of insurer) with regard to loss and loss adjustment expense reserves.

I think that No. 3 is pretty straightforward, just setting out the qualifications. The fourth component is for a person other than a member of the American Academy of Actuaries. The opening paragraph of the opinion should contain the following sentence:

"I am an officer/employee of the insurer and I have competency in loss reserving."

This is a very straightforward statement. This is a certification to the government, the state insurance departments, to the courts, to all people that ultimately rely on that opinion or in a fiduciary capacity with the insurer affected, that the person signing that blank has competency in loss reserving. There's another aberration of that, but that should be pretty straightforward. But again, the statement, representing to all the world that the person signing it has competency in loss reserving will decrease your liability if you have an insolvency, and you have inadequate reserves and there is a question of competency. It's going to come to the surface very quickly.

There is a fifth component from the NAIC language. The following are examples which are for illustrative purposes of language which would be included in the remainder of the Statement of Opinion.

"The illustrative language should be modified as needed to meet the circumstances of a particular case and

> the specialists in any case should use language which clearly expresses his or her professional judgment."

Again, it is language for illustrative purposes. The directions and instructions encourage modifications as needed. If you utilize this specific language, it provides no protection in a liability situation if it is used in a situation where the suggested language has no application. It is very straightforward and the utilization of the language isn't going to provide any protective shield. Obviously, that language intended that the author of these opinions would modify it to suit the situation and use language which clearly expressed his or her judgment.

A sixth component should contain a sentence such as the following:

> "I have examined the assumptions and methods used in determining reserves as listed below and as shown in the annual statement of the company as prepared for filing with the state regulatory officials -- the paragraph should list those items and amounts with respect to which the specialist is expressing an opinion, that should include but is not limited to ..."

What is the point? The point is that a critical component is the certification by the casualty loss reserve specialist that they have examined the assumptions and methods used in determining the reserves as indicated. That, from a legal standpoint, this statement requires the specialist not only to examine the underlying methods and assumptions, so there is a certification of the examination, but also to declare that the methods and assumptions used meet the task of being generally accepted sound loss reserving standards. Those that are interested from an Academy standpoint, in terms of determining whether the reserves that have been established, look at the methods and assumptions that have been utilized. Take a look at Opinion A(7), which defines generally accepted actuarial principles. This is where you go to formulate generally accepted actuarial principles and it is very straightforward. You go to professional standards as promulgated, the guidelines, the opinions, the recommendations, promulgations by the Interim Actuarial Standards Board. You go to the procedures of CAP, SOA, of the Casualty Actuarial Society of the American Academy of Actuaries. You go to articles. In the handout I have listed about 25 or 30 specific articles on casualty actuarial loss reserving techniques. If I can find those, any one could find those and we'll argue that the techniques, the methods and assumptions that you've signed off on were in fact inappropriate, if inadequate reserves are in fact an issue in an insolvency situation. Again, insolvency is the only time that these kinds of things are going to be tested, so that's really the bottom line.

The next provision, reading from the NAIC Instructions:

> "If a specialist has examined the underlying records and/or summaries the scope/paragraph should also include a sentence such as the following: 'my examination included such review of the assumptions and methods used and the underlying basic records and/or summaries in such tests and calculations as I consider necessary'".

I think that's pretty straightforward.

> "If the specialist has not examined the underlying records or summaries but is relying upon those prepared by the companies ..."

That sets out some suggested language. The reliance provision, in my judgment, merits careful scrutiny. In reliance situations the specialist should carefully document his request to company officials for the records and summaries, and be the records and summaries actually provided by the insurer. The opinion should be qualified to delineate those materials upon which the specialist relied and those which he or someone under his direction controlled and personally examined. In addition, the specialist should refuse to sign the opinion if the company has failed to provide appropriate or adequate records or summaries following the appropriate request. Doug hit the nail on the head in my judgment. The specialist should also recognize that in law, even where company officers state that summaries accurately reflect under relying records, if those summaries should raise questions -- if a reasonable special looking at those records would say these records are deficient, there's a whole unit missing -- there's a block of material missing -- liability can still attach. For legal foundation take a look at the Equity Funding case. The court in the Equity Funding case held the accountants and actuaries liable based not on the fact that they knew of the fraud, but based on the fact that from the material they had - they should have known about the fraud. You don't escape liability even if company officers certify that everything they've given you is full and accurate if upon reviewing what is given to you, a reasonable person would have raised serious questions. Where there is smoke there is fire. As a professional, of course, you are liable in those situations.

The opinion paragraph should include a sentence that covers at least the points listed in the following illustration.

> "In my opinion, the amounts carried in the balance sheet on account of items identified above: (1) are computed in accordance with accepted loss reserving standards, (2) are based on factors relevant to policy provisions, (3) meet the requirements of the insurance law of a particular state, (4) make good provisions for all unpaid losses."

Here, of course, the specialist is offering his professional opinion that: (1) sound loss reserving standards have been utilized for both unpaid losses and reserves for unpaid loss adjustment expenses; and (2) that such reserve amounts are consistent with the coverage of the affected underlying policy, (3) the reserves are so determined with applicable state insurance codes. It is very straightforward.

Another provision which conclusions I think are self-evident, are as follows from the NAIC Annual Statement directions:

> "If there has been any material or change in the assumptions and/or methods from those previous employed that change should be described in the Statement of Opinion by inserting a phrase.

There's a signed signature line -- it's straightforward. In terms of your liability exposure, as a loss reserve specialist, it is incredible on these opinions. You don't have to look far-- you don't even have to believe me, just talk with the people who have legal proceedings pending against them. Some suggestions to minimize your liability that won't go away are liabilities like the electric bill. It's one of those things that's part of doing business. First, carry malpractice insurance -- that should be pretty obvious. Second, qualify your opinion as often as needed. Third, carefully document your reliance on the insurers underlying records and summaries. Fourth, if you are relying on summaries and records provided by the insurer, challenge insurers who provide insufficient or questionable data. Do not sign an opinion based on such data. Fifth, examine the applicable statutory provisions of each state where the statement will be filed to assure the reserves are consistent with those provisions. The states have varying reserving standards. Sixth, examine the underlying policies to assure that the related reserves are appropriate and give the coverage. Seventh, examine the methodologies and assumptions used for determining reserves and satisfy yourself with: 1) they meet the test of reasonableness, and 2) they are appropriate for the instance at question. Make sure you can qualify yourself as a quality loss reserve specialist. If you have and there are insolvency problems in reserves that are at the heart of the insolvency problem, guess what -- you'll be asked to prove your qualifications. Eighth, examine the actuarial item to the annual statement which have direct implication as to the reserves and make comments if you have reservations about any of those provisions. I could go on but it should be clear that liability is pretty straightforward -- it is predicated on that opinion. As everybody in this room knows those are very, very serious documents, each of which has a potential to come home in a big way. See I can be boring. Thank you.

WARREN COOPER: Thank you Bill. We now have time for some questions. As you are probably aware, all of these sessions are being taped. Unfortunately we do not have a microphone in the back of this room. If you have a reasonably simple question I will repeat it. If you have a very complex question which is beyond the scan of my ailing memory, I'll ask you to come forward to the microphone so we can get it on tape. Who has a question?

CHUCK McCLENAHAN, Coopers & Lybrand: The question is for Commissioner Hager and relates to something that he said at lunch relating to the obligation of the qualified loss reserve specialist to opine on the collectability of reinsurance. I guess I have two problems/questions with that. The first being a practical question -- how far do you go through cessions, retro cessions and pools? The second specific question to Commissioner Hager -- what do you do in the event that my firm decides that the "X Y Z" Insurance Company of West Branch Iowa, which is fully licensed by your state, and under no regulatory supervision or rehabilitation, we decide that those reserves are no good, and tell our clients that they are no longer admissible.

BILL HAGER: I thought I was going to get a difficult question-- no problem. Actually, when I made that statement, Chuck, I hadn't had an opportunity to finish my dessert, so I was just angry and that's why it all came out. I think when you think about the liability issue, forget about your specific job description or your assignment, just step back and look at the liability issue as it will, in fact, be looked at. The liability issue will be examined when you are in an insolvency situation. That's when what you did or did not do in the reserving process becomes an issue. It does not become an issue any other time--

ives a damn. Even if you're off, if the company is still solvent and doing well, nobody cares. Put yourself in that situation. I'm in that situation with respect to three insurance companies that are insolvent. We are in the business of maximizing assets we collect. That's the politics of it. In the State of Iowa, all of the property/casualty insurers pay the assessment and there is no offset. Dollar for dollar it comes right off their bottom line. Guess what -- we get tremendous encouragement -- some might say political pressure -- but I say we get tremendous encouragement to collect all of the cash we can. One of the areas of cash collection is bringing liability actions against anybody who even waved during the time this company was in operation -- directors and officers, all of the consultants that service this company. That's straight reality-- you don't get a chance to vote on it. The question isn't whether you like it or not. Let's criticize the situation where the key reason for the downfall of the insurers is that the reinsurance was uncollectible. Let's assume that the loss reserve specialist was in six months before the insolvency. And let's assume that the word out on the street was that the reinsurer was very marginal. Let's assume that everybody in America knew that reinsurer was very marginal. We've got an opinion by the casualty loss reserve specialist saying that the reserves are adequate with no mention of reinsurance problems-- no statement about reinsurance problems. Yet, a reasonable person at that juncture in time, knew or, in the words of the Equity Funding case, should have known that there were problems. Well what the hell. I'll tell you that the loss reserve specialist is going to be scrutinized very carefully as a potential candidate to be a defendant in the asset collection liability actions. I think is it is not fair -- I think your statement is that it's impossible to go through treaty, after treaty, after treaty. Nobody said this was an easy task. Nobody said these were easy times, it's very difficult. I don't know where to stop. But perhaps the general counsel for Coopers & Lybrand -- can you give us some suggestions on where to stop in terms of going through the treaties. My point is that if I were general counsel to a group that was issuing opinions in this area, we would talk a lot about reinsurance. And we would talk a lot about how those opinions ought to mention reinsurance. Perhaps, I'm dead wrong -- perhaps the U.S. Supreme Court won't give a damn about the fact that everybody in town new the reinsurer was on the margin. Everybody in town knew that at the time the opinion was issued that those reinsurance receivables were uncollectible, maybe that was the case, but I don't think so.

MARK SOBEL, Touche Ross & Co.: I wasn't sure Bill if you were implying at lunch that if a consultant goes in and does a loss reserve or a particular company, and for one reason or another he was unable to opine on that company ... his analysis there's an obligation placed upon a consultant to then say something to the regulators involved in the supervision of that company. It seems to me that clearly puts the consultant in jeopardy. I thought I heard you say at lunch that the degree of cooperation between the consultant and the regulator was something that was looked at very carefully and I wasn't sure if I was jumping to any conclusions here.

BILL HAGER: I guess the speech gave more people indigestion than I thought. First of all, recognize an obvious thing. I don't have any power to make law, and I don't make law -- courts and legislatures do. What we're talking about here are facts that perhaps, in my judgment, lend themselves to the potential for liability. If you get dragged into these insolvency liability actions, those of you that have been around know that the costs of litigation are tremendous. Attempting to avoid being dragged in is certainly worthwhile. I'm familiar with the fact that casualty actuaries are frequently invited to look at the reserves, perhaps not give an opinion; perhaps give an oral opinion; perhaps give an opinion that is unconnected to any certification for any NAIC annual statement purpose. There's nothing inappropriate about doing that; about not issuing any kind of formal opinions. I don't see any liability there. What I was really getting at in my luncheon speech and if I remember I didn't get a chance to finish my steak so I didn't have much protein in my bloodstream at the time I was talking. But what I was really getting at is in the event that through your consulting activity with a particular insurer you come away with a sense that something illegal is going on. You come away with a sense that a serious coverup is going on. You come away with a sense that management in fact is going to coverup the inadequacy of the reserve. I think you're at the point that if I were a consultant I'd at least get on the phone and talk with the general counsel of your consulting firm and explain it to them, and then make your decision. Those are tough calls and I'm not in a position to set out the law but I am in a position to tell you the kinds of considerations that go into the formula about who becomes a defendant and who doesn't become a defendant. It's a touchy thing and your general counsel will probably hem and haw for a while and will probably do some research. Thank you.

JEFF ENGLANDER, Ernst & Whinney: I have a question for Doug. Getting back to the wording of certification. Let's assume you've been asked to certify a company's reserves and the company has got an extremely volatile book of business so you set about your work and run a variety of projection techniques and develop what you believe is the best estimate and a range and due to the variability in that company book that range might be quite low. You may have a difference between the casualty reserve and your best estimate but the casualty reserve is in your range. Let's say for argument sake that it's not that large a company so the difference from the high or from even the best estimate indicates that the company can be bankrupt or approaching some form of indemnity. Do you feel that any kind of disclosure or unqualification is warranted, even though it was within your range?

ANSWER: I think you have an obligation to make a disclosure depending on whether the reserves are outside of your acceptable range. I believe the range you just described is more like the risk margin -- it's a wider range than what I would consider to be the acceptable range. Clearly, I would say if it's outside of the acceptable range then you need to disclose it. Certainly if the difference was a significant portion of surplus or at least equal to surplus, that would require disclosure of it. The Academy Guideline Recommendation No. 8 says that if the perceived inadequacy is greater than surplus, then you're required to disclose that. I'd certainly agree with them and I think the standard should be a lot tighter than that. Clearly, if the inadequacy is a significant percentage of surplus, I would think it should be disclosed.

MARTIN CARUS, New York Ins. Dept.: The answer to your question in New York would be yes, you would have to inform us. As an independent certified public accountant, Regulation 110 would require you to make that notification to the Department. That becomes ticklish. There could be an expansion of that. Frequently the independent certifier is performing a dual function, and it's not clearly divisible whether you're certifying the reserves as being completely divorced from your actions as being the certifier of the statement.

MARK SOBEL: Does 110 apply if he is acting simply as an actuary as opposed to an auditor?

MARTIN CARUS: So far the Department regulations don't address that -- they are not applicable strictly to consultants but in terms of independent certified public accountants, they are. In terms of your comment Chuck concerning what responsibilities you have to have in determining the collectability of reinsurance. You have to understand that in many jurisdictions the superintendent or commissioner is dealing with two hats. He's the liquidator and the regulator. As regulator he may say the company is a licensee, and therefore the reinsurance is good. But as a liquidator he has a responsibility to his security funds, and if he doesn't take the appropriate steps into making the most collection that he can, he's going to have to answer in his fiduciary capacity as the liquidator. He's frequently wearing two hats -- on one end he's telling everybody I have to allow credit for this reinsurer, on the other hand, he's going to say but you should have known he was broke.

WARREN COOPER: We did get started late, and we've ended up our time. I apologize for that but the panelist will all be present at the rest of the meeting, and if you have any heart weary questions that must be answered, I'm sure they will be very happy to oblige you. Can we get a show of appreciation for our panelists?

RESERVING FOR REINSURANCE -II

SESSION 3-D
1987 LOSS RESERVE SEMINAR
MINNEAPOLIS, MINNESOTA

Regina Berens
September 10, 1987

Good afternoon. My name is Regina Berens and I work for Prudential Reinsurance. My background also includes seven years at AFIA, which was formerly the American Foreign Insurance Association. For the last eight years I've been doing reserves on reinsurance, but there are some people out there who could probably also discuss this subject and will probably have some different ideas. You know who you are; please speak up.

CLASSIFICATION OF DATA

- At a minimum: Pro Rata vs. Excess
- Annual Statement lines may not be meaningful
- If credible data is available: Working-level Excess vs. High-Layer (e.g.Catastrophe) Excess
- Property vs. Casualty vs. Marine, Others
- Contracts with credible contract year, accident year, etc. data vs. those reported on a bordereau basis

First, we'll talk about classification of data. I assume that everyone has either been to the last reinsurance session or has had enough experience that they know some of the terminology. At a minimum, you should be separating your business between pro rata (or quota share) business and Excess of Loss, which is sometimes referred to by inept secretaries and people who know the business as "Excessive Loss". Another way to divide the data is to do Facultative separately, and I'll mention that later.

For reinsurers, the Annual Statement lines of business are not necessarily meaningful. Many reinsurance contracts cover an entire class of business written by the ceding company, such as personal lines business. This is especially true for catastrophe reinsurance. Sometimes the ceding company will make an honest effort to separate the accounts- premium and losses- by line. Sometimes premium is not available by line, but losses are.

Obviously you want to try doing property, versus casualty, versus some of the others. Don't worry about splitting auto liability between personal and commercial, for example, because you probably won't get meaningful data. If you have enough data, you may want to separate your excess business between working-level and catastrophe level, since you would expect them to develop differently.

Pro rata business, particularly that written on a portfolio basis, may not have experience split by contract year or accident year-- this is the way the market works. An accounting statement, for example, may simply show a total for outstanding losses for all five years you've been on the contract. It is better to try and do something with that data separately.

You may want to look at your data on a gross versus net basis, or gross, **retroceded** and net. It's probably most common for companies to do their analysis on a net basis, but it's more interesting to look first at what you took in and then at what you retroceded out, and then net them against each other.

Retrocessions may not even be in your data-- sometimes they're on green sheets in the accountant's desk. (I know of one computer system sold to reinsurers five years ago that didn't **do** retrocessions.) You should also make sure that any retroceded data you have is a "mirror image" of the assumed business it covers. This sounds elementary, but frequently a ceded reinsurance transaction will be coded to the contract year of the retrocession agreement, which may not be equal to the contract or accident year of the assumed business transaction. The same may be true for line of business coding.

In some companies certain reinsurance contracts have specific retrocessions. In other words, you might purchase reinsurance from several companies covering a single assumed contract. That's one complication. Sometimes your retrocessions or ceded reinsurance may cover the whole book-- a catastrophe cover, for example. In this case you may find that the premium for this protection was taken out of a single line of assumed business, and not allocated among premium on all the business it covers.

UNDERWRITING QUESTIONS

- Special Contract types-
  IBNR provision reported
  Funded covers
  High aggregate deductibles
  "Clean-cut" cancellations
- Rate adequacy changes-yours and the ceding company's
- Availability of pricing data

One of the first places in your company to start asking questions is the Underwriting Department. First, there are some contract types which will distort the data if not analyzed separately. Some ceding companies report an IBNR provision with their accounts. If these contracts are written, find out if the suggested IBNR is booked, and to what account. "Funded Covers", which stabilize the results of the ceding company by allowing them to reimburse the reinsurer for a portion of the adverse loss experience over a period of several years, should be isolated because much of the IBNR could be reimbursed. Contracts with very high aggregate deductibles should also be isolated. These contracts require that the ceding company absorb claims which would ordinarily be paid under the contract up to a certain limit-- which could be in the millions of dollars-- before the reinsurer is liable. These contracts could appear "loss-free" for years.

Some reinsurance contracts are cancelled on a "clean-cut" basis, meaning that the ceding company has taken back the loss portfolio and the reinsurer is no longer liable for losses on the contract. Since IBNR would not be anticipated on these contracts, they should also be isolated.

Ask the underwriters about price adequacy changes-- both yours and the ceding company's. It is important to know if a doubling of last year's premium volume means your rates have doubled or your exposure to loss has doubled. Ask if data was provided for pricing the contract-- if this is not an area where your actuaries are active (and it should be), all kinds of interesting things may fall out of the files.

CLAIMS QUESTIONS

- Changes in your company's claim processing practices
- Are adjustments made to reserves reported by the ceding company?
- Are claim audits conducted regularly?
- Do you request periodic reports of claims falling under the retention for aggregate deductible contracts?

The Claims Department is another place to stop and ask questions. First, there is the classic question of whether there have been any changes in reserving practices which might distort historical data. Ask also if they make adjustments on individual claim reserves reported by the ceding company based on their assessment of the case and, if so, how these adjustments are booked. Some large reinsurers perform periodic claim audits of ceding companies. This gives them information on how the ceding company's claim practices are changing. You should also ask if they maintain data on losses falling **under** the ceding company's retention on contracts with high aggregate deductibles, which can be used to monitor your company's potential losses once the aggregate retention has been reached.

The Accounting Department can help if you find aberrations in the data you can't explain-- particularly if you can pin it down to a single contract. My favorite example, from a former employer, was a huge claim in an area where no one knew of any major catastrophes. It turned out that an account had been rendered in Italian Lira, and the accountant (who was in the

London office) coded it as Pounds Sterling. Once we got that out of the data things didn't look so bad.

You should also ask about "top-sheet" or "non-ledger" adjustments-- the ones that get put into the company results but for some reason are not in your data. You should ask about major changes to prior accounting periods, which were put through in the current period. If you can't get the historical detail to allocate the corrections to the periods where they belong, at least get them out of the current results.

> **BORNHUETTER-FERGUSON**
>
> - GOOD FOR:
>   Some working-level excess.
>   Some pro rata business.
> - NOT APPROPRIATE FOR:
>   High-level (e.g. catastrophe) business.
>   Contracts with aggregate deductibles.
>   Pro rata contracts reporting on a bordereau basis.
>   Funded covers.

Once you have your data, you have to select an appropriate method. The first I'll cover is the Bornhuetter-Ferguson method--and other methods which depend on the use of loss triangles. They are good for a lot of things but have some serious limitations. On working-level excess business where there aren't any major changes, you can probably get reliable results, taking into account the caveat I just gave you on talking to the underwriters, accountants, claims people, etc. and making sure there is nothing messing up the triangle. It's good for pro rata business if you trust the detail by contract year. It's not appropriate for high-level excess business, catastrophe business, anything where the reporting is very slow. As I mentioned before, it's not appropriate for aggregate deductible contracts.

These methods are also not appropriate for pro rata contracts reported on a bordereau basis, or for funded covers, where you could eventually recover many of the losses. Another item to check is whether your underwriters have had the good sense to put aggregate limits on losses payable under the contracts, in which case a triangulation approach will over-state your IBNR.

RAA factors are another popular method for setting reserves on reinsurance business. RAA is the Reinsurance Association of America, and they have been collecting incurred loss experience by accident year from reinsurers since 1956-- for Excess of Loss business only, separately for Auto Liability, Medical Malpractice, Workers' Comp., Asbestosis, General Liability excluding Asbestosis, and Casualty not Otherwise Classified.

RAA FACTORS

- GOOD FOR:
  1. Some excess business, particularly after 2-3 years of development
  2. Some pro rata business, if adjustments are made for faster reporting
- NOT APPROPRIATE FOR:
  1. Very high-level excess business
  2. Low- volume or immature experience
  3. Pro rata business where results are reported on a bordereau basis

Claims-made experience was requested separately for the first time this year. Every two years, a report of incurred loss triangles and age-to-age factors is sent out to member companies; copies are also available from RAA's office in Washington, D.C. Please note-- this is **not** an endorsement. I'm covering it because RAA is one of the few sources of historical reinsurance data, and it is a popular source when little else is available. Let's go over the uses and limitations.

What are RAA factors good for? They are good for excess business that is comparable to the underlying mix of business and retentions in the data. That's a tricky question, since you don't necessarily know what kinds of retentions underlie the experience that these companies have reported. It's more useful for data with a few years of development.

Let's go over an example. Using the "Percentage of Ultimate Reported" curve for 24 months of development on General Liability, the "average" percent reported is 17%. Taking the two sides of the 50% confidence interval, you could have 6% or 28% reported. Suppose you have $1 million in premium for this year and $100,000 of reported losses after 24 months. Depending upon which of the above factors is appropriate, your ultimate losses on $1 million of premium could be $357,000, $588,000 or $1,667,000. And that's just the spread on the 50% confidence interval-- it's even wider if you want to use 75%. As you can see from this example, even at two years there's an extremely wide margin for error.

RAA experience is now total excess business. It may in the future show facultative experience separately-- it was requested last year, but neither that nor claims-made was shown in the last RAA report, so they may not have gotten a lot of it. It may be something you'll have in the future.

RAA factors might be appropriate for pro rata business if you've got experience by contract year and if you make adjustments for the fact that reporting is faster. They are not appropriate for very high-level excess business since it probably is not comparable to the mix of business being reported by the members of RAA. It's not apppropriate, unfortunately, for low-frequency or immature experience, as you saw from the example. This is unfortunate because that's probably when you need it most. It is not appropriate for pro rata business where you don't have results by contract year.

Finally- a big caveat- check your own company reporting patterns. You could be getting losses in faster either because you've got a different mix of brokered versus direct market, or maybe your claims department is faster, or you've got lower retentions. Whatever the reason, if your business is reporting faster than the general RAA average (and you can find that out just by checking age-to-age development factors), using RAA factors to project IBNR can mean that you're getting hit twice. First, you already have more reported at the evaluation point. You're then applying tail factors which assume that what you've already got sitting on your books is still out there with the IBNR. That's probably one of the most important reasons that you have to be cautious.

One of the things that I noticed in the new booklet is that they've shown a graph of the percentage of ultimate losses reported from the current study, from five years ago and from ten years ago -- losses are reporting more slowly, and the curves are really spreading out. What this means is that you can't assume 1986 after 30 years will look the same as 1956 after 30 years. So, you have wonderful historical data but it may not reflect what we're going to see in the future.

Now we'll go over a few thoughts on reserving for individual contracts. First of all, you have to make sure there are valid reasons for it. When I did our last reserve evaluation the underwriters gave me a list of thirteen contracts to analyze individually. Having learned my lesson from the last reserve study I looked up individual reports on each treaty and found that several of them had no premium or losses. The underwriters admitted that these were brand new contracts but there were certain reasons that each contract was unique and they wanted to monitor the experience on it. At that point there wasn't any. The point is to make sure there is a justification for separate analysis or you will drive yourself crazy trying to analyze individual contracts which could reasonably be included with the rest of the book.

Many of the methods we have reviewed or discussed can be used on individual contracts. You really have to take into account the characteristics of the individual contract. You may want to go read the contract and talk to the underwriter. If you've got an extremely large contract you can do loss triangles on it. If it is an aggregate deductible contract, ask for losses under the retention and do an analysis of where your layer will go. When you've done that, check the results against what you're getting on the other contracts in that general group. If this single contract is running a 40% ultimate loss ratio and similar contracts are running around 150%, you have to ask yourself if you really believe it is that much better, or (in some cases) that it is that much worse. Again, ask about pricing data. Many times actuaries were involved in pricing. You should have separate actuaries involved in pricing and reserving. They should talk to each other -- absolutely. It's been useful for me to ask the pricing people for a file on a particular contract, and the information there is often helpful. One reinsurance actuary observed that using actuaries only for reserving is like not calling a doctor in to see the patient until it's time to call the coroner.

I've already mentioned doing Facultative business separately, but we use basically the same methods. Does anyone else have special methods for the treatment of Facultative business in their company? (NO RESPONSE.)

SELECTED ULTIMATE LOSS RATIO

- GOOD FOR:
  1. Business without credible data; immature years.
  2. A reasonability check on any other method.
- NOT APPROPRIATE FOR:
  Business where other methods used on credible data clearly indicate a different ultimate loss ratio.

I also want to discuss selected ultimate loss ratios as a method. This is a good check for reasonableness against any other method. If you've got immature business and you don't know where it's going to go,you're better off setting an ultimate loss ratio on it than you are trying to use some scientific method on one claim. It almost sounds like a disappointment or a cop out to say -- well let's reserve it to an ultimate loss ratio. But for something like an aggregate deductible contract, it might be a lot more realistic than just lumping it in with the other contracts.

On the other hand, if other methods clearly indicate a different ultimate loss ratio you shouldn't be doing that. If you've got years and years of contract experience that shows that this kind of business is 100% ultimate loss ratio, you don't set the current year at 60%, just because you hope that this year will be better.

When you're setting reserves on reinsurance business, Earned but not Reported premium (EBNR) is extremely important because the premium coming in during a given calendar year may apply to coverage provided several years earlier. EBNR can usually be estimated by the use of premium development triangles, with ultimate levels calculated using the same methods applied to loss triangles. This should be done separately for Pro Rata versus Excess, and separately for Property, Casualty and Other if enough experience is available.

EBNR

- METHODS
  1. Earned Premium triangles
  2. By Contract
  3. Discuss current year with underwriters
- IMPLICATIONS
  1. Net out expenses
  2. IBNR on EBNR- can create "instant" profit/loss

EBNR acts as an addition to the asset side of the books; it must be offset by an expense provision and by IBNR on this extra premium, using whatever methods are used to calculate IBNR on reported premium.

Pay particular attention to EBNR on the current year, since you may be projecting ultimate levels from very little data; it should be a reasonable multiple of the prior year's premium volume. In effect, you may be creating an "instant" profit or loss on the current year if you are running at an ultimate loss ratio of 40% or 110%. If the business is extremely good or bad, errors in the estimate of ultimate premium volume can substantially affect the accuracy of your results.

What's in the future? One thing that I think we're going to see is better data from two sources. We're slowly moving towards better reinsurance systems. Most reinsurance systems seem to have evolved from a patchwork of primary company systems and have grown in response to specific needs from specific areas. Now we're seeing more systems designed specifically for reinsurance. I believe also that more companies have gone through trying to design the perfect ultimate system that's going to be everything to everybody. They've found out that it wasn't possible and designed something fairly realistic. I can't underestimate the importance of good data.

I think we're also going to see better data from the ceding companies, especially with changes in the market in recent years. It has been easier to ask for loss triangle experience by contract year, or for the individual claims under the threshold of an aggregate deductible contract. It used to be that the data was "impossible" to get, or the reinsurer could obtain it only after it had lost millions of dollars on the contract and was threatening to sue for being defrauded. I know of one ceding company which finally provided a lengthy computer printout of all of the claims falling under a large aggregate deductible. It was, unfortunately, printed on thermal paper which turned an opaque, illegible blue when exposed to sunlight. I don't think that happens as often now.

Another change I see is that business is becoming more international, which is fascinating. It is almost inevitable that when you're talking about spreading risk, it makes sense to

THE FUTURE

- Better data??
  (From ceding companies and in-house systems)
- More sophisticated techniques
- More techniques developed exclusively for reinsurance
- Business is becoming more international

do it on a global basis. It's been perfectly normal for many years for an established reinsurer to assume business from state-owned insurance companies in Romania, Brazil or Poland. Even when few other services are traded with a particular country, they will buy reinsurance protection. Reinsurance is frequently a good way to get into the market in those countries.

The international part of the business can be a stabilizing influence-- I've seen both extremes. My company has a nice, sensible, stable book of international business that's not subject to the vagaries of the U.S. market. Inexperienced reinsurers can also get killed in the international market-- ironically, it is usually caused by assuming a portfolio which includes U.S. casualty business.

The companies that are thrown into insolvency by tackling the international market in reinsurance usually end up being replaced fairly easily, however. There is a bank in California which has decided that the residential mortgage business is too risky. Instead, they're going to put their capital into a joint venture in reinsurance with a broker in the London market-- writing U.S. casualty business on a claims-made basis. It should be interesting to see what happens.

I think we're also going to end up with more sophisticated techniques, and we're finally getting in more data to play with. Companies have been in existence for a while and I know there are a lot of new companies starting up, but some of the established ones have 10 to 20 years experience. You can't throw beautiful, high technology methods at small data bases -- it doesn't work.

You also have more experienced reinsurance actuaries. You come into it trying to treat it like primary business and then you start realizing that it works differently. And you start using different techniques and thinking about it differently. I think a major change includes methods comparable to Pre Re's report lag methodology. I have not mentioned it in this session, but we still use it and there's a lot published on it.

In addition to more data, better data, and more sophisticated actuaries, I think there will be more methods suited particularly to reinsurance -- especially Facultative and Excess of Loss.

Any ideas or any questions? What do you think about the future of reinsurance reserving? It is getting easier or more complicated? Does anyone have any questions?

Q: How do you track results of past reserve evaluations?

R. BERENS: It depends on the method you're using. For example, if you're using loss development triangles, take the ultimate losses that you come up with after this evaluation by contract year and calculate what you should have carried as of 12/83 and 12/84, for example, if we knew then what we know now about ultimate levels. You can also track your predictions of ultimate loss ratios, and even average report lags in our case. In some ways you're begging the question, of course, if you're keeping the same method, since your prediction of what's still out there on old reserves depends upon the accuracy of your method.

You can also predict losses (either paid, known incurred or counts) to come in by year in the future when you do a reserve evaluation to use it as a monitoring tool as experience develops.

Q: How do you set reserves on low-frequency, high-severity business such as earthquake coverage?

R. BERENS: In some cases, reserving to an ultimate loss ratio is the best. On that type of business if you look at your paid loss triangles or your incurred loss triangles you're not going to have any data. One possible way is to do a more sophisticated exposure study; I did one on Caribbean hurricanes in 1978, and someone has done a windstorm model recently. You get an idea of your exposure if you look at property values along possible hurricane paths, for example.

We're going from one extreme, which is setting an ultimate loss ratio, to the other, which is a full-scale exposure study. On some of these there aren't really any textbook answers.

Q: You mentioned international reinsurance. How do you deal with the issue of ranges in foreign currency exchange rates in doing your analysis?

R. BERENS: That's a fun problem-- there are a couple of things you can do. One is to keep the individual currency detail-- you could then set reserves on specific pieces by foreign currency. Usually you end up with Longley-Cook's proverbial collection of crumbs.

When I did our international study, I had two separate cases. One data source converted all transactions at a single set of exchange rates-- we used the current rate. All of the historical transactions were converted at the same rate and therefore you didn't have exchange fluctuations in the data.

Q: But you still have a source of error because you're fixing a set of relativities among currencies that may not have applied in the past.

R. BERENS: Yes, you do-- it's not perfect. Another method used for the rest of the data was to actually request that the underwriters supply to us the distribution of premiums and losses by currency for major groups. (We have very hard-working underwriters.) We then came up with exchange rate "index" factors by contract year and by type of business. We were then able to adjust the development triangles to a current exchange-rate basis. Again, it's not perfect but it's a way to try and get the exchange fluctuations out.

Q: How do you adjust for changing retention levels in your Excess book?

R. BERENS: When we do our IBNR analysis we separate the data into IBNR groups according to the size of the retention. You're right-- if you mix them all together when you're changing the retention sizes in the contract, you're going to have a mess.

Q: How do you account for premium not yet received on in-force contracts at year-end?

R. BERENS: For business written out of the U.S., we calculate EBNR using premium triangles periodically and then update them monthly, according to changes in premium volume. Changes in EBNR go into the IBNR formula. Our Canadian operation does a laborious contract-by-contract analysis of the number of statements that have been received and use that to estimate premium on statements not yet received. It can be done that way, but in most of our business it is not necessary to do a contract-by-contract analysis.

Q: On your age-to-age factors where you eventually multiply one times another times another to get the ultimate-- how do you select your factor? Do you take the latest year, or the average of the latest three years, or five?

R. BERENS: If I think things haven't changed that much, I'll do a weighted average of all the years. By weighted I just mean add up all of the incurred losses reported as of three years of development-- divide by all of the incurred losses reported as of two years of development on the same years. If there are changes in the patterns that I can see I may not use all years. It depends upon how stable you think the book is.

Q: Now I'm going to get on my actuarial soapbox. After you pick the 12-24, 24-36, you multiply them together. When you pick the average of these factors you pick a weighted average, right? I argue that if you're going to, use a geometric average.

Let's use an extreme situation which is not true to life but it illustrates the point I'm making. Suppose you're dealing with two years of experience. One factor indicated .5 and the other indicated 2. I'm going to use the average of these two factors to multiply the other factors that have been selected the same way. The geometric average to me is the only one to use because if I multiply 2 times .5 I get 1, and the square root of 1 is 1. If I add the two factors together I get 2.5 and the arithmetic average is 1.25. I think that's wrong. I think that when you're talking about numbers that you're eventually going to multiply together you cannot use an arithmetic average. I've used an extreme and unrealistic situation just to illustrate this.

COMMENT FROM AUDIENCE: Of course, that introduces a bias because the geometric average is always lower than the arithmetic average.

Q: Do you ever look at trends in th age-to-age factors?

R. BERENS: One of the things we actually have the computer do is a linear regression on the factors. It's kind of ridiculous if you've got only three age-to-age factors for that particular point of development. Sometimes results are way out of the ballpark and sometimes they are close to what we have selected. It's one of those things I look at and never use.

Q: How do you handle retrospective premium adjustments?

R.BERENS: If they aren't expected to be substantial, they're just treated as part of the EBNR. On our domestic treaty book they actually do a separate contract-by-contract analysis.

Q: Do you handle or do you separate the sliding-scale commission reserves on top of those?

R. BERENS: No, we don't handle that explicitly but it could probably be done individually for large contracts.

Q: How do you calculate IBNR recoverable from your retrocessionaires for purposes of completing Schedule F?

R. BERENS: Practically all of our retrocessions are to one single facility and participation is spread out pretty thinly among many companies. We actually keep the premiums separate on business that is ceded to this facility, so we can set up separate reserves for it, we can do a separate analysis and we know what IBNR we're carrying on that business by retrocessionaire.

Q: How do you prepare Schedules O and P of the Annual Statement using typical reinsurance data?

R. BERENS: Schedules O and P are a pain for reinsurers-- I know, I've done it. You can usually separate out Excess business by line and by year and we put that on Schedules O and P that way for the State of New York. I think we're now going to have to do this countrywide. Up to now, for our reporting to Delaware, we allocated all our experience on assumed reinsurance to the

"Reinsurance" line on Schedule O.

Where we're required to report pro rata business by year, as for New York, we allocate it judgmentally based on the data we have. Schedules O and P are not an exact science for reinsurers. We really do our best but it wasn't really designed for reinsurance companies.

Q: Has any thought been given to including another column on Schedule O or P that would actually show an underwriting year premium, or ultimate premium?

R. BERENS: Does anyone know of any thought in that direction? That's been a chronic problem.

COMMENT: Maybe you could re-state past years' premium as it develops.

R. BERENS: That's one approach. I think the idea of another column being added to the annual statement for ultimate premium estimates is a good one.

Q: If loss experience on prior years shows adverse development but retrospective premium received **because** of that development is coded to the current year, you're over-stating the loss ratio for the old year and under-stating it for the current year.

R. BERENS: You're right-- and another example is a stop-loss contract where you might be covering business that the ceding company wrote over the last ten years. For covering development that occurs in the current year, you get the premium in the current year. You can either decide to code the losses back to the years where they happened, which then makes those years look bad because you have adverse experience and no premium to cover it-- or you put all the loss development in the current year which makes it look like the incurred losses are developing at a horrible rate.

Q: The last speaker was talking about the importance of evaluating the solvency of reinsurers by looking at their Annual Statements.

R. BERENS: I have a paper I'm going to write on that someday! I wasn't there when he discussed that-- I was in here trying to figure out how to work the slide projector. Yes, the Annual Statement is a starting point but sometimes, for reinsurers, the data just doesn't fit into the little boxes we have to put it in.

Any more questions or comments?

Thanks for your participation-- you were a great audience.

1987 CASUALTY LOSS RESERVE SEMINAR

3E/5D - DISCOUNTING LOSS RESERVES FOR FEDERAL INCOME TAX

Moderator & Recorder: Stephen C. Eldridge, Partner-NY
Regional Director of Insurance Tax Services
Ernst & Whinney

Lee M. Smith, Principal
Ernst & Whinney

Panel: Robert V. Deutsch, Sr. Vice President
& Chief Actuary
Executive Re, Inc.

Walter T. Gryska, Vice President of Tax Administration
The St. Paul Companies

STEPHEN ELDRIDGE: We're here to spend the next hour and a half or so talking about loss reserve discounting for tax purposes. We're going to have presentations made by these three gentlemen to my right, your left, first is Lee Smith, an actuary, my partner from Ernst & Whinney in Chicago. Next is Bob Deutsch, Sr. Vice President of Executive Re. Bob is an actuary formerly with the New York office of Ernst & Whinney. And last but not least is Walter Gryska, a CPA with the St. Paul Companies. Lee will give you an overview of discounting. Bob is going to talk about some investment strategies. And Walter is going to talk about the subject on everybody's mind -- what is the GAAP impact of discounting. I'm Steve Eldridge, a CPA in the New York office of Ernst & Whinney. I E&U's insurance tax practice in that region. I am not an actuary. I'll be making comments and keeping things moving along.

LEE SMITH: The handout that would goes with the slides that I'm putting out looks like this -- it has an outline on front with our names on it and displays the subject matter we're now discussing. I'm going to do the more mundane aspect of this session. I'm going to talk a little bit about what the Act says about discounting and how discounting is calculated. Then Bob and Walter are going to go into some of the more interesting ramifications of discounting. We're going to go fairly quickly through my portion of it, and it's going to be pretty much a matter of following the slides.

The first series of slides goes through a number of things that we're not going to talk about. I was just showing the kind of a scope of the Tax Act as it affects insurance companies. We're not going to spend any time discussing any of these. I think Walter may be talking a little bit about some of these topics later on, but they aren't directly related to loss discounting. The first slide basically discusses the one factor that is affected by the discounting aspect of the Tax Act, incurred losses. Incurred losses are deductible for tax purposes for insurance companies. The aspect of the Act that we're talking about is the change in the definition of incurred losses, which the 1986 Act affects. The change is to redefine the unpaid loss portion of incurred losses to be the discounted unpaid amounts instead of the <u>un</u>discounted <u>un</u>paid amounts. This just shows the definition of incurred losses -- whether it's discounted or undiscounted. We'll go through this formula and what it means and what the effect of the Tax Act is later. The Tax Act defines unpaid losses to include cases and IBNR reserves and loss expense reserves, so we're discounting all of the unpaid amounts. I think any of you who have read the Act are familiar with that. The key provision is discounting and it is effective in 1987. The current law defines incurred losses as the paid losses during the year, plus the undiscounted unpaid amounts at the end of the year, minus the undiscounted or unpaid amounts at the beginning of the year. Now this formula and the next formula combine to give us the basis for determining the effect of the new law on income and therefore on taxes, so that's why we're going a little bit slow on what seem to be fairly simple concepts. The new law then defines incurred losses to be paid losses during the year plus* discounted unpaid losses at the end of the year, minus discounted unpaid losses at the beginning of the year. I've broken discounted unpaid losses into the undiscounted piece that we saw before minus the effect of the discount. I did that so that we could see what the effect of the law is -- because the effect of the law is the difference between these two definitions, and that's the effect on tax.

One factor used during the mechanical calculation one needs to do to determine discounted losses is the undiscounted loss amounts that are presented in the annual statement. The interest rate is the second factor to be used for discounting -- and that's about 7.2% based on the formula. The loss payment pattern is prescribed by the Internal Revenue Service and is not negotiable, even though very few actuaries would probably agree for any particular situation with the way the formula works. That's not of concern to the IRS. Special provisions are made in the law for claims made policies, and for discounted annual statement reserves. If the current annual statement reserves are discounted the company is allowed to undiscount them if they disclose in the statement the basis for the discounting so that the IRS can understand how they've gone from the statement reserves to the undiscounted reserves. If the statement reserves are discounted you're allowed to undiscount them before discounting them again, if you provide the information necessary by which to do that. It's important that people disclose how they discount if they discount so that they can undiscount before they discount. Again, we may get into more detail later. We're trying to familiarize you with the basic concepts first, then we can get into some of the more detailed ideas. As far as the interest rate and the way that's determined there is a factor to consider in understanding why the IRS did what it did. And that is that we had very high inflation rates prior to 1986 and the IRS wants to use a 5 year average of interest rates. If they had used a 5 year average this year, it would have gone back to 1981 when interest rates were very high and it would have had a damaging effect on a lot of insurance companies because we would have been discounting at a very high rate of interest instead of 7.2%. That is, had we done the calculation based on a 5 year average ending December 1986, it might have been 9% or more, so it was to the advantage of the insurers that they define this interest rate to only include the 5 month period -- August to December 1986. That period will extend by 12 months every year. August of '86 will always be the first month in the calculation, and every year we will pick up 12 additional months. Next year we'll pick up all the 1987 months, for example. Ultimately when we get out to 60 months after August of '86, we will have a 60 month average built in when calculating the interest rate. Once the interest rate is set it is permanent for the accident year. Once the interest rate is set this year for all of the accident years in the calculation, it will be set for that year and that year will always use that discount rate. The loss payment pattern is redetermined every 5 years. This year the Service will put out calculated payment patterns based on industry data-- based on Best's data which the companies may use. They will also give certain companies the option to use their own experience. There is a strategy involved in whether or not one would select ones' own experience.

There are different definitions for Schedule O and Schedule P lines as to how the payment pattern is defined. That's because of the information in the Annual Statement. The information in the Annual Statement only allows one to go back two years in Schedule O to get the factors needed to determine the payment pattern. So they have to assume that the losses are all paid after four years, and what they do is take the Schedule O data, which we'll talk about in a minute. The ratio of paid losses to incurred losses is used. That ratio is only available for enough years in Schedule O to allow you to calculate a payment pattern for two years. They allow four-years in the calculation, the next two-years you take whatever is left and assume it is half paid in the third year and half paid in the fourth year.

For Schedule P, again there's enough information in the annual statement to have a payout pattern calculated for 10 years. They allow this payment pattern to be determined over a 10-year period. This period may be extended if the payments after the 10th year are greater than the payments in the 10th year. Even though we're only talking about three items and they're fairly simple to understand: interest rates; undiscounted losses; and payment patterns; when you get to the mechanical ways that are prescribed it gets kind of messy.

Here's an example of the payment pattern from Best's Schedule P-- Workers' Compensation. For example, for the current accident year -- 25.9% of losses are paid. What that means is if you look at the Best's data you look at the ratio of the paid losses to the incurred losses for the most recent accident year. If you're looking at the '87 Statement for the '87 accident year, that ratio would be 25.9% -- 25.9% of assumed ultimate losses have been paid in the '87 year. The remainder is assumed to be paid out over the next 10 year period. Each of these factors is a function of the ratio of losses paid to losses incurred for the accident years in the Annual Statement. The 28.6% for the accident year plus one is a function of -- again using the 1987 Statement as an example -- the ratio of the paid losses for 1986 to incurred losses for 1986. That ratio is going to be 54.5%. We know that because we assume that 28.6% of losses are going to be paid in the second year and we know that they're assuming the 25.9% were paid in the first year. The sum of those two is 54.5%, which is the percentage of '86 losses that have been paid in 1987. Again, the theory here is that that particular Annual Statement that you're looking at has all of the information in it that you need to calculate a payment pattern. You just look at the '86 year and that's the only year to use to determine what percentage of the losses are paid in the first year after the year you're looking at it. The other numbers can be similarly interpreted -- for accident year plus two, the 13.3% is the ratio of the payments for 1985 to incurred for 1985, minus the two prior pieces. It is a very mathematical, very algebraic kind of approach -- it doesn't necessarily meet any kind of logic test that one might apply, but it works for the IRS because they don't have to audit anything other than the prescribed documents.

STEPHEN ELDRIDGE: You explained it in lay terms (not being an actuary) that really is the latest triangle.

LEE SMITH: Right -- if you're looking at a loss development triangle for those years -- working with that last diagonal -- a ratio of the last diagonal payment to the last diagonal incurred amounts.

LEE SMITH: If I look at my reserves at the end of the first year, I've already paid 25.6%. I only have to discount the remaining 74.4% unpaid at the end of that year.

LEE SMITH: These are just examples of discount factors, we'll put some other ones up later. These are just a function of the ratio of the discounted future payments for a period to the undiscounted payments for that period. We'll talk about that in a minute, so these factors aren't that meaningful. Again, I refer to the election issue we've discussed before. If you want to use your own payment patterns and you don't want to use the industry statistics, you've made that an irrevocable choice and you're stuck with that for five-years. It is a pretty serious consideration. One consideration is the credibility of your data. You are allowed to do it if you're one of the top 90% of the writers in that line -- however, your data may not be very credible, and you're going to have to recalculate that payment pattern each year for the most current accident year. You may get wide fluctuations in that five year period. If you're a really small company that's something you ought to think about before you would use your own data. What changes is the interest rate, and that's going to change anyway.

STEPHEN ELDRIDGE: Don't you also have to project your own Annual Statement for the next several years which can be dangerous?

LEE SMITH: In terms of the tax strategy, you have to try and predict what's going to happen over the next five years to your Annual Statement, i.e., what's going to appear on the actual published document because that's all the IRS is going to let you use.

There's some specific guidelines with regard to international and reinsurance because they're Schedule O lines and the IRS presumes they're more like Schedule P lines in payout pattern. In essence, what they're saying is that for international and reinsurance you've got to pay them out over 10 years or 15 years. You can't pay them out over four years like you do other Schedule O lines. Let's just say that's something they've decided. If you know what kind of reinsurance you have, for example, if all of your reinsurance is medical malpractice, you may have to use a medical malpractice payment pattern from Schedule P. If it is a mix you use the combined payment pattern for all Schedule P lines. That's the way it works for international and reinsurance. There's a fresh start provision which I think Walter is going to talk about. Basically, they just forgive the opening discount. They're not going to make you calculate your incurred loss based on undiscounted amounts for the prior period and discounted amounts for the current period, which would give a very small deduction. For GAAP purposes this gets a little tricky in that it (fresh start) has to be amortized in over a period of years.

We have an example of a particular insurance company -- it happens to write one line of workers' compensation insurance. It has earned premiums of $100 million, 5% growth; and a loss and loss expense ratio of 80% -- it's a fairly stable, easy to demonstrate insurance company. The company payment pattern is fairly straightforward -- 25% in the first year -- for the most recent prior accident year we've paid out 40%. The 25 which was already determined from the first year plus another 15 gives us the 40%. From the annual statement it is a little bit tricky because the annual statement doesn't have incremental factors the way the IRS puts them out -- they have the cumulative factors. The annual statement will have a 25, 40 and a 60, and you have to break those into the incremental pieces. If you try to tie out these factors to the annual statement ratios you won't come out precisely right because you have to take the difference in each year. This is the raw data from which those ratios appear. You can look, for example, at 1985. If you look at the payments as of '85 they are $415,786; the incurred's are $1,663,144; and therefore that ratio is 25%. That's how the IRS calculates the first element of the payment pattern. They just look at the ratio for the most recent year -- payments to the most recent year incurred amounts. For the second year the 15% they assume they've paid in the second year is the ratio 633 to 1583, which is 40%, minus the 25% you just calculated, because you're not paying out the whole 40% in the second year -- you're only paying out the difference between what you paid in the first year and the total you've paid in the second year. If we could go backwards we would find that when we look at that 15, 25, it would correspond to these numbers. The 25% of the first year is the ratio of the 415 to the 1663. The 25% of the second year is the 633 ratio to the 1583, minus the 25%. The 10% for the third year is the ratio of the 754 to the 1508, which is 50% minus the 40% you just calculated, which is the amount assumed to have incurred in the third year. That's how the IRS prescribes one calculate the payment pattern, regardless of whether that payment pattern has anything to do with what you think is going to happen for that line. In fact, it may be very different from what your annual statement says it is. What you're predicting the payment pattern may be, may be very different from what's prescribed.

Here are the discounted and the undiscounted loss and loss expense amounts. They show that we calculate the factor based on the payment pattern and the interest rate. We apply the factors to the undiscounted, unpaid amounts. If you discount your annual statement reserves you're allowed to gross them up. You can see that the undiscounted, unpaids for this company is about $5,131,000; and the discounted is $4,162,000, the discounting affect is a little less than $1 million. We have to have the discount and the undiscounted amounts for both years. We'll see how those are used in the formula in a minute. This is actually the affect of the discounting itself. We see the $5,131,000 is the undiscounted amount that we had for the 1985 year. We're going to spend a little bit of time with this because this is really the bottom line on what happens once you've calculated your payment pattern, and once you've applied your interest rate for that payment pattern, and taken the present value of all future payments for each accident year. Once you've done that here is what happens for a particular situation. We would have had $5,131,000 in unpaid amounts under the old law. Under the new law after discounting we have $4,162,000 for the '85 year. So the effective discounting is $969,000 for the '85 year, which is one piece of the formula for the incurred losses. For the '86 year, prior to discounting we had $5,388,000 in unpaid amounts; after discounting we have $4,370,000 for a discounting of $1,118,000. There's a change in this discount effect, which impacts the incurred losses, because everything else in the incurred loss formula is the same. The paid loss is the same; the undiscounted amounts are the same as the old law. The only thing that changes is that we're subtracting out the discount from the current year and the prior year from the new formula. It's the change in discounts which affects the incurred loss estimates. In this case the discount is more in the '86 year than in the '85 year, so the discount has gone up by $48,000, which means incurred losses have gone down by $48,000, which means you're being taxed on additional $48,000 amount. As I said, it is a fairly simple process to go through the discounting because it's prescribed so precisely. The IRS prescribes how to do the payment pattern, and they even produce the discount factors that result from that prescribed payment pattern and prescribed interest rate. If you want to go with the IRS factors and you don't want to do any tax planning or strategizing, or projecting by-years and figuring out what would be better, you just hit your undiscounted loss reserves by these factors that are produced by-line, by the IRS, you produce your discounted amount, and then you'll have a new incurred loss to subtract from your earned premium to produce a taxable income.

We've talked about some of these considerations, and we probably should spend a second on them. One is that the actual results are going to diverge from the prescribed. Some people are going to be confused because you're going to be saying that the effective discount in this current year is something based on this formula. If you're going to be doing financial projections for management, you're probably going to be doing a more sophisticated model for preparing the effect of future investment income. It's going to be different from what the IRS prescribes -- you're going to have another set of books. You're going to have the management projections; you're going to have the tax projections; and the other you do for whatever other purposes. You're going to have to keep that in mind because people are going to get confused. They're going to assume that the calculations given to the IRS are the same ones that you're going to use for management. In fact, that probably won't be the case. If your reserves are discounted and you don't provide the information in the annual statement by which to undiscount them, you're going to be required to discount your discounted reserves. If you have reserves in your annual statement and they're discounted, and you don't show how to get them back to an undiscounted basis, you're going to be discounting the discounted reserves and that's going to probably penalize you in your tax calculation.

There is a notion about reserve strengthening that I don't think has been resolved yet. The IRS says you don't get a fresh start on any reserve strengthening which occurs. There is a definition of reserve strengthening which talks about a change in incurred

LOSSES

- Incurred Losses Deductible
- Paid Losses + Unpaid Losses (Current Year) - Unpaid Losses (Prior Year)
- Unpaid Losses Include:
  - Reported Losses
  - Incurred-But-Not-Reported Losses
  - Unpaid Loss Expenses

CURRENT LAW

Incurred = Paid (Y)
+ Undiscounted Unpaid (Y)
- Undiscounted Unpaid (Y-1)

NEW LAW

$$\text{Incurred} = \text{Paid (Y)} + \left[\text{Undiscounted Unpaid (Y)} - \text{Discount (Y)}\right] - \left[\text{Undiscounted Unpaid (Y-1)} - \text{Discount (Y-1)}\right]$$

1985 SCHEDULE P – PART 1D – WORKERS' COMPENSATION

Accident Year	*Loss and Loss Expense Unpaid*	*Discounted Loss and Loss Expense Unpaid*
Prior to 1976	164,580	159,106
1976	80,406	77,731
1977	168,852	157,896
1978	206,844	183,511
1979	248,213	210,075
1980	325,779	269,137
1981	410,481	330,244
1982	574,674	462,961
1983	754,260	600,142
1984	950,367	742,050
1985	1,247,357	969,353
	5,131,813	4,162,206

1986 SCHEDULE P – PART 1D – WORKERS' COMPENSATION

Accident Year	*Loss and Loss Expense Unpaid*	*Discounted Loss and Loss Expense Unpaid*
Prior to 1976	119,206	115,240
1976	53,604	51,821
1977	84,426	81,618
1978	177,295	165,791
1979	217,186	192,686
1980	260,623	220,579
1981	342,068	282,594
1982	431,006	346,757
1983	603,408	486,109
1984	791,973	630,149
1985	997,886	779,152
1986	1,309,725	1,017,821
	5,388,403	4,370,317

EFFECT OF DISCOUNTING

STATEMENT YEAR	*LOSS AND LOSS EXPENSE UNPAID*	*DISCOUNTED LOSS AND LOSS EXPENSE UNPAID*	*EFFECT OF DISCOUNTING*
1985	$5,131,813	$4,162,206	$ 969,607
1986	5,388,403	4,370,317	1,018,086
Change in Discount Amount			$ 48,479

loss estimates for prior accident years. If this year your incurred loss estimates for accident years '85 and prior, are higher than they were last year that definition would say you strengthened reserves. Another interpretation of it is only reserve strengthening which is done for artificial reasons will not be forgiven. I think there is a real issue there that hasn't been resolved in terms of how they define the reserve strengthening that will not be allowed in the fresh start calculation. As Steve said some five year projections should be done to see what the potential affect of alternatives are.

These are all of the mechanical aspects of the discounting. They may help you to understand a little bit better some of the more advanced subjects that Walt and Bob are going to talk about now. Then as I said, we'll be able to talk about anything that didn't come through clearly. I know that we rushed through a lot of material very fast -- we can talk about it at the end of the session.

STEPHEN ELDRIDGE: Bob Deutsch is going to talk about investment strategy.

ROBERT DEUTSCH: (Slide #1) Usually I start out with a joke, but these tax rules are so complicated and so confusing that not even a joke will help add some levity to this. Are there any people from the IRS here? I always thought that your tax return was your first offer. But these rules are so complicated that your first offer may be accepted. Slide 2 shows different marginal tax rates, depending on whether you're a regular taxpayer or a minimum taxpayer. The 1986 to 1988 numbers are shown to illustrate the tax rate changes -- 1987 is shown because it is a transitional year so there's a 40% maximum corporate tax rate.

STEPHEN ELDRIDGE: Bob, before you go on, when you talk about a minimum taxpayer you mean an alternative minimum taxpayer.

DEUTSCH: That's right. An alternative minimum taxpayer and one that's not complicated by the use of NOL's. You can use NOL's to offset up to 90% of your AMTI. I've not complicated it with NOL's, which we'll get to later on.

ELDRIDGE: So we have a regular AMT taxpayer here as opposed to an NOL/AMT taxpayer. We have three kinds of taxpayers -- we have a regular taxpayer, a regular taxpayer AMT, and an NOL/AMT taxpayer?

DEUTSCH: Here are the marginal tax rates. The calculations for them are shown on the next page (Slide #3). I'll be careful since we can't go backwards. For example, on the new stocks which is the last line there -- that's probably the most complicated one. Twenty percent of the stock dividend is already included in taxable income. Then 15% of the 80% dividend exclusion is added back, and that's part of the proration aspect which will be covered in the next session. Then that leaves 50% or 75% to apply to the remaining 68% of the previously untaxed dividend income. It's 50% for 1987, '88, and '89, and then AMT is based upon adjusted earnings and it switches to 75%. Adjusted earnings for the most part you can think of as regular taxable income plus untaxed investment income.

ELDRIDGE: Bob, since adjusted earnings can have other meanings, let's use the tax term "earnings in profits."

DEUTSCH: We're talking about earnings and profits -- "E&P".

ELDRIDGE: E&P is a pure tax phrase having no meaning anywhere else outside the tax law.

DEUTSCH: Correct. Let's start with these underlying assumptions for the rest of the scenarios (see Slide #4). We have assets of $500 million; taxable investments yield 9%; tax exempts yield 7%. This was done prior to Mr. Greenspan's interest rate moves, so these need to be changed. Assume that all of the tax exempts are bought after August 7, 1986. Therefore, they qualify as new bonds so then 15% of tax exempt -- added tax exempt income is added back for tax calculations. The insurance company has a statutory underwriting loss of $25 million, and the effect of the loss reserve discounting and the 20% UPR adjustments total $20 million. I have intentionally not broken it down between permanent differences, such as the fresh start and timing differences such as the 20% of the change in UPR. Walt will address those in his talk. Here we are with 1986, life is simple. In the next slide (#5), you had $25 million of underwriting loss. What do you do? You just buy enough of taxables so that you generate $25 million of taxable investment income, and therefore you pay no taxes. Under this scenario you would invest $278 million in taxables -- $222 million in tax exempts. The bottom line effect of this is that from the statutory point of view your after-tax statutory income is $15.6 million, and you paid no taxes. Now it is 1988. I've left out 1987 only because this uses the transition rates and let's just get right into 1988. On one scenario you can start with 100% in taxables. Here the different calculations are shown. Your regular tax is $13.6 million and that's because you had regular taxable income of $40 million. You'll notice here the $20 million from the discounting and UPR -- those are adjustments added back to the underwriting income. Here we paid $13.6 million in regular tax. The AMT calculation results in $8 million in tax. Here, there is no preference item -- and when I say preference item I mean 50% of the difference between your book income and your tax income. That amount is is added back as a preference item for AMT calculations. Here, since your regular taxable income exceeds your book income, there is no preference. The result here is clearly not a good one from the company's point of view. They've invested way too much in taxables. They paid far more tax than they need to and the result is after tax statutory income of $6.4 million.

ELDRIDGE: Bob before you move on you've assumed here in calculating the AMT that the statutory statement is the applicable financial statement in this purpose, i.e., a company that issues only a statutory statement.

DEUTSCH: That's correct. There's a priority of financial statements. I've assumed GAAP statements are not issued. This is not a company that is registered with the SEC, and the "applicable financial statements" are the statutory ones. Walt will address the issue when a GAAP financial statement is the "applicable financial statement".

In the next scenario (Slide #7) we've assumed 100% is in tax-exempts. In this case you pay very little regular tax, you only pay $85,000. The proration that you see there, that $5.25 million, that you see and is 15% of the tax-exempt investment income, and that is added back to the regular tax calculation. Here your AMT becomes a much heavier burden. You have a very large preference between your book income of $10 million and your regular taxable income of $250,000, so that half of that difference is added back and your alternative minimum taxable income is $5.1 million. 20% of that results in $1 million of AMT taxes. After you've paid your million dollars of taxes, your income after taxes here is $9 million. When you've invested 100% in taxables, you've ended up with $6.4 million in after tax income. When you've invested 100% in tax-exempts, you've ended up with $9 million.

What is the optimal strategy? It depends on what your goal is. Let's assume that your goal is to maximize after tax statutory income. The best way to do that is to make sure your AMT calculation and your regular tax calculation result in the same tax. That is when you've paid the minimum amount of taxes possible (see Slide #8). Your statutory income is equal to the $25 million underwriting loss, plus 9% times whatever amount is invested in taxables, plus 7% times whatever amount is invested in tax-exempts. We've assumed a very simple portfolio just between new tax exempt bonds and taxable bonds -- no stocks in this portfolio. Your regular tax is 34% of that equation, which starts with your $25 million underwriting loss -- adds back the $20 million for unearned premium and reserve discounting adjustments -- adds to that the taxable investment income -- and adds to that the proration piece of the tax exempt investment income, which is 15%. The AMT calculation is 20% of your regular taxable income, plus 50% of that book tax preference, assuming it's a number greater than, or equal to, zero. I won't go through the mechanics but if you plug through these formulas you end up with numbers 5 and 6 there. If you set the two of them equal to each other in order to calculate you "T" the amount to be invested in taxables then "T" is $55 million. Effectively you've placed 11% of assets in taxables and 89% in tax exempts. Having done that (Slide #9), we calculate a tax of $1.6 million, and that tax is the same under the regular tax calculation and the alternative minimum tax calculation. Here we have maximized after-tax statutory income, and that's equal to $9.5 million.

Slide #10 is a graph showing the different tax calculations. The X axis shows the percentage invested in taxables. It starts with zero on the left and goes to 100 on the right. The first line starting with the dotted line at zero and going straight up is the regular tax calculation. The other line shows your AMT calculation. You see that below 11% the regular tax is less than the alternative minimum tax. Above 11% the regular tax is greater than the alternative minimum tax. The solid line shows the actual tax that you would pay, which is the higher of the two. The reason there's a slight bump in the AMT line is because at some point you no longer have a book tax preference. It's a pretty moot point because you're already paying the regular tax. The next graph (Slide #11) shows you your after tax statutory income. You see that we have maximized after tax statutory income at around $9.5 million when we're at 11% invested in taxables.

QUESTION: Is this a demonstration on the '87 to '89 rules?

DEUTSCH: This is a demonstration under '88 and '89 because '87 has the transition tax rates. The AMT line would change. The next page (Slide #12) shows you different after-tax statutory income amounts as you progress up in taxables -- starting with zero in taxables and going to $500 million. What is interesting is that if we would have followed the 1986 strategy and invested $222 million in tax exempts, we would have ended up with $8 million in after tax statutory income. Staying with your '86 posture in 1988 would have been a mistake.

The last slide (#13) just highlights some of the complications involved in this approach which is quite simplistic. It assumes a simple portfolio; it assumes you can move in and out as you have to. We've excluded all of the stocks. We've excluded old tax exempt bonds that are not subject to proration. All of these results are very sensitive to the yields. If the 7% yield had been 6%, the curves would have changed. Also, if the underwriting taxable income was different the curves would have changed as well. Again, the AMT line shifts when we start using the E&P calculation (the earnings and profit calculation). Likewise, we have not considered NOLS. We have not considered the real world complications of moving your portfolio year after year -- quarter after quarter as interest rates changed.

Finally, the biggest complication is we've just viewed this from a statutory point of view. Many companies do file GAAP statements, which take precedent over statutory, and Walter will address those.

ELDRIDGE: Not only that but companies often view their GAAP financial statements as being more important than their stat financial statements. Published reported earnings are often life or death for management.

DEUTSCH: Here we've really taken a cashflow approach. We've tried to minimize the actual cash dollars turned over to the IRS.

ELDRIDGE: One point we'd just like to emphasize is that while it hasn't been brought out here yet, is the potential negative impact of tax-exempts in 1990. You'll see perhaps as our next speaker goes on (and especially if you stay for the next session), that the impact of the shift in 1990 to the earnings in profits, if we ever get there. I say "if we ever get there" because no one knows if 1990 will ever come to pass. That is, don't know whether the E&P system will ever come to pass as it is presently scheduled to be in 1990. The significant investment point here is that the tax impact of all of these tax-exempts changes dramatically in 1990. Many people are simply not aware of that, and it is because of the mechanics of the AMT, and we may spend a little time on this here, if we have some time, but we will go into this more in the next session. We just want you to know the point that the impact of tax exempts changes dramatically i.e., it gets worse in 1990.

MARGINAL TAX RATES

REGULAR TAXPAYER

	1986	1987	1988
TAXABLE BONDS	46%	40%	34%
"OLD" TAX-EXEMPT BONDS	0	0	0
"NEW" TAX-EXEMPT BONDS	0	6(a)	5.1(b)
"OLD" STOCKS	6.9(c)	8(d)	6.8(e)
"NEW" STOCKS	6.9(c)	12.8(f)	10.88(g)

MINIMUM TAYPAYER

	1987-1989	1990-?
TAXABLE BONDS	20%	20%
"OLD" TAX-EXEMPT BONDS	10(h)	15(i)
"NEW" TAX-EXEMPT BONDS	11.5(j)	15.75(k)
"OLD" STOCKS	12(l)	16(m)
"NEW" STOCKS	13.2(n)	16.6(o)

TAX RATES CALCULATIONS

(a) 40% x 15%
(b) 34% x 15%
(c) 46% x (1-85%)
(d) 40% x (1-80%)
(e) 34% x (1-80%)
(f) 40% x [20% + 15% x 80%]
(g) 34% x [20% + 15% x 80%]
(h) 20% x 50% x (1-0)
(i) 20% x 75% x (1-0)
(j) 20% x [15% + 50% x (1-15%)]
(k) 20% x [15% + 75% x (1-15%)]
(l) 20% x [20% + 50% x 80%]
(m) 20% x [20% + 75% x 80%]
(n) 20% x [20% + 15% x 80% + 50% x (1-20%-12%)]
(o) 20% x [20% + 15% x 80% + 75% x (1-20%-12%)]

<u>ASSUMPTIONS</u>

1. ASSETS OF $500 MILLION.
2. TAXABLES YIELD 9%. TAX-EXEMPTS YIELD 7%.
3. ALL TAX-EXEMPTS IN 1988 SCENARIO BOUGHT AFTER AUGUST 7, 1986.
4. STATUTORY UNDERWRITING LOSS OF $25 MILLION.
5. EFFECT OF LOSS RESERVE DISCOUNTING AND 20% UNEARNED PREMIUM RESERVE ADJUSTMENT IS $20 MILLION.

<u>1986</u>

1. MAXIMIZE AFTER-TAX STATUTORY INCOME BY GENERATING $25 MILLION IN TAXABLE INCOME.
2. REQUIRES $277.8 IN TAXABLES AND $222.2 IN TAX-EXEMPTS.

UNDERWRITING INCOME	(25,000)
TAXABLE INV. INC.	25,000
TAX-EXEMPT INV. INC.	15,556
INCOME BEFORE TAXES	15,556
TAXES	0
INCOME AFTER TAXES	15,556

<u>1988 - #1</u>

1. ASSUME 100% IN TAXABLES.
2. REGULAR TAX IS $13.6 MILLION.

UNDERWRITING INCOME	(25,000)
DISCOUNTING AND UPR	20,000
TAXABLE INV. INC.	45,000
RTI	40,000
TAXES	13,600

3. ALTERNATIVE MINIMUM TAX IS $8 MILLION.

PRETAX STAT. INCOME	20,000
RTI	40,000
PREFERENCE	0
AMTI	40,000
AMT	8,000

4. AFTER-TAX STATUTORY INCOME IS $9.8 MILLION.

UNDERWRITING INCOME	(25,000)
TAXABLE INV. INC.	45,000
INCOME BEFORE TAXES	20,000
TAXES	13,600
INCOME AFTER TAXES	6,400

1988 - #2

1. ASSUME 100% IN TAX-EXEMPTS.
2. REGULAR TAX IS $0.1 MILLION.

UNDERWRITING INCOME	(25,000)
DISCOUNTING AND UPR	20,000
PRORATION	5,250
RTI	250
TAXES	85

3. ALTERNATIVE MINIMUM TAX IS $1.0 MILLION.

PRETAX STAT. INCOME	10,000
RTI	250
PREFERENCE	4,875
AMTI	5,125
AMT	1,025

4. AFTER-TAX STATUTORY INCOME IS $9.0 MILLION.

UNDERWRITING INCOME	(25,000)
TAX-EXEMPT INV. INC.	35,000
INCOME BEFORE TAXES	10,000
TAXES	1,025
INCOME AFTER TAXES	8,975

<u>1988 - #3</u>

1. MAXIMIZE AFTER-TAX STATUTORY INCOME WHEN REGULAR TAX EQUALS ALTERNATIVE MINIMUM TAX.
2. STATUTORY INCOME BEFORE TAXES EQUALS (25,000) + 9% x T + 7% x (500,000 - T).
3. REGULAR TAX EQUALS 34% OF (25,000) + 20,000 + 9% x T + 15% x 7% x (500,000 - T).
4. ALTERNATIVE MINIMUM TAX EQUALS 20% OF RTI + 50% x (PRETAX STATUTORY INCOME - RTI). THE LATTER TERM CANNOT BE LESS THAN ZERO.
5. RTI = 250 + .0795 x T.
6. AMTI = 250 + .0795 x T + ABSOLUTE VALUE OF 4875 - .02975 x T.
7. REGULAR TAX = ALTERNATIVE MINIMUM TAX WHEN T = 55,035.
8. PLACE 11% OF ASSETS IN TAXABLES AND 89% IN TAX-EXEMPTS.

1988 - #3 CONTINUED

1. REGULAR TAX IS $1.6 MILLION.

UNDERWRITING INCOME	(25,000)
DISCOUNTING AND UPR	20,000
PRORATION	4,672
TAXABLE INV. INC.	4,953
RTI	4,625
TAXES	1,573

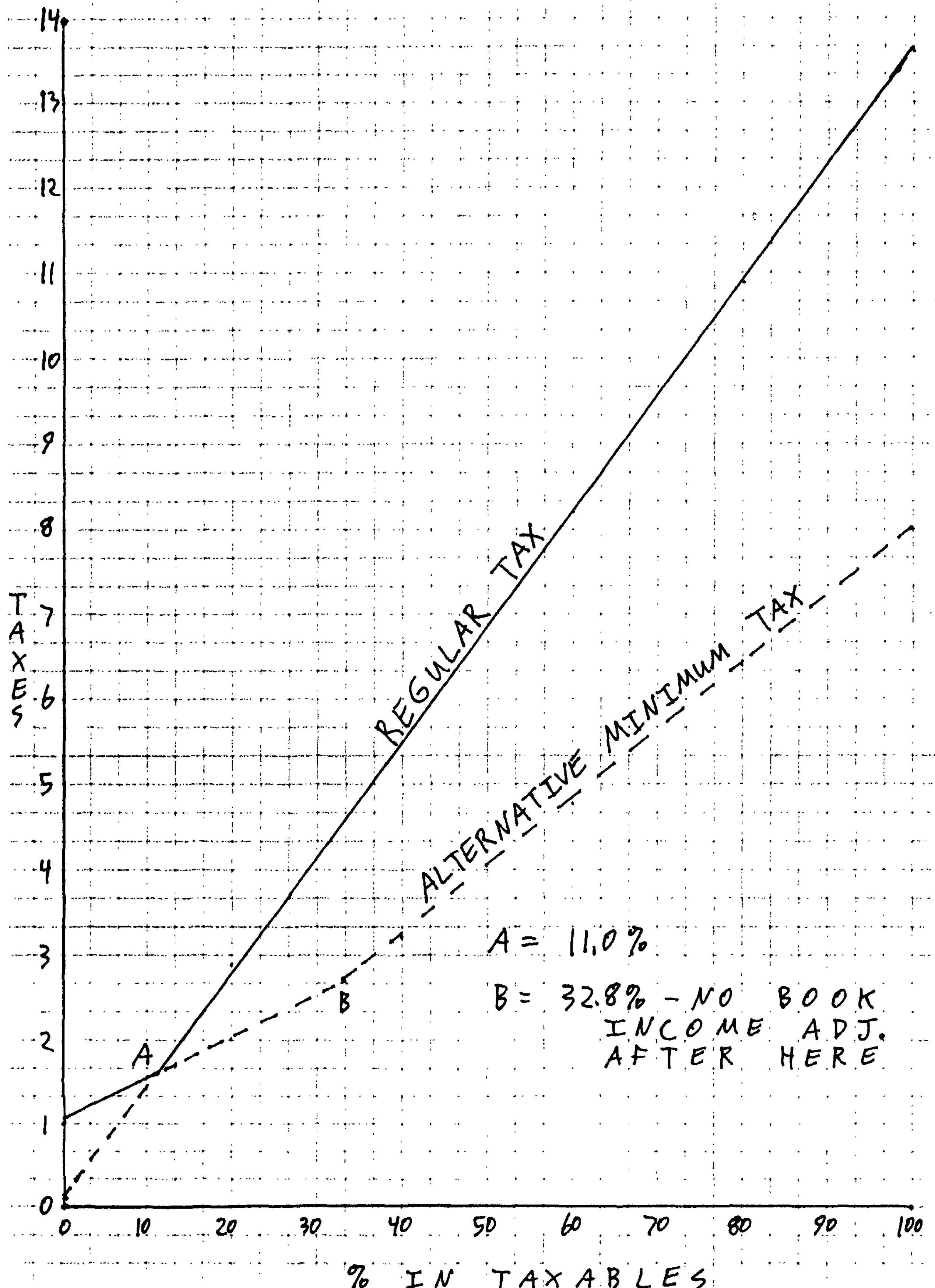
2. ALTERNATIVE MINIMUM TAX IS $1.6 MILLION.

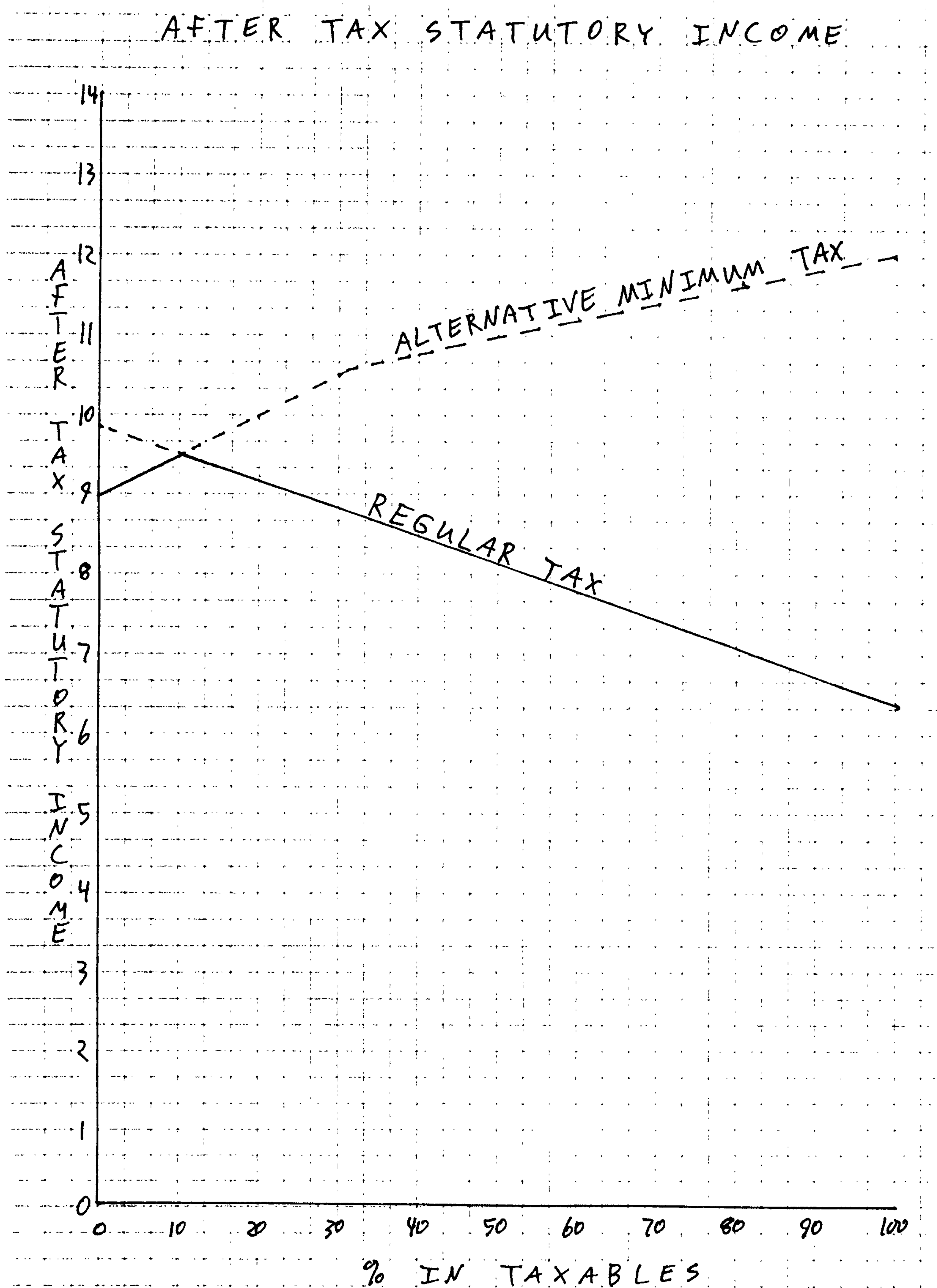
PRETAX STAT. INCOME	11,101
RTI	4,625
PREFERENCE	3,238
AMTI	7,863
AMT	1,573

3. AFTER-TAX STATUTORY INCOME IS $9.5 MILLION.

UNDERWRITING INCOME	(25,000)
TAXABLE INV. INC.	4,953
TAX-EXEMPT INV. INC.	31,148
INCOME BEFORE TAXES	11,101
TAXES	1,573
INCOME AFTER TAXES	9,528

FEDERAL INCOME TAXES




AFTER TAX STATUTORY INCOME
AFTER TAX STATUTORY INCOME
% IN TAXABLES
ALTERNATIVE MINIMUM TAX
REGULAR TAX
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90
100

TAXABLES	TAX EXEMPTS	PRETAX STAT. INCOME	REGULAR TAXABLE INCOME	REGULAR TAX	ALTERN. MINIMUM TAXABLE INCOME	ALTERN. MINIMUM TAX	AFTER TAX STAT. INCOME	TAX PAID
0	500,000	10,000	250	85	5,125	1,025	8,975	AMT
25,000	475,000	10,500	2,238	761	6,369	1,274	9,226	AMT
50,000	450,000	11,000	4,225	1,437	7,613	1,523	9,478	AMT
55,035	444,965	11,101	4,625	1,573	7,863	1,573	9,528	SAME
75,000	425,000	11,500	6,213	2,112	8,856	1,771	9,388	REGULAR
100,000	400,000	12,000	8,200	2,788	10,100	2,020	9,212	REGULAR
150,000	350,000	13,000	12,175	4,140	12,588	2,518	8,861	REGULAR
200,000	300,000	14,000	16,150	5,491	16,150	3,230	8,509	REGULAR
250,000	250,000	15,000	20,125	6,843	20,125	4,025	8,157	REGULAR
277,778	222,222	15,556	22,333	7,593	22,333	4,467	7,962	REGULAR
300,000	200,000	16,000	24,100	8,194	24,100	4,820	7,806	REGULAR
350,000	150,000	17,000	28,075	9,546	28,075	5,615	7,455	REGULAR
400,000	100,000	18,000	32,050	10,897	32,050	6,410	7,103	REGULAR
450,000	50,000	19,000	36,025	12,249	36,025	7,205	6,752	REGULAR
500,000	0	20,000	40,000	13,600	40,000	8,000	6,400	REGULAR

COMPLICATIONS

1. PORTFOLIO INCLUDES "NEW" AND "OLD" STOCKS AND "OLD" TAX-EXEMPT BONDS.
2. EXTREMELY SENSITIVE TO TAXABLE AND TAX-EXEMPT YIELDS, AS WELL AS AMOUNT OF UNDERWRITING TAXABLE INCOME.
3. AMT SHIFTS SIGNIFICANTLY IN 1990 WHEN USE ADJUSTED CURRENT EARNINGS AND 75% FACTOR.
4. NOL CARRY FORWARDS AND LIMITS OF USE.
5. FINANCIAL EFFECTS OF FREQUENTLY CHANGING PORTFOLIO MIX.
6. STATUTORY VS. GAAP VS. CASH FLOW CONSIDERATIONS.

1987 CASUALTY LOSS RESERVE SEMINAR

SESSIONS 3E/5D

DISCOUNTING LOSS RESERVES FOR FEDERAL INCOME TAX

ROBERT V. DEUTSCH
SENIOR VICE PRESIDENT AND CHIEF ACTUARY
EXECUTIVE RE INC.

SEPTEMBER 10-11, 1987
MINNEAPOLIS, MN

SLIDE 1

MARGINAL TAX RATES

REGULAR TAXPAYER

	1986	1987	1988
TAXABLE BONDS	46%	40%	34%
"OLD" TAX-EXEMPT BONDS	0	0	0
"NEW" TAX-EXEMPT BONDS	0	6(a)	5.1(b)
"OLD" STOCKS	6.9(c)	8(d)	6.8(e)
"NEW" STOCKS	6.9(c)	12.8(f)	10.88(g)

MINIMUM TAYPAYER *

	1987-1989	1990-?
TAXABLE BONDS	20%	20%
"OLD" TAX-EXEMPT BONDS	10(h)	15(i)
"NEW" TAX-EXEMPT BONDS	11.5(j)	15.75(k)
"OLD" STOCKS	12(l)	16(m)
"NEW" STOCKS	13.2(n)	16.6(o)

*Alternative Minimum Taxpayer

SLIDE 2

TAX RATES CALCULATIONS

(a) 40% x 15%
(b) 34% x 15%
(c) 46% x (1-85%)
(d) 40% x (1-80%)
(e) 34% x (1-80%)
(f) 40% x [20% + 15% x 80%]
(g) 34% x [20% + 15% x 80%]
(h) 20% x 50% x (1-0)
(i) 20% x 75% x (1-0)
(j) 20% x [15% + 50% x (1-15%)]
(k) 20% x [15% + 75% x (1-15%)]
(l) 20% x [20% + 50% x 80%]
(m) 20% x [20% + 75% x 80%]
(n) 20% x [20% + 15% x 80% + 50% x (1-20%-12%)]
(o) 20% x [20% + 15% x 80% + 75% x (1-20%-12%)]

ASSUMPTIONS

1. ASSETS OF $500 MILLION.
2. TAXABLES YIELD 9%. TAX-EXEMPTS YIELD 7%.
3. ALL TAX-EXEMPTS IN 1988 SCENARIO BOUGHT AFTER AUGUST 7, 1986.
4. STATUTORY UNDERWRITING LOSS OF $25 MILLION.
5. EFFECT OF LOSS RESERVE DISCOUNTING AND 20% UNEARNED PREMIUM RESERVE ADJUSTMENT IS $20 MILLION.

<u>1986</u>

1. MAXIMIZE AFTER-TAX STATUTORY INCOME BY GENERATING $25 MILLION IN TAXABLE INCOME.
2. REQUIRES $277.8 IN TAXABLES AND $222.2 IN TAX-EXEMPTS.

UNDERWRITING INCOME	(25,000)
TAXABLE INV. INC.	25,000
TAX-EXEMPT INV. INC.	15,556
INCOME BEFORE TAXES	15,556
TAXES	0
INCOME AFTER TAXES	15,556

1988 - #1

1. ASSUME 100% IN TAXABLES.
2. REGULAR TAX IS $13.6 MILLION.

UNDERWRITING INCOME	(25,000)
DISCOUNTING AND UPR	20,000
TAXABLE INV. INC.	45,000
RTI	40,000
TAXES	13,600

3. ALTERNATIVE MINIMUM TAX IS $8 MILLION.

PRETAX STAT. INCOME	20,000
RTI	40,000
PREFERENCE	0
AMTI	40,000
AMT	8,000

4. AFTER-TAX STATUTORY INCOME IS $9.8 MILLION.

UNDERWRITING INCOME	(25,000)
TAXABLE INV. INC.	45,000
INCOME BEFORE TAXES	20,000
TAXES	13,600
INCOME AFTER TAXES	6,400

1988 - #2

1. ASSUME 100% IN TAX-EXEMPTS.
2. REGULAR TAX IS $0.1 MILLION.

UNDERWRITING INCOME	(25,000)
DISCOUNTING AND UPR	20,000
PRORATION	5,250
RTI	250
TAXES	85

3. ALTERNATIVE MINIMUM TAX IS $1.0 MILLION.

PRETAX STAT. INCOME	10,000
RTI	250
PREFERENCE	4,875
AMTI	5,125
AMT	1,025

4. AFTER-TAX STATUTORY INCOME IS $9.0 MILLION.

UNDERWRITING INCOME	(25,000)
TAX-EXEMPT INV. INC.	35,000
INCOME BEFORE TAXES	10,000
TAXES	1,025
INCOME AFTER TAXES	8,975

SLIDE 7

<u>1988 - #3</u>

1. MAXIMIZE AFTER-TAX STATUTORY INCOME WHEN REGULAR TAX EQUALS ALTERNATIVE MINIMUM TAX.
2. STATUTORY INCOME BEFORE TAXES EQUALS (25,000) + 9% x T + 7% x (500,000 - T).
3. REGULAR TAX EQUALS 34% OF (25,000) + 20,000 + 9% x T + 15% x 7% x (500,000 - T).
4. ALTERNATIVE MINIMUM TAX EQUALS 20% OF RTI + 50% x (PRETAX STATUTORY INCOME - RTI). THE LATTER TERM CANNOT BE LESS THAN ZERO.
5. RTI = 250 + .0795 x T.
6. AMTI = 250 + .0795 x T + ABSOLUTE VALUE OF 4875 - .02975 x T.
7. REGULAR TAX = ALTERNATIVE MINIMUM TAX WHEN T = 55,035.
8. PLACE 11% OF ASSETS IN TAXABLES AND 89% IN TAX-EXEMPTS.

SLIDE 8

1988 - #3 CONTINUED

1. REGULAR TAX IS $1.6 MILLION.

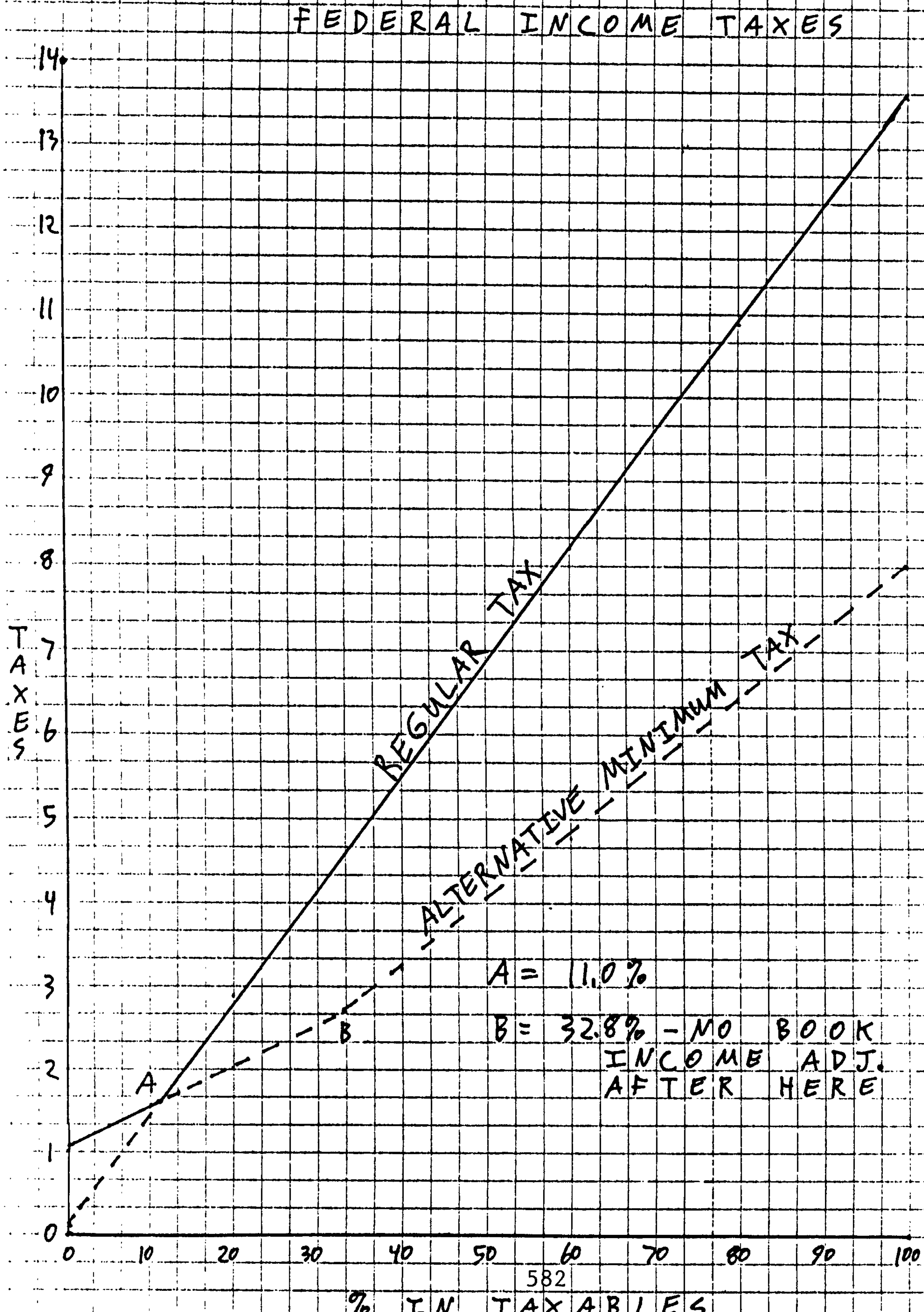
UNDERWRITING INCOME	(25,000)
DISCOUNTING AND UPR	20,000
PRORATION	4,672
TAXABLE INV. INC.	4,953
RTI	4,625
TAXES	1,573

2. ALTERNATIVE MINIMUM TAX IS $1.6 MILLION.

PRETAX STAT. INCOME	11,101
RTI	4,625
PREFERENCE	3,238
AMTI	7,863
AMT	1,573

3. AFTER-TAX STATUTORY INCOME IS $9.5 MILLION.

UNDERWRITING INCOME	(25,000)
TAXABLE INV. INC.	4,953
TAX-EXEMPT INV. INC.	31,148
INCOME BEFORE TAXES	11,101
TAXES	1,573
INCOME AFTER TAXES	9,528



FEDERAL INCOME TAXES
TAXES
14
13
12
11
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9
8
7
6
5
4
3
2
1
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REGULAR TAX
ALTERNATIVE MINIMUM TAX
A
B
A = 11.0%
B = 32.8% - NO BOOK INCOME ADJ. AFTER HERE
0
10
20
30
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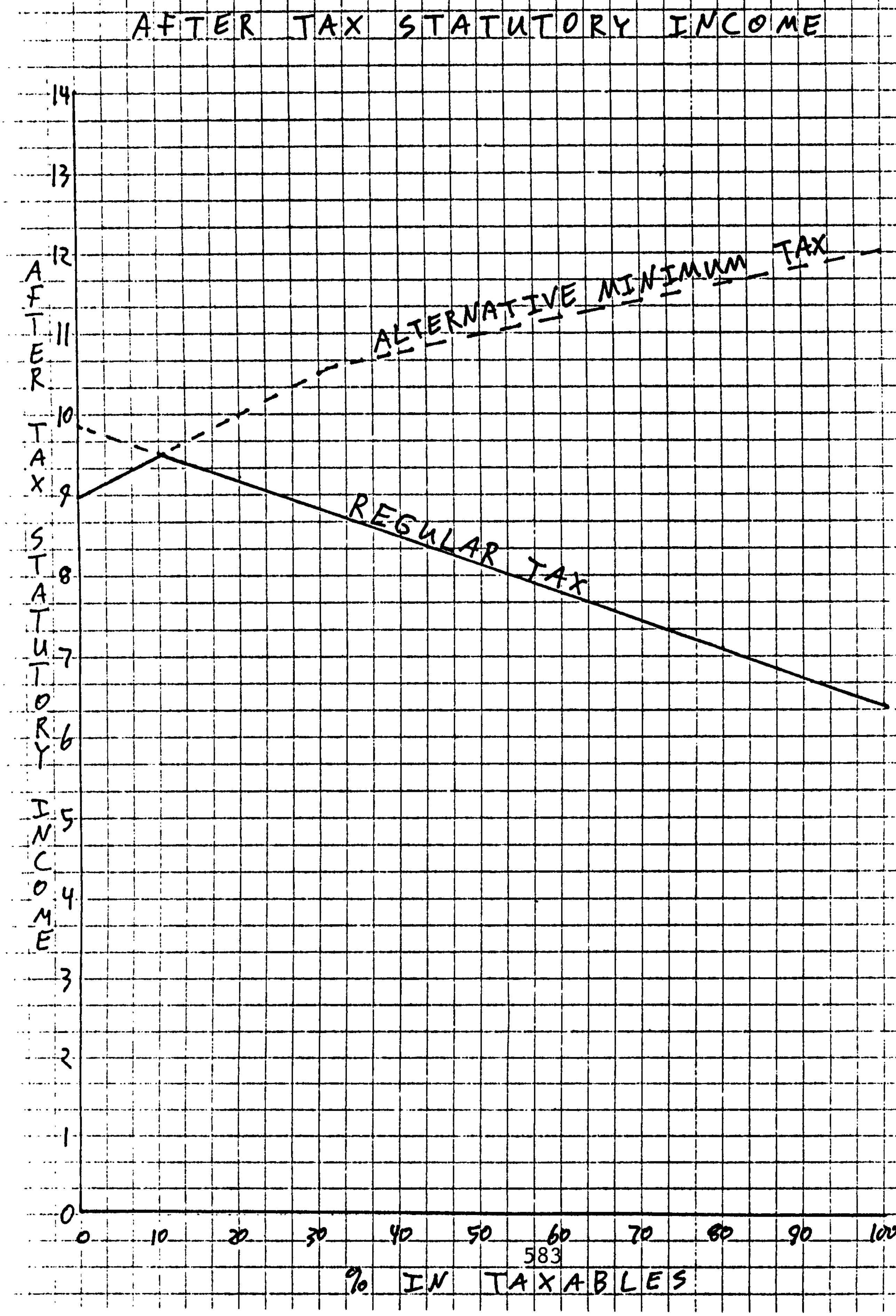
50
60
70
80
90
100
% IN TAXABLES

SLIDE 10


AFTER TAX STATUTORY INCOME
AFTER TAX STATUTORY INCOME
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ALTERNATIVE MINIMUM TAX
REGULAR TAX
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90
100
% IN TAXABLES

SLIDE 11

TAXABLES	TAX EXEMPTS	PRETAX STAT. INCOME	REGULAR TAXABLE INCOME	REGULAR TAX	ALTERN. MINIMUM TAXABLE INCOME	ALTERN. MINIMUM TAX	AFTER TAX STAT. INCOME	TAX PAID
0	500,000	10,000	250	85	5,125	1,025	8,975	AMT
25,000	475,000	10,500	2,238	761	6,369	1,274	9,226	AMT
50,000	450,000	11,000	4,225	1,437	7,613	1,523	9,478	AMT
55,035	444,965	11,101	4,625	1,573	7,863	1,573	9,528	SAME
75,000	425,000	11,500	6,213	2,112	8,856	1,771	9,388	REGULAR
100,000	400,000	12,000	8,200	2,788	10,100	2,020	9,212	REGULAR
150,000	350,000	13,000	12,175	4,140	12,588	2,518	8,861	REGULAR
200,000	300,000	14,000	16,150	5,491	16,150	3,230	8,509	REGULAR
250,000	250,000	15,000	20,125	6,843	20,125	4,025	8,157	REGULAR
277,778	222,222	15,556	22,333	7,593	22,333	4,467	7,962	REGULAR
300,000	200,000	16,000	24,100	8,194	24,100	4,820	7,806	REGULAR
350,000	150,000	17,000	28,075	9,546	28,075	5,615	7,455	REGULAR
400,000	100,000	18,000	32,050	10,897	32,050	6,410	7,103	REGULAR
450,000	50,000	19,000	36,025	12,249	36,025	7,205	6,752	REGULAR
500,000	0	20,000	40,000	13,600	40,000	8,000	6,400	REGULAR

COMPLICATIONS

1. PORTFOLIO INCLUDES "NEW" AND "OLD" STOCKS AND "OLD" TAX-EXEMPT BONDS.
2. EXTREMELY SENSITIVE TO TAXABLE AND TAX-EXEMPT YIELDS, AS WELL AS AMOUNT OF UNDERWRITING TAXABLE INCOME.
3. AMT SHIFTS SIGNIFICANTLY IN 1990 WHEN USE ADJUSTED CURRENT EARNINGS AND 75% FACTOR.
4. NOL CARRY FORWARDS AND LIMITS OF USE.
5. FINANCIAL EFFECTS OF FREQUENTLY CHANGING PORTFOLIO MIX.
6. STATUTORY VS. GAAP VS. CASH FLOW CONSIDERATIONS.

WALTER GRYSKA: It's always terrible being the last speaker because everybody says well Walt will cover this, Walt will cover that. Well, I'm not going to cover anything that they said I'll cover. What I'm going to talk about are my problems, and most of my problems with the new Tax Law have centered around our GAAP financials. If you don't have GAAP financials and only file statutory statements, you can go to sleep right now because your life is considerably more simple than those of us who have to prepare GAAP statements and have to worry about earnings-per-share. Because when you take what Bob has talked about and you put it on your GAAP financial statements, you get some very, very strange results, and I'll try and illustrate these results with my slides. My slides are based on Bob's example, so I'm working with the same numbers that Bob had in his outline. I've had to make some additional assumptions concerning fresh start and how it reverses over future years. I have assumedthat this is a long-tail commercial lines company, maybe somewhat similar to St. Paul. Again, what I'm going to talk about is GAAP; tax planning in a GAAP environment. I'm not going to try and make you experts on GAAP accounting. I'm not going to get into the details of the reasons why these things are happening. I'm just going to go over effects.

My slides are at the back of this outline. Slide #1 is a recasting of Bob's company on kind of a GAAP basis. I've tried to break out the regular tax calculation which you would do when you file your tax return which is below the bold line, from the way we do our GAAP tax calculation. If you remember from Bob's example, he had equalized the regular tax and the AMT tax at $1,573,000. You have pre-tax GAAP income of $11 million. You have no GAAP tax expense, primarily because you have a GAAP loss. GAAP tax expense is not based upon tax return taxable income. It's based on what we call GAAP taxable income". That's basically book income after permanent differences but before what we call timing differences. This $27 million GAAP tax loss is the number that you multiply times the 34% corporate tax rate to get the GAAP tax that you show in your financial statements. Then there's a financial statement problem caused when we do what Bob says. While I agree with Bob completely, that from a tax planning point of view this is exactly where you'd like to be when you file your tax return, unfortunately, what has happened is we created a $27 million GAAP loss. I've also assumed that this company cannot book a tax credit for this loss. It is an insurance company that probably had some tough underwriting in 1983 and 1984, recovered all the taxes it had provided its financial statements in prior years and probably took all of its deferred tax liability down; and it probably has GAAP tax loss carry forwards. I know it's kind of hard to imagine these facts, but I think about 90% of the industry is in this position. This company cannot book a tax credit for the loss. When that happens in trying to decide from a GAAP earnings point of view whether you want a taxable bond or a tax exempt bond, you look at pre-tax yields because there are no taxes involved here anymore. If you had a choice between a 9% taxable and a 7% tax-exempt from a GAAP earnings point of view, the 9% taxable is going to produce more GAAP earnings because there are no taxes. Our investment mix here, as Bob said, was 11% taxables and 89% tax exempts. To maximize GAAP earnings, what you want to do is get GAAP taxable income back to zero. So what I've done on Slide #2 is I've taken GAAP taxable income to zero. We'll start at the bottom of the slide here and look at my summary of the GAAP income statement. Here we have $17,960,000 of GAAP after tax earnings, which is 62% higher than the $11,101,000 that we had on Slide #1. Unfortunately, while we have increased taxes paid to the federal government also increase. In this example, we have $9,269,000 more tax that we're going to pay to the government. We had about $1,573,000 on Slide #1, and now we're going to pay $10,842,000.

ELDRIDGE: Walter before you go on, just answer a question. Do your examples illustrate the current accounting rules?

GRYSKA: Yes, these are the current accounting rules under APB #11.

ELDRIDGE: The reason I emphasize this point is that you can look down at the bottom of Walter's slide and see that you're going to pay $10,842,000, and you're also going to set up an asset of $10,842,000, because really what you've done is prepay your taxes here. We've got a recoverable deferred tax asset, and under current GAAP rules, and I say "current" with great emphasis, you could record that amount as an asset. The point is, the accountants are about to change the GAAP rules. So please note that i.e., this answer -- this deferred tax asset, is correct for 1987 and 1988. As it stands right now this answer is expected to change in 1989.

GRYSKA: Right -- and you're going illustrate Steve's point to keep matters from being too confusing. By the way, our investmentment is now 80% taxables and 20% tax exempt. We've almost flip-flopped from the tax minimization scenario that Bob outlined. It's not this simple unfortunately because we also have this alternative minimum tax that we've been talking about. And the GAAP accountants have gotten together and they've had to figure out exactly how are we going to account for the alternative minimum tax on the GAAP financial statements. They determined that the alternative minimum tax is a separate but parallel tax system, and what you have to do is calculate your GAAP tax two different ways. You have to go through the regular tax calculation and then you have to go through the alternative minimum tax calculation on a GAAP basis and provide the higher of the two taxes. Now, in this scenario, 34% of zero is going to yield a zero regular tax. You must now also do a GAAP alternative minimum tax calculation which is what I have done on Slide #3.

Slide 3 calculates the GAAP alternative minimum tax. What you do is start with GAAP taxable income which is zero. You compare GAAP taxable income to pre-tax book income -- take 50% of that, and that's our book income preference. You end up with alternative minimum taxable income of $8,980,000 and 20% of that is $1,796,000. This is your alternative minimum that has to be tax charged to GAAP earnings. Steve and I also argued about this yesterday as to whether or not this AMT tax has to be charged to earnings or whether it could be recorded as an asset on your balance sheet, because it has an unlimited carry forward. You can offset the $1,796,000 any of your deferred tax liability. When I thought about it, this company does not have any deferred tax liability, it has a deferred tax asset. I don't think it can record the $1,796,000 as an asset on its balance sheet unless it is assured beyond a reasonable doubt, and I don't think you can have an assurance beyond a reasonable doubt in these circumstances. That was my conclusion.

ELDRIDGE: Again we're talking about the accounting rules in effect for '87 and '88. If you say that this deferred tax asset (i.e., this AMT) can be recovered in some future year, the current rules perhaps <u>might</u> let you record it. That's for '87 and '88, and again it's going to be different in '89.

GRYSKA: I'll give you my personal editorial comment. Quite frankly, I think this is stupid. First of all you're a regular taxpayer. The $10,842,000 of regular tax you pay is based upon 34% of current taxable income. You have a book income preference that doesn't exist on your tax return because you're in the regular tax posture on the tax return. Your <u>tax return</u> regular taxable income exceeds your pre-tax <u>book</u> income, so there is no book income preference. Since this is a regular taxpayer, it would seem to me that you would provide taxes on your GAAP financials on a regular tax basis. I don't understand why you have to do this hypothetical AMT.

ELDRIDGE: Let's take a moment to understand the AMT. For these next three years -- '87, '88, and '89, that AMT in excess of regular tax or $1,790,000 is recoverable in any future year in which the taxpayer's regular tax exceeds its AMT. You expect that sometime in the future that's going to happen. The point is when we get to 1990, the AMT changes to E&P concept, and there will be no longer any recoverable taxes. By that I mean that any excess AMT over regular tax in years after 1989 will not be recoverable. This piece $1,790,000 is recoverable in any future year that this taxpayer's regular tax exceeds its AMT. You just know that sometime it is going to happen.

GRYSKA: This is not the final answer here because you can still, on a GAAP basis, equalize the two taxes just as you did on a tax return filing basis. On Slide #4, what I've done is truly maximized my GAAP earnings under existing accounting rules because the regular tax is now equal to the AMT tax. It is not exactly equal because I could not get there based upon these facts. I have 100% invested in taxables now. We've gone from 89% tax exempts, which is the optimal position to be in when you file your tax return to minimize the tax paid to the federal government, to 100% taxables to maximize your GAAP earnings. In other words, your investment mix is going in the opposite direction when you maximize GAAP earning rather than minimize taxes paid.

We have $13,600,000 now in current tax expense that we're paying, which is about $12,000,000 more than we had on Slide #1, which was the tax minimization slide. We have a 55% increase in after-tax GAAP operating earnings over Slide 1. For those of you who have been sleeping through all of this and didn't understand a word that I said, you're in luck because this is all going to change. Actually, you don't even have to pay attention to these rules in 1987 and 1988. What's happened is the FASB has issued an exposure draft on GAAP accounting for income taxes. It is my understanding that this exposure draft will be issued in final form in November. It will be mandatory in 1989, and it will be elective in 1987 and 1988. You can choose to apply the new rules early if you want to. I'm not going to get into an explanation of the new FASB opinion on accounting for income taxes because that's a whole separate seminar, but I will show you the effects in the next few slides. In general, I will say that the new opinion is going to be bad for the industry. This occurs primarily because we're in this prepaid tax position, and the new accounting opinion is going to limit the amount of deferred tax assets that you can record on your balance sheet. Generally, this is not good.

What I've done on Slide #5 is taken Slide #4 and calculated tax under the new accounting rules. Again, starting from the bottom, after-tax operating earnings went down from $17,189,000 to $13,284,000 or down by $3,905,000. This happens because the deferred tax asset that can be recorded on the balance sheet is limited. You can't record the full $10 million of tax that you paid. You're limited to $6 million and the difference has to be charged to earnings. If you do choose to apply the new rules, this is not the optimum position you want to be in. Again, you can optimize GAAP earnings by shifting the investment portfolio. I did that on slide #6.

On Slide #6, what I've done here is maximized GAAP earnings by equalizing the limit on the deferred tax debit with the amount of current taxes that you have actually paid. This results in $14,625,000 of GAAP earnings. I think the investment mix on this slide is about 50/50. GAAP earnings are a little bit down from the $17 million that we had on Slide #4, which was the optimum position to be in from a GAAP earnings point of view under the existing accounting rules, but it is still 32% higher than Slide #1. Slide #6 has a 50/50 investment mix which is somewhat more rational then when we had 100% taxables on Slide #4 and were paying all that additional federal tax. I do see some pluses to making a decision to use the new rules. I wouldn't just reject not applying the new rules out of hand. You still have higher GAAP earnings and you have a more rational investment mix. Your tax minimization planning is more consistent with your GAAP earnings presentation, so it's not that bad.

Now there's still one other issue here that is somewhat controversial, and that has to do with the "fresh start". You'll recall Lee talked a little bit about the fact that we're going to discount our opening reserves, and that that discount is going to be permanently forgiven. We won't have to pay tax on it, and its treated as a permanent difference under existing rules for accounting purposes. To the extent that we have a tax benefit from that fresh start, we're allowed to record that tax benefit in our GAAP financial statements. There is some controversy on what happens to fresh start under the proposed new tax accounting opinion (i.e., the liability method). Some accounting firms have said that fresh start changes from a permanent difference to a temporary difference under the liability method of deferred tax accounting. I've talked to my counterparts with some other P&C companies and the feel fairly strongly that fresh start will remain a permanent difference under the new accounting opinion and not change to a temporary difference. There is a little bit of a controversy here. I don't know if Ernst Whinney wants to jump into the fray here, and venture an opinion, but you're welcome to Steve.

ELDRIDGE: As the tax people we don't give accounting opinions and we have to wait until Ernst Whinney makes an official pronouncement. Let's restate, just to be sure we understand what Walter is saying here. You can view fresh start as a totally free second set of tax deductions, and you get that second set of tax deductions, as your reserves builds from a discounted reserve up to 100%. In affect, right now, the fresh start is dribbling into GAAP earnings as it's realized. It comes in over a period of years. The present treatment, known as a dribble approach, flows earnings into your bottom line as a reduction of your federal tax expense each year as that second set of deductions is claimed on the tax return and actually reducing taxes payable or deferred taxes otherwise recoverable, and it will do so over a period of years. Some people believe that when the new accounting rules take affect, the impact of this becoming a temporary difference all of a sudden on January 1, 1989, is that the then unamortized fresh start comes into income all in one year. You were expecting this income to dribble in (admittedly probably a declining amount over 10 years), then all of a sudden you would have income in 1989 equal to the remaining amount of income not yet picked up. This is known as the dribble-dribble-plop approach in some circles as opposed to the perpetual dribble.

GRYSKA: Generally companies that have good GAAP earnings are not that excited about bringing the benefit of fresh start into GAAP earnings all in one year. The industry position generally is to have it continue to dribble because they get an earnings benefit for it over a longer period of time.

ELDRIDGE: Make your opinions on this issue known to your auditor, whatever that opinion happens to be.

GRYSKA: What I have done on Slide #7 is calculated what the GAAP earnings would look like if fresh start were treated as a temporary difference instead of as a permanent difference. Essentially what happens under these circumstances is the limitation on the deferred tax asset increases allowing you to pay higher taxes without penalizing GAAP earnings. In this circumstance we've increased operating earnings to $19,093,000. This will be the optimum position that you can be in if fresh start were a temporary difference and you elected to apply the new tax accounting opinion early. The tax you're paying to the federal government is also considerably higher at $13,443,000. The investment mix here is 99% taxables.

I will just briefly summarize. I'm sitting at the St. Paul with four choices for 1987 and 1988. I can minimize the tax that I pay to the federal government, and then I have after-tax income of $11,101,000, and I pay $1,573,000 to the federal government, or I can maximize GAAP earnings under APB-11 of the existing rules, and then I have $17,189,000 of after tax income, and I pay $13,600,000 to the federal government -- or I can maximize GAAP income under the new rules with fresh start as a permanent difference and then I have $14,625,000 of after tax GAAP income, and $6,884,000 of taxes paid to the government; or I can maximize GAAP income under the new rules with fresh start as a temporary difference and I have $19,093,000 of after tax income and a $13,443,000 payment to the federal government. I have an interesting range of alternatives.

ELDRIDGE: By playing with your investment mix?

GRYSKA: All by playing with investments.

ELDRIDGE: Minimizing taxes actually payable also maximizes statutory earnings, so maximizing GAAP earnings can harm statutory earnings.

GRYSKA: Yes, But while you must keep an eye on statutory earnings, I think you have to watch more than just the taxes you're paying to the government. I think the moral to the story is that if you're trying to devise a tax planning strategy for your company, and you do have GAAP financial statements, when devising that strategy, you have to keep an eye on your GAAP after-tax income. Because otherwise you can cause a disaster by chasing tax dollars. It is a choice between money in the bank and GAAP earnings, and GAAP earnings are important. I'm done.

ELDRIDGE: We have managed to leave some time for questions.

[QUESTION, INAUDIBLE]

ELDRIDGE: I'm not sure I understand your question. I think your IBNR asking You know we're talking about December 31, 1986 reserve calculations (including (IBNR) and their impact on fresh-start.

[COMMENT, INAUDIBLE]

ELDRIDGE: I think your question is, do have some choices as to reserving techniques to maximize fresh start.

DEUTSCH: I think you're asking about whether you can allocate your IBNR reserves between accident years. A lot of people would like to allocate a lot of their reserves to more recent accident years --let's say the 1986 accident year. Then the fresh start adjustment will be maximized. This is one strategy. People do model -- there are dozens and dozens of ways to model different strategies as regards as to how you allocate your IBNR reserves.

DEUTSCH: Also, most likely you get different answers as far as fresh start goes if you elect your own experience versus using the industry averages. I know we did. It was a significantly different -- especially in our medical line of business. We were faced with that situation if you maximize fresh start, which does give you a GAAP earnings pump, but also causes higher taxable income. You pay higher taxes but you get a larger GAAP bump.

ELDRIDGE: Lee I understand that there can be a Schedule P penalty incurred because of the way you allocate IBNR to the various accident years.

DEUTSCH: After you've done your allocation if you come up with a loss ratio penalty in Schedule P, that will effect again the way your numbers work. You just have to look at the loss ratios that result after you've done your allocation to be sure you're not going to be hit with a Schedule P penalty.

QUESTION: When do you make the election to use your own experience and what years does it cover?

ELDRIDGE: You make that election at the beginning of each five year period with respect to the following five years. You never go back to your prior five year period. It's just a forward election for the next five-year period.

QUESTION: What is the "accident year" for a claims-made policy?

DEUTSCH: For claims made policies, they defined "report year" to be the accident year. What that means is that if you're moving from a mix of business -- let's say from occurrence policies to claims-made policies that are a significant part of your business, the payment pattern that is going to be prescribed for you is going to be applied to a book of claims-made business over time. They have not, to my knowledge, made any provision for that in equity, and I haven't heard that they are thinking about it.

COMMENT: Discounting should cause companies to lose increasing amounts of tax deductions.

DEUTSCH: It will if you reserves are growing, remember, it could work the other way. Most people think that the affects of this tax law is going to be to increase tax. It may not in fact. For example, if you stop growing, the reserves are lower in the current year as they were in the prior year, you could actually have a higher incurred loss. There are some strategic issues here.

QUESTION: How do you define "reserve strengthening"?

DEUTSCH: I don't think we've gotten any guidance from the IRS about how they are going to define "reserve strengthening". The definition that we were provided with says that change in incurred estimates, whether or not it is legitimate. I mean there were legitimate reasons in 1987 for changing your incurred estimate for all prior accident years.

[COMMENT, INAUDIBLE]

ELDRIDGE: In affect, the Committee report suggests the following. Let's assume that you had $100 of reserves at the end of 1985. If you had payments in '86 of $30, with respect to 1985 and prior accident years,and reserves at the end of '86 of $90 (with respect to '85 and prior accident years) -- that's a total $120 -- everything over $100 is by definition "reserve strengthening". The Committee reports then go on to make the peculiar comment that the purpose of this rule is to prevent "artificial" strengthening. They don't put the quotes around it, I did. The question is what does that really mean? Is that a hard and fast rule that says that everything over $100 is disallowed or is there some leeway provided? I've generally taken the position that if you as actuaries document properly the need for the $90 of reserves at the end of 1986, i.e., why you really need $90 more of reserves, I would argue that that's not reserve strengthening. "Reserve strengthening" is not defined in the statute.

ELDRIDGE: I just talked about '85 and prior accident years. Specifically, the Committee reports say that for the 1986 accident year, any change in methodologies from prior years is "reserve strengthening". The only thing that they specifically allow you to do is to reduce your interest rate theoretically down to zero. Other than that, any change in practice for the

'86 year from a practice in prior years would be "reserve strengthening". This reference is to change in practice is with respect to the 1986 accident year only.

[COMMENT, INAUDIBLE]

ELDRIDGE: I certainly think you have a weak argument if your methodologies in deriving the $90 in reserves in my illustration were grossly different than the ones you came up with at the end of '85, that certainly goes against you.

QUESTION: You mentioned the Committee report so I assume that you're talking about the Treasury Department Committee Report. What's the exact title of that?

ELDRIDGE: That's the Blue Book -- there are two things. One is the general explanation of the Tax Reform Act -- that's the Treasury Blue Book. This is what Treasury is telling us about what the people who wrote the law were thinking about. The real Committee reports are what the Senators and Congressmen debated.

QUESTION: Is there an IRS publication number, again you refer to that shows the discounting method ...

COMMENT: If there is I don't know what it is.

ELDRIDGE: I thought one of you had it in your presentation. We'll get it -- yes, there's a recent IRS announcement as to the loss payment patterns -- Rev. Rule 87-34.

[QUESTION, INAUDIBLE]

ELDRIDGE: Interesting -- if I understand your question this is a GAAP question. We have $100 worth of GAAP and tax reserves at 1/1/87, of $100 gets discounted down to $80 on 1/1/87, and that discount (in effect) is earned because (under your facts) those reserves are paid out in '87, but you still find that at the end of '87 you still need another $50. I can see an argument for taking the entire tax affect of the $20 fresh start as a bottom line profit that year (1987), notwithstanding that you're strengthening your overall reserves with respect to '86 and prior years, because you didn't know about it then in 1986.

DEUTSCH: I guess I think the rule is that you're suppose to take the fresh start in and as you settle the losses. And if you haven't settled all of the losses you still have a few left at the end of the '87, I would wonder whether you can take the fresh start benefit into GAAP earnings all in 1987.

ELDRIDGE: I would agree with you if he would have had $150 in GAAP reserves at the end of '86, and never changed his estimate.

COMMENT: He wants to accellerate his fresh start to benefit.

ELDRIDGE: The GAAP benefit in this example is $20 times the tax rate. The question is do we take it all in 1987 or do we take in 2/3's of it in 1987? That's the issue -- it's a timing issue-- not an amount difference. It's not trickle, trickle, plop, it's really a change in the estimates of the reserves. That's what it is.

[COMMENT, INAUDIBLE]

ELDRIDGE: Well, he's paid $100 on which the fresh start was based -- and my answer is that all the benefit belongs in 1987 even though he's changed his estimate of the losses at the end of 1987 so there's still another $50 left unpaid from pre-1987 accident years.

DEUTSCH: I think the bottom line is it's just an auditor call. Whatever you can sell to your auditors.

ELDRIDGE: It's 2:59 -- Heidi do we get credit for a spectacular on-time performance, while answering all questions? For those of you who want to hear this panel a second time we will repeat it tomorrow. We have the same size rooms so you can sit on the new people's laps. Thank you very much for your attention.

1987 CASUALTY LOSS RESERVE SEMINAR

SESSION 3E/5D

DISCOUNTING LOSS RESERVES FOR FEDERAL INCOME TAX

WALTER T. GRYSKA
Vice President - Tax Administration
THE ST. PAUL COMPANIES, INC.

September 10-11, 1987
Minneapolis, MN

ASSUMPTIONS

- o UNDERWRITING LOSS OF $25,000
- o $500,000 INVESTMENT PORTFOLIO
- o YIELD ON TAXABLE SECURITIES = 9%
- o YIELD ON TAX EXEMPT SECURITIES = 7%
- o 100% OF TAX EXEMPT INCOME SUBJECT TO PRORATION
- o FRESH START RUNOFF, UPR, AND ORIGINATING DISCOUNT AMOUNTS ARE BASED UPON RATIOS/RELATIONSHIPS FOR A PREDOMINATELY SCHEDULE P COMPANY
- o NO AMT PREFERENCES OTHER THAN THE 50% BOOK OVER TAX INCOME PREFERENCE
- o ALL RATIOS AND AMOUNTS ARE BASED ON ANTICIPATED 1988 RELATIONSHIPS/AMOUNTS

MINIMIZE CURRENT TAX PAYABLE

	REGULAR TAX	AMT
UNDERWRITING INCOME	($25,000)	
TAXABLE INVESTMENT INCOME	$4,953	
TAX-EXEMPT INVESTMENT INCOME	$31,148	
PRE-TAX BOOK INCOME	$11,101	
PERMANENT DIFFERENCES:		
TAX-EXEMPT INTEREST	($31,148)	
TAXABLE PORTION OF TAX-EXEMPTS	$4,672	
FRESH START RUNOFF	($11,889)	
GAAP TAXABLE INCOME	($27,264)	($27,264)
50% BOOK OVER TAX INCOME PREFERENCE		$19,182
GAAP AMTI		($8,081)
REGULAR GAAP TAX AT 34% AND GAAP AMT AT 20%	$0	$0

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	REGULAR TAX	AMT
TIMING DIFFERENCES:		
ORIGINATING DISCOUNT	$25,730	
UPR	$6,159	
CURRENT TAXABLE INCOME	$4,625	$4,625
50% BOOK OVER TAX INCOME PREFERENCE		$3,238
AMTI		$7,863
REGULAR TAX AT 34% AND AMT AT 20%	$1,573	$1,573

GAAP INCOME STATEMENT SUMMARY:	
PRE-TAX OPERATING INCOME	$11,101
CURRENT TAX EXPENSE	($1,573)
DEFERRED TAX EXPENSE	$1,573
OPERATING EARNINGS	$11,101

MAXIMIZE GAAP EARNINGS ASSUMING NO GAAP AMT

	REGULAR TAX	TAX AMT
UNDERWRITING INCOME	($25,000)	
TAXABLE INVESTMENT INCOME	$35,818	
TAX-EXEMPT INVESTMENT INCOME	$7,142	
PRE-TAX BOOK INCOME	$17,960	
PERMANENT DIFFERENCES:		
TAX-EXEMPT INTEREST	($7,142)	
TAXABLE PORTION OF TAX-EXEMPTS	$1,071	
FRESH START RUNOFF	($11,889)	
GAAP TAXABLE INCOME	$0	
TIMING DIFFERENCES:		
ORIGINATING DISCOUNT	$25,730	
UPR	$6,159	
CURRENT TAXABLE INCOME	$31,889	$31,889
50% BOOK OVER TAX INCOME PREFERENCE		$0
AMTI		$31,889
REGULAR TAX AT 34% AND AMT AT 20%	$10,842	$6,378

GAAP INCOME STATEMENT SUMMARY:	
PRE-TAX OPERATING INCOME	$17,960
CURRENT TAX EXPENSE	($10,842)
DEFERRED TAX EXPENSE	$10,842
OPERATING EARNINGS	$17,960

GAAP TAX CALCULATION WITH GAAP AMT

	REGULAR TAX	GAAP AMT
UNDERWRITING INCOME	($25,000)	
TAXABLE INVESTMENT INCOME	$35,818	
TAX-EXEMPT INVESTMENT INCOME	$7,142	
PRE-TAX BOOK INCOME	$17,960	
PERMANENT DIFFERENCES:		
TAX-EXEMPT INTEREST	($7,142)	
TAXABLE PORTION OF TAX-EXEMPTS	$1,071	
FRESH START RUNOFF	($11,889)	
GAAP TAXABLE INCOME	$0	$0
TIMING DIFFERENCES:		
ORIGINATING DISCOUNT	$25,730	
UPR	$6,159	
CURRENT TAXABLE INCOME	$31,889	
50% BOOK OVER TAX INCOME PREFERENCE		$8,980
AMTI		$8,980
REGULAR GAAP TAX AT 34% AND GAAP AMT AT 20%	$0	$1,796

GAAP INCOME STATEMENT SUMMARY:	
PRE-TAX OPERATING INCOME	$17,960
CURRENT TAX EXPENSE *	($10,842)
DEFERRED TAX EXPENSE	$9,046
OPERATING EARNINGS	$16,164

* REGULAR TAX PER SLIDE 2

MAXIMIZE GAAP EARNINGS (GAAP REGULAR TAX = GAAP AMT)

	REGULAR TAX	GAAP AMT
UNDERWRITING INCOME	($25,000)	
TAXABLE INVESTMENT INCOME	$45,000	
TAX-EXEMPT INVESTMENT INCOME	$0	
PRE-TAX BOOK INCOME	$20,000	
PERMANENT DIFFERENCES:		
TAX-EXEMPT INTEREST	$0	
TAXABLE PORTION OF TAX-EXEMPTS	$0	
FRESH START RUNOFF	($11,889)	
GAAP TAXABLE INCOME	$8,111	$8,111
TIMING DIFFERENCES:		
ORIGINATING DISCOUNT	$25,730	
UPR	$6,159	
CURRENT TAXABLE INCOME	$40,000	
50% BOOK OVER TAX INCOME PREFERENCE		$5,945
AMTI		$14,056
REGULAR GAAP TAX AT 34% AND GAAP AMT AT 20%	$2,758	$2,811

GAAP INCOME STATEMENT SUMMARY:	
PRE-TAX OPERATING INCOME	$20,000
CURRENT TAX EXPENSE *	($13,600)
DEFERRED TAX EXPENSE	$10,789
OPERATING EARNINGS	$17,189

* $40,000 x 34%

SLIDE 5

GAAP EARNINGS (EXPOSURE DRAFT WITH FRESH START AS A PERMANENT DIFFERENCE)

	REGULAR TAX	TAX AMT
UNDERWRITING INCOME	($25,000)	
TAXABLE INVESTMENT INCOME	$45,000	
TAX-EXEMPT INVESTMENT INCOME	$0	
PRE-TAX BOOK INCOME	$20,000	
PERMANENT DIFFERENCES:		
TAX-EXEMPT INTEREST	$0	
TAXABLE PORTION OF TAX-EXEMPTS	$0	
FRESH START RUNOFF	($11,889)	
GAAP TAXABLE INCOME	$8,111	
TIMING DIFFERENCES:		
ORIGINATING DISCOUNT	$25,730	
UPR	$6,159	
CURRENT TAXABLE INCOME	$40,000	$40,000
50% BOOK OVER TAX INCOME PREFERENCE		$0
AMTI		$40,000
REGULAR CURRENT TAX AT 34% AND AMT AT 20%	$13,600	$8,000

GAAP INCOME STATEMENT SUMMARY:	
PRE-TAX OPERATING INCOME	$20,000
CURRENT TAX EXPENSE	($13,600)
DEFERRED TAX EXPENSE (SEE NOTE 1)	$6,884
OPERATING EARNINGS	$13,284

NOTES: (1) WE HAVE ASSUMED THAT 63.49% OF THE TIMING DIFFERENCES OF $31,889 WILL REVERSE WITHIN THE NEXT THREE YEARS. 20,246 x 34% = 6,884.

MAXIMIZE GAAP EARNINGS (EXPOSURE DRAFT WITH FRESH START AS A PERM. DIFF.)

	REGULAR TAX	TAX AMT
UNDERWRITING INCOME	($25,000)	
TAXABLE INVESTMENT INCOME	$22,640	
TAX-EXEMPT INVESTMENT INCOME	$17,392	
PRE-TAX BOOK INCOME	$15,031	
PERMANENT DIFFERENCES:		
TAX-EXEMPT INTEREST	($17,392)	
TAXABLE PORTION OF TAX-EXEMPTS	$2,609	
FRESH START RUNOFF	($11,889)	
GAAP TAXABLE INCOME	($11,641)	
TIMING DIFFERENCES:		
ORIGINATING DISCOUNT	$25,730	
UPR	$6,159	
CURRENT TAXABLE INCOME	$20,248	$20,248
50% BOOK OVER TAX INCOME PREFERENCE		$0
AMTI		$20,248
REGULAR TAX AT 34% AND AMT AT 20%	$6,884	$4,050

GAAP INCOME STATEMENT SUMMARY:	
PRE-TAX OPERATING INCOME	$15,031
CURRENT TAX EXPENSE	($6,884)
DEFERRED TAX EXPENSE (SEE NOTE 1)	$6,479
OPERATING EARNINGS	$14,625

NOTES: (1) WE HAVE ASSUMED THAT 63.49% OF THE TIMING DIFFERENCES OF $31,889 WILL REVERSE WITHIN THE NEXT THREE YEARS. 20,246 x 34% = 6,884.

MAXIMIZE GAAP EARNINGS (EXPOSURE DRAFT WITH FRESH START AS A TEMP. DIFF.)

	REGULAR TAX	TAX AMT
UNDERWRITING INCOME	($25,000)	
TAXABLE INVESTMENT INCOME	$44,478	
TAX-EXEMPT INVESTMENT INCOME	$406	
PRE-TAX BOOK INCOME	$19,884	
PERMANENT DIFFERENCES:		
TAX-EXEMPT INTEREST	($406)	
TAXABLE PORTION OF TAX-EXEMPTS	$61	
GAAP TAXABLE INCOME	$19,539	
TIMING DIFFERENCES:		
FRESH START RUNOFF	($11,889)	
ORIGINATING DISCOUNT	$25,730	
UPR	$6,159	
CURRENT TAXABLE INCOME	$39,539	$39,539
50% BOOK OVER TAX INCOME PREFERENCE		$0
AMTI		$39,539
REGULAR TAX AT 34% AND AMT AT 20%	$13,443	$7,908

GAAP INCOME STATEMENT SUMMARY:	
PRE-TAX OPERATING INCOME	$19,884
CURRENT TAX EXPENSE	($13,443)
DEFERRED TAX EXPENSE (SEE NOTE 1)	$12,652
OPERATING EARNINGS	$19,093

NOTES: (1) WE HAVE ASSUMED THAT $39,537 OF TIMING DIFFERENCES WILL REVERSE WITHIN THE NEXT THREE YEARS. 39,537 x 34% = 13,443.

1987 CASUALTY LOSS RESERVE SEMINAR

3G/4G - ADVANCED TECHNIQUES III & IV

Moderator: Steven W. Philbrick, Consulting Actuary
Tillinghast/TPF&C

Panel: Gregory C. Taylor, Principal
E.S. Knight & Company

Ben Zehnwirth, Professor, Economics and Financial Studies
Macquarie University

STEVE PHILBRICK: Good afternoon, and welcome to the continuation of the advanced track. We have two very distinguished speakers this afternoon. You'll note that the afternoon sessions are combined sessions. Greg Taylor will be speaking first and will cover roughly the first 90 minutes, and then we will take the normal break with everybody else, and will come back and finish up with Ben Zehnwirth. The first speaker is going to be Greg Taylor, and he's with Mercer, Campbell, Cook & Knight in Australia. If any of you have done any reading in the literature you would have run across his name a number of times. There are a number of papers, and as we heard this morning, he's written books on the subject of loss reserving. He's lectured numerous times on the subject, and is quite proficient in this area. He's going to say something that may be somewhat in conflict with what we're used to doing here, but I think we can all learn from some of the things he's going to tell us ... Greg.

GREGORY C. TAYLOR: Good afternoon to all of you. It's most regrettable that this afternoon's session is to begin on such a sad note. There were to be two other consulting actuaries present at this session, and unfortunately they're not here. These are colleagues of mine, both of whom were using a chain ladder. What you need to understand is that the distribution of literature for this seminar was rather late in reaching Australia and sometime none of us had any idea of the date on which it was to be held or the place. These three colleagues of mine have been used to making predictions decided to use historical dates in order to make an estimate of this year's date. One of them took all of the observations that he had on previous years seminars as regard to the date, and fitted a curve, a rather elaborate curve and although he's not here, he's on his way and will be here in 1996. The other one was more clever than that because he realized that he not only needed a date he needed a place, and he not only had the date from the past but he needed the place for the present as well. He was clever enough to fit a three-dimensional surface to all of the past data in order to predict time and place. He's not coming; he was astonished to discover that this year's seminar is scheduled to be held in 1974 prior to the beginning of the series of such seminars, and not only that, he was even more astonished to discover that it is being held on Mars.

The difficulties in communicating with actuarial colleagues of mine in some ways typify the difficulties associated with the chain ladder -- I'll call it the chain ladder method because that's my familiar terminology, but some of you call it the development factor method. What I'd like to do is to show you a particular correlation matrix. This is not one I made up, this is one that was derived from some data which I'll tell you about in a moment. We're faced with an estimation problem. For the present purposes it doesn't matter what the estimation problem is. Suppose you are conducting the estimation problem and you have a model margin that has 14 parameters, and you have produced the correlation matrix of those 14 parameters. I didn't have room on the page to fit all of the matrixes in, but I think you can get the idea. You see that virtually every one of the correlation coefficients shown there is of the order 99%. Probably some of you don't know what the correlation matrix of the divestment is and possibly you don't know what significance attaches to it, and in particular what significance attaches to one that has correlation coefficients of that magnitude. I'll come back to that in a moment. But I assume that as everyone here would know that the correlation coefficient must lie between plus and minus one. To see a matrix in which every single entry is very close to one extreme or the other would raise some warning signs. It would cause you to ask yourself at this point is this a good thing or a bad thing? Perhaps now is the time to reveal the source of that correlation matrix. This is the matrix arising from a chain ladder estimate of loss reserves based on 14 different accident years. This is the correlation matrix of what essentially amounts to the estimated claim sizes for those 14 accident years. Just to anticipate some of the materials coming in the next few minutes, I'll tell you now that is a bad and not a good thing. I will explain why in a moment.

Now I'd like to review some remarks that I made here a year ago, because in many ways what I'm saying today is a sequel to what I said last year. Last year I presented a more theoretical paper which criticized the chain ladder method as either over-parameterized. Secondly, it's suggested that the theoretical procedures embraced by such methods might usefully be replaced by regression procedures. That at least is one possibility. Third, you can discuss how does one decide when one has eliminated enough parameters. Fourthly, you discuss a method from the statistical literature called the bootstrap, which is a method aimed at deriving not only an estimate of standard deviation of one's estimate result, in this case estimated loss reserves, but in fact also provide information on the entire distribution of the estimated loss reserve.

The purpose of today's talk is to fill in some of the numerical data associated with the more theoretical treatment which I gave last year. I like to include certainly what I would hope to be reasonably comprehensible numerical detail. But I think it's appropriate to begin with a number of preliminaries. I'll make the astounding assumption that not everyone here has extracted my last year's paper from their files in the last 2 or 3 days and reread it, so I'll cover a little bit of that ground again as quickly as I can. I'd also like to discuss very briefly the financial relevance of quantifying uncertainty in loss reserve.

Why do we want to do this? A good question. What's the reason why we're doing this? The basic reason is embodied in this diagram. Estimates of loss reserves affect three types of items in company accounts. On the one hand it affects the balance sheet -- the net assets. On the other hand they affect the profit and loss account through the profit. Just as they affect net assets, sure enough they affect the premium to surplus ratio. Just as they affect profit and net assets, the joint affect on those two things appears in the return on equity. What I'm saying is that the return on equity reported by a company or reported by an analyst of a company will depend in a direct way on the quality of the loss reserve.

Let me give you a numerical example of that. This sort of structure I have set out here on this slide would be regarded as unexceptional, at least in the sort of relationship I have between premium income and loss reserves. In this example basically the profit and loss account leads to a profit of $50 million. The net assets are $350 million after taking into account a much larger loss reserve of $550 million. The return on equity is 20%. It's a exercise to consider the way in which the reported return on equity will vary according to the way the loss reserves are varied. To put that another way -- what is the sensitivity of the loss reserve on the return on equity. Here you have it exemplified. I have calculated the profit and loss account and the balance sheet in two cases. In one case the loss reserve is increased by 5% and in the other case it's decreased by 5% as compared to the original version written in black. The 550 goes up to 578 or down to 523. Perhaps the green figures represent the case of the higher loss reserve and the blue represents the case of the lower loss reserves. Making that change to the loss reserves flows through into net assets. It also flows through into claims incurred and therefore the profit. The end result is if the loss reserve is 5% higher the return on equity changes from 20% to 35%. And if it's at 5% lower the return on equity changes from 20% to 8%. 20% in Australia is roughly what the market demands of an insurance company after tax. Therefore, a change of 5% in loss reserves -- an insurance company from one that is regarded to quite satisfactory in the market to an insurance company which is making astronomical returns to one which is totally inadequate in its performance. Loss reserves do matter and the quality of loss reserves does matter to financial control. Therefore it's knowing the quality of loss reserves methods and by knowing the loss reserves essentially I mean knowing the degree of uncertainty associated with them. The loss reserves have a main value which is equal to the value of the liabilities. If that's not the case then that's a much serious problem. That's not the topic to be addressed today. I want to come onto the question of speaking models to data and using those models to make predictions of future experience.

First of all, the fitting of models to data. I have here a picture which is rather similar to one shown this morning. I hope it's visible. The jagged line that you see here connects some observations. I tell you in a moment what the observations are. They're not just made up, they're real observations of something. There are three curves, one curve which is a slightly increased lines. The three curves are attempts to model that set of observations. The straight line represents the fitting of straight lines to the data by means of regression. The extension that you see here following this curve represents the fitting of the quadratic to the same data again by regression and the triangles represent the fitting of a cubic to the same data still using the same data. It is very difficult to say which one of the models is the best of the three. The next stage is to arrive at those models to make predictions in the future. And perhaps now it is the appropriate stage to tell you that the data are in fact random numbers generated between minus 1/2 and plus 1/2. They have no trend at all. Fitting a straight line to them actually depicts a slight trend which really isn't there. It appears to be there just because we have a small sample but it really isn't there. Fitting a straight line is really doing the modeling in this case, but you really didn't know this until I told you, which is the typical situation. If someone could only tell us we could make good models. We now have to predict the future, and now we have it.

The graph here is simply a reproduction of the picture on a smaller scale. Again, you can see all three models fit the data reasonably well. In the prediction you see the straight line continues to climb slightly about the X axis and actually generates some more random variation which in fact one was attempting to predict. Here you see the second degree poly-nominal going off to infinity, and the third degree poly-nominal doing the same thing in the opposite direction. It's very easy to construct examples like this, and it may seem rather facetious to do it. The fact remains that it does illustrate a central point. To the extent that you overdo your modeling, you make things look good by fitting a model close to past data. But in fact, your power of predicting the future is lessened.

I now want to come back to the matrix that I showed you at the very beginning because it relates to another major topic. The two major topics that I'll be concerned with as regard to modeling. One, over parameterization is what you just saw and two, multicollinearity, that's a big word. I'll try to give some indication of what it means in practice. Again, I've generated some random variables. This time the random variables are represented on the grid X and the random variables are functions of X and Y, as well as having a random component. I've generated them by a means of a particular formula so that the formula each observation is some function of X and Y, plus a random component. The random component is a uniform random variable between plus and minus a half. These observations are represented by the highlights in green. You'll see that the observations have been made in two directions. One has been made along the line of X, and the other along the line of Y minus X. We've chosen to take observations along two lines which are perpendicular. You'll see in a moment there's a reason for considering that. What I've done is to fix a linear surface to those observation by means of regression. That surface is represented by the brown lines as you can see. You see, once again, just like in the previous example, the brown line deviates -- it rises slowly away from the X/Y plane. Perhaps is the time for me to tell you that the function of X and Y from which the random components were added is zero. If X and Y equals zero -- in fact these observations which I said were functions of X and Y are again, just random variables. Suppose now I had chosen to make the observations on a different pair of lines, well in fact I still take observations along the line Y equals X. But I take the second set of observations along the line Y equals 1.0 of X. In other words, I'm choosing my second line parallel to the first. My question is does it really matter? In both cases we have the same number of observations, and we're going to use those observations to estimate a linear surface to fit them. It doesn't really matter where we take an observation. The answer fairly clearly is that it does matter. It's like trying to balance a platform on a picket fence. You can see that you have some large sites and some high sites and they're very close together. If you get a low site and a high site here and you try to fit a surface to them the surface is very unstable. Whereas, if you spread out the observations you provide a stable platform in which to erect a surface. This concept is the one that's at the heart of multi-collinearity. Multi-collinearity in regression problems means you have chosen your observations in directions which are similar, and you can expect as they say in this intuitive example to get fuller results. You'll get unstable predictions from your model. I know it's not apparent from that explanation how that relates to loss reserving but I hope to cover that in just a moment.

Before I actually display this next transparency I want to say that this is the only difficult mathematics. But I'm unable to convey the difficulties of multi-collinearity without going into a little bit of it. Here we have a standard regression model-- a linear model with parameters -- we'll just do the simplest regression case and assume it's normal. We estimate the parameters by minimizing squares which is this so our estimate takes this form -- just a standard regression estimate of parameters. And so our estimate takes this form -- just a standard regression estimate of parameters. And so our prediction takes this form where the star means we're talking about the future. The X star is the matrix for future observations -- the Y star is the prediction of future observations. The parameter uncertainty is given by this simple expression. The important thing to notice at this stage is it involves a matrix inverse. We have to invert the matrix S which is defined back here. I want to point out to you and try to follow this mathematics completely or to verify it as I go. Please bear with the essential points that I point out as I go along, because this matrix conversion is really the key to multi-collinearity. The prediction uncertainty, that is the uncertainty in our predictor -- Y star, can be written down reasonably simply. Notice it also involves that inverse matrix. It involves another term but that doesn't concern us here.

As an example of multi-collinearity -- assume that in our design matrix X, X essentially describes the directions in which we have made observations as in the pictorial example I gave. Assume that Column 2 is a multiple of Column 1 in that matrix. And that essentially means that we have taken two of our sets as observations have been taken in exactly the same direction. In that case the matrix that we have to invert becomes singular, and that's intuitively the case. Obviously if you're working in two dimensions you take two sets of observations but only in one direction. You can't fit a model in two dimensions. The way that comes through in the mathematics is that the matrix that you need to invert is singular and you can't do it. What we're concerned with really is not exactly this case of one column being exactly a model of the other. What we're concerned with the case that it's not really a model but close to it. That we've chosen the two directions too close to each other. The singularity in that matrix has two effects. The first effect is that it causes one or more of the elements of its inverse will be large if we have a matrix which is really singular. If that is the case then all of our calculations that depended on this inverse we would yield large results. Mainly a parameter uncertainty and a prediction uncertainty. The second effect is that if we choose Column 2 of X to be a multiple of Column 1, then Row 2 of X which usually is defined in terms of X, will be a multiple of Row 1. It follows that Column 2 of its inverse will be a multiple of Column 1. In that case the correlation between two of our parameter estimates and those two parameters will be highly correlated. That follows from our expression of the variance matrix of the parameter estimate.

What all of this is providing an example of the effect that when you end up with correlations of individual parameter estimates being closed to minus one, you can expect the dispersion of your predictions to be high. Therefore if you look at the correlation matrix of your parameter estimates, and that correlation matrix contains an unduly large number of elements close to one or minus one, then beware, your model contains an unduly large number of elements close to one or minus one, then beware. Your model contains multi-collinearity.

[QUESTION, INAUDIBLE]

I now want to come onto some numbers. I'm becoming very conscious of so many symbols and not enough numbers. The data or some manipulation of the data which I'll be working on, and I've written down here six years of experience and I've written down development factors going out to the 8th year. I've converted everything to what would be constant dollars if there were no super inflation -- there is in fact in this case, but that's not a major issue for the moment. The reason that I've chosen that data set is that it's the best behaved set that I could find from that class of business, and therefore it's the best way of giving the development factor method a sporting chance.

Someone said earlier today that you must make sure you spell out your models before you begin. First of all, this is a non-stochastic model which is the usual development factor model. It's the usual model underlying the development factor method. The claim payments obviously include a factor equal to the number of claims involved. They include some kind of accident year fix and some kind of development year base. The stochastic model which I'll be using for my examples is similar. It, in fact, only has two other ingredients. We're not restricted to this particular effect, and I could have chosen many other effects that I wanted to. But for the sake of having to give examples I've chosen this particular structure, and then there's the stochastic model which I will take to be normal. We can argue that some other time but again for the sake of example, we'll assume the error tends to be normal with a mean zero and a variance which is allowed to vary by development year, retirement year, and depends upon the number of clients, and all sorts of things you would want to take into account. Again I will point out that's not the only way we could chose the variance of the error exam. And again, as someone pointed out this morning, this kind of multiplicative model has the appealing property that if you take logs you end up with a model which is linear in the parameters, and the fact has been pointed out in the literature that the analysis and estimation of parameters from such multiplicative models can be thought of as doing all the same things as an analysis of variance on the log observation.

One of the topics that I've entered that I've been talking about is the topic of parameter reduction -- reducing the number of parameters in the model. I'll give you a couple of very simple examples of how one might reduce the number of parameters in the model. Let me go back again to the model itself. Notice that in both of the models as they've set out at the moment you need one parameter for each accident year and one parameter for every development year. In my example which has 14 accident years and 9 development years, that adds up to quite a few parameters. Here are a couple of examples as to how one might reduce the number of parameters. Just before I take this slide off, just notice that "A" refers to the accident year fix and "B" to the development year fix. One might assume that the accident year fix is just some power function. In other words, putting that in more common terms it means that average sizes go up with constant inflation from one accident year to the next. In order to reduce the number of development year factors we could, for example, say that "B1" the first development fix that stands as a parameter on its own -- "B2" the second year also stands on its own. But in the third and subsequent years the development year fix run down according to some exponential trend. I'm not in any way suggesting by writing these down that these are the rules to be followed. I'm simply just putting down some possibilities, and we can look in a moment at what the possibilities actually were. First of all, let's take a look at what the data array looks like. The data array available is in what's the standard form in Australia. That's an unusual form here -- it's not a triangle it's a parallelogram. The brown cross mark where points occur in the data array, and with the green boxes I've indicated how one would go about calculating development factors in the usual manner. Clearly one has to pick out observations in pairs of successive development years which correspond to the same accident year. The first development factor is calculated from the observations set out in the first box. The second development factor set out in the second box and so on. The usual calculation is to form means within the columns -- that's parts of the columns within the boxes and then take ratios to get H to H factors. That's something that everyone knows. The conventional development factor method takes arithmetic means within the column. You take arithmetic means usually but who's to say you shouldn't take geometric means or some other weighted means or whatever. But conventionally you take arithmetic means. Second moments of the predictors which result from the algorithm. As far as I know there's no published knowledge of any quality at all on what are the second moments of those predictors. I think it is a very intractable problem analytically to try and arrive at that knowledge. If one uses regression one takes exactly the same model, that is, all the same parameters. One writes down symbolically all of the same parameters, but estimates them by regression. Then possibly one uses the maximum likelihood fitting of the same model. Interestingly enough, if one assumes the log normal rather than normal as I'll be assuming in the numerical work, the column means that you need to take in order to develop a regression version of the chain ladder method -- a weighted geometric mean. It's interesting throwing up the suggestion made by Harry Panjer earlier, but maybe geometric weights can be used. One can observe that our exactly geometric means can be used. They are exactly what's prescribed by a particular model.

One of the advantages of using both regression on this problem is because it works on a fully specified model that is -- you simply cannot run the regression unless you say there is an error term and you say what the properties are. The benefits that flow from that are that the second moments of the predictors of loss reserve can be derived. And really they can be derived without a lot of difficulty. I don't think anyone should go away with the idea that because the theory of such work involves writing down a lot of symbols that the implementation of it is difficult. In fact, it's really easy. The fact that regression packages aren't around but simply manipulated fairly readily, means that a lot of the programming of such work is actually easier than sitting down to program doing chain ladders or development factors. What I want to do is make some sort of comparison between the what I'll call the full model -- that is the full development factor model with all of its parameters present. That on the one hand and alternative models on the other hand. Alternative models will be similar to the full model in that they are one attempt to introduce any new variables such as right of settlement of claims, because that would be cheating. That wouldn't be right to use a whole lot of new variables that might have good predictive power -- that's not a fair comparison with the full chain ladder models. I'll stick with the same parameters but I'll try to reduce the fit of parameters. I'm working with the one data set that I'm showing you. I could use the conventional chain ladder but it's very untractable so what I've done is replaced it by regression version of that same model which in fact gives reasonably similar results. But in any case, probably the results coming out of the regression chain ladder will be more reliable in the sense of having smaller uncertainty. By choosing to use regression chain ladders I'm really weighting the comparison in favor of the chain ladder. My alternative model has been -- I've developed from one reduced model to the next with two main tools. One of which is the so-called Bryman & Friedman statistic, and the other is a rough estimate of the standard deviation of the loss reserve. I should mention that the Bryman & Freeman statistic attempts to give a very quick estimate of the same thing. So the general idea is to take the full model, strike out some of the parameters, and then test whether the uncertainty associated with the predicted loss reserve is now smaller than it was for the full model -- and then keep doing it. Strike out some more parameters and then test again. Basically keep doing that until you find that by removing more parameters causes the uncertainty to increase. It is clear that ultimately if you keep removing parameters then you will get a bad estimator again, because if you remove all the parameters then clearly you're not going to predict anything at all.

Finally, I'll do some comparisons of the biased and respective methods, and the variance where the variance will be estimated by three different means. The bootstrap that I mentioned earlier is rather central to some of this so I'll tell you very quickly how it works. The bootstrap is really just a common sense method. What you do is take your data set and model it, you get fitted variance corresponding to your observations. That way you'll get residuals -- the differences between your data and your model. Imagine you've got 60 or 70 data points you've fitted a model and you've got 60 or 70 residuals. These are standardized residuals so you've got 60 or 70 points. Then what you do is assume that those residuals that you have observed have the same distribution -- their distribution is the distribution of the true underlying residuals. In other words, if you took a different data set generated by the same process and you went through the same exercise with it. Then the residuals you would come up with then would be the same as the residuals that you would have in this case. Because of that assumption you can take a random sample from those residuals and you feed that random sample of residuals back to the fitted values to produce a new set of data. It's usually called pseudo data -- it's a new set of data which has actually been manufactured from the original set. And you go through the same procedure -- fitting the same model to the pseudo data and you get an estimated loss reserve from that, and you repeat this. And you repeat it how ever many times you think appropriate, and every time you generate a new set of pseudo data you get a new estimate of loss reserves. If you get a new estimate of loss reserve and you can generate 100 of these-- then you have 100 estimates of loss reserves that form themselves into a distribution of loss reserves. There is a problem with the bootstrap and here I acknowledge Ben Zehnwirth's advice on this. That the bootstrap has been developed on the assumption that the model being used is the correct model. And unfortunately in claims analysis that usually or always is not the case. We have to worry about such a thing as specification error. The effect of mis-specifying the model, and in particular overfitting a model means that if you consider what happens in the corners of the chain ladder -- for example, take one corner to be the latest accident year where you have only one observation and many selections from the chain ladder model produced a fitted value exactly equal to that observation. So the residual there is zero. What happens with all the fitting is that the residuals get understated, and that lead to the understatement always that the variability in the pseudo data ____ the variability of loss reserves is understated. There is a way of overcoming this difficulty. I don't know that in the literature but I've used it here. I call it cross bootstrapping, and it works like this. Where we want to compare in Model 1 and Model 2 using the bootstrap, I suggest this. That we use Model 1 to produce our residuals. We use Model 1 simply to produce the raw material that generates our pseudo data. Then when we come to using those pseudo data sets, we estimate the loss reserve by using Model 2. This gives us a standard deviation. Let's call it Sigma 1-2. The topic suffix indicates the model used to generate the data, and the bottom suffix means the model used to do the analysis. Clearly we can calculate all the combinations here -- all the two models. Models 1 and 2 will be best compared if we make these two comparisons that are written down here. We compare Sigma 1-1 to Sigma 2-1. The bottom suffix represents the model doing the analysis. So Model 1 is used to do the analysis in both these cases, but Models 1 and 2 respectively are used to generate the data. I'll come back to that and show you an example of that in a moment.

I'm going to be using some very rough estimates of the standard deviation of the loss reserve. In fact, rather than produce a single estimate which is difficult, I'll use an upper bound and a lower bound. I've written them down here. In each, they involve a first term that looks complicated. It simply represents future domestic fluctuation and it has got nothing to do with the modeling. The term we're concerned with is the term that depends on parameter estimation. What is easy to derive is the effective parameter estimation error on the estimated loss reserve. 1) In the case that there is zero correlation between all the predicted test flows that make up that loss reserve. 2) In the case that there is full correlation between all of those cash flows that make up that loss reserve. 3) In the case that there is full correlation among all of those cash flows. One could, in fact consider negative correlations but they don't happen in practice so I'll ignore them. So I'll take the lower bound from variance to be the variance derived assuming zero correlation between all predicted cash flows and the upper bound to be that derived by assuming full correlation between all future cash flows.

I'll skip the next slide but what it shows is under certain quite reasonable assumptions, the conventional implementation of the chain ladder method will introduce an inherent bias in prediction, and the bias will in fact be upward. In other words, when you use the conventional chain ladder method, the main value of your estimated loss reserve will be higher than its true value provided, of course, that the model in which the chain ladder was based in the first place is the correct model. Obviously, if you choose your own model you might be too high or too low. The central point is if that happens to be the correct model, one tends to overestimate it. "I" illustrate that point here. Remember "Cij" was claim payments in accident year "i", development year "j" and so I'm defining a development factor in the usual way. Here are the instruments of the development factors estimated by the conventional chain ladder method and the regression chain ladder method. You see that in the first 6 cases out of 8 the conventional method estimates higher Age-to-age factors than does the regression, which is exactly the results that I predicted. The differences between the two sets of estimates are reasonably substantial. Each one taken on its own is only a few percentage points or less than that, but when you compound them they become substantial. It's only when we get to the unstable data where results are likely to be unpredictable that we find the trend reversed and the regression method gets higher age-to-age factors than does the conventional method.

The net result of all of this is that the conventional chain ladder does indeed give a higher predicted loss reserve than the regression chain ladder. Bear in mind that at this point there is no difference in the models. They are exactly the same models but the parameters are fitted by different techniques. Whereas, the conventional chain ladder produces a loss reserve of 545,000,000, the regression chain ladder produces a result of 493,000,000.

Let's look at attempts to reduce the number of parameters. The first model shown in this list is the one that I've been talking about all the time until now which is called the full chain ladder model. My terminology is that full development year claims means that you estimate a separate parameter for every development year. And full accident year means you estimate a separate parameter for each accident year. There is not a type of year fix built into the standard year model. The number of parameters involved in that model is 22. And we have several measures of efficiency of the model. First of all, we have the weighted residual sum of squares, which people dealing with fitting problem or regression problems are often tempted to look at. But one of the things that I want to show you is it is irrelevant to this sort of problem. Not only is it irrelevant it is destructive to look at it. We have the Byneman treatment SP which is some kind of proxy for the uncertainty in the estimated loss reserve, and we have the upper and lower bounds that I showed you a moment ago of that same uncertainty. We have the upper and lower bounds are 23,000,000 and 50,000,000 respectively, they seem a long way apart but I'll say a few words in a moment about how one can take a reasonable stab at where the real value lies. Now we have a second model. If you think right back to the start where I showed you the correlation matrix. I see then where it related to the parameters describing different accident years. In fact, the correlations between those parameters are far higher than the correlations between the development year fix. The place to start in trying to reduce the parameters is with the accident year. Again, I need to describe my terminology. When I write down the A, A3, and A9, the A means I'm fitting a linear term to the accident year. In other words, I'm assuming that the average claim size increases linearly with accident year. The A3 means that I'm building another term which arises from the rate of change of that average size from one year to the next to change at the third last accident year. That is, the rate of increase of average claim size has been different in the last 3 accident years from what it was prior to that. The A9 means the same sort of thing -- another change in the right is going at the 9th accident year. Those choices were all made on a sensible basis that arose from various diagnostics that came out of the regressions that are being done. The number of parameters reduces immediately. The residual sum of squares goes up-- naturally that must because the full model contains all of the parameters contained in the reduced model, plus other. The residual sum of squares which measures fit must indicate a worst fit in the present case. On the other hand, the SP statistic comes down, and that's what you want to happen. Similarly, the lower bound of variance rises slightly and the upper bound comes down slightly. Well we can try another model. This time we strike out two of the parameters describing accident year fix, left with only A3, that means we have a linear trend in average claim size up to the third last accident year and then the trends stop and become flat. We've struck out two of our parameters so the number of parameters comes down to nine. The sum of squares hardly changes -- well in fact it still goes up but only by a little amount. That is an encouraging sign on its own, it means that removing two parameters we hardly change the quality of fit. We know that the SP comes down and the estimate of variance comes down as well. We can keep on doing this but I don't want to take you tediously through every example. But we can keep on doing this trying different models. We can try different accident year effects and then we can try different development year effects. It appears that keeping the A3 term on accident years -- so I've kept that throughout and then started multiplying development year fix. Where D1 means I have a parameter for development year one, D2 for development year 2. D5 means that I have the same age-to-age factor for development years 3, 4, and 5. When we come down to the model that I've enclosed in a box here. You see you have only 4 parameters left out of the original 22. I emphasize that it is still exactly the same model but we just have a lot of the parameters have been estimated the same or to be related in some way. For example, in A3, instead of estimating a separate parameter for representing the average size associated with every accident year, we assume that there is a linear trend in most factors, and all we have to estimate is the one parameter associated with that trend -- mainly the slope. The "D" parameters mean we have -- "D1" that's not an age-to-age factor it's just a stopping point to using an age-to-age method- - essentially the payments per claim made in development year one. That means the age-to-age factor for year two is one. We have the same age-to-age factors for development years 3, 4, and 5. A different factor applying to accident year 6, 7, and 8. You'll notice that the "SP" statistic is a minimum value for that model and the estimates of variance are in fact quite a lot smaller than they were in the beginning. At least the upper bound is -- the lower bound is exactly the same, but I'd suggest that the actual variance is likely to lie much closer to the lower bound in that case than in the top case. The reason for that is that where we have only four parameters, the correlations between the estimates of those parameters will tend to be small. Where we have many parameters, and we've seen the numerical example of it, the correlations will tend to be large. Recall the lower bound was calculated on the assumption that there was zero assumption between the parameter estimates. To say that the correlations between parameter estimates are decreasing as we go down the page, means that the true standard deviation of the loss estimate will tend to move towards the lower bound as we go down the page. In fact, if you take that into account there's been quite a substantial reduction in uncertainty as we have reduced the number of parameters. There are some other details down here examining the fix, but they don't really add anything to the general structure of this.

A quick remark about the cross-bootstrapping. If we generate data using the full model and we analyze the data so generated by the full model, we get an estimate of the standard deviation of 41,000,000. If we use the reduced model to generate the data and we do the analysis by the full model we get 51,000,000 -- and we do the analysis by the reduced model we get 41,000,000. Any way you look at it the reduction in standard deviation is in the order of 25%. Here's a chart of symbols -- the information about all the various models I had written down in a more comprehensive form. Going across from left to right on this page amounts to running down the page of estimates I showed you before. And up to the encircled points here, that essentially means reducing the number of parameters. The number of parameters involved in the various models is indicated by the crosses, and you can see it running down. The residual sum of squares represented by the brown crosses and you can see that as you reduce the number of parameters it goes up. And if you think that looking at the residual number of squares is an indicator of the quality of your model, then you would choose on that basis the full model. We notice that the SP statistics -- the green stars go very steadily down. And we noticed that the estimated variance of the loss reserves, at least the intervals between the up and lower bounds, appears to go fairly steadily down as well. Which last two results are quite in contradiction to the results suggested by the residual sum of squares. The sum of squares may just be totally irrelevant. The SP statistic and the estimated variance is reasonably consistent one with the other.

In conclusion, in the same manner the development factor method is rather extravagant with parameters. Models which are used in many parameters lead to overfitting and multi-collinearity. The effect of overfitting is because the model to adhere strongly to past data but to predict future observations poorly. Since the uncertainties associated with the individual parameter estimates of which there are many accumulate, therefore the effects of overfitting are: 1) greater uncertainty in the estimated liability, hence unnecessarily large capital holdings; hence insufficient use of capital; hence takeover. That's what makes companies become takeover targets by insufficient use of their capital. I think that's about all the time I have to spend on this. No doubt those of you who are here in 1994 will receive further information from my colleagues.

STEPHEN PHILBRICK: We have the other half of the Australian connection here. Dr. Ben Zehnwirth has a very impressive resume. I won't read it all or we won't have time for his presentation. I'll just give you some quick excerpts. He is currently a senior lecturer in statistics at Macquarie University in Sydney. He's the author of more than 30 research papers in statistics, economics and actuarial science. And he is the co-author of the "Introductory of Statistics With Applications in General Insurance", which won the Clarence Kulp prize from the American Risk and Insurance Association. He's an editor or referee for more than 10 scientific journals, and has been a guest speaker at a number of international scientific meetings. He also has put together a computer base statistical sampling package which some of you can see in the exhibitors sessions following this session. Without giving any more of his background I'll let Ben Zehnwirth go ahead and speak.

BEN ZEHNWIRTH: I'd like to personally thank the people that were responsible for giving me the opportunity to talk to you today-- Eric Paper, Bob Miccolis and Philbrick. Much of the material I am going to cover I covered last year. Some of the material I'm going to cover has been covered earlier today, perhaps I'm going to give it a slight delivery. I guess you know that if two people always agree on every issue then only one is thinking. I'm not going to be accused of not doing any thinking.

First of all, I want to illustrate that any case based on the calculation of development factors -- on the chain ladder or any variance thereof, is unsound, and doesn't really help you talk or identify any structure trends in the data. I'm going to also try and illustrate some of the fundamentals principles of forecasting. Some of these have already been discussed today, but I'm going to elaborate on them. In a way I've got a pretty ambitious program which hopefully I'll be able to cover in 90 minutes. First of all you're looking at a case study which takes the loss developments away but I eventually generate it based on a particular model. When I actually generate this data more than a year ago, I felt that this was only a pathological example. But I felt this was a good example to illustrate why any technique based on age-to-age development factors can never work. Two weeks ago I was in London and I did some analysis on the loss development array on the London Reinsurance market and that loss development array had the same common features of this pathological example that we're going to be discussing today. Perhaps real life does involve pathological examples. I'm then going to talk about the chain-ladder model. I think it is very important to recognize that behind the chain ladder or behind the age-to-age development there is a model that is very important. Because if you recognize that then it is very easy to understand either the deficiencies or the merits of that particular technique. Fundamentals of forecasting -- what is it where the forecasting realizations of variables is like forecasting the IQ of the next person that walks through that door that happens to be Bob Beckowitz. Without forecasting the main IQ of actual is actually forecasting the IQ of an actuary that we might choose. Simplicity -- I think that has also been addressed today about how many parameters -- how complicated should your model be. The mechanisms that generate life severity, length in reporting-- frequencies are incredibly complex. Model is not really intended to describe every aspect of that process. A model should bring out the essentially important features that we are trying to understand. According to Milton Friedman, 1953 -- any hypothesis is important. Similar views were expressed by Carl, who said that simple statements are to be more highly valued than less simple ones. They tell us more and their content is greater

SLIDES OF TALK PRESENTED AT

CASUALTY LOSS RESERVE SEMINAR,

MINNEAPOLIS 1987

BY

DR. BEN ZEHNWIRTH,

SCHOOL OF ECONOMIC AND

FINANCIAL STUDIES,

MACQUARIE UNIVERSITY,

AUSTRALIA

PURPOSE OF TALK IS THREEFOLD

- VARIANTS OF CHAIN LADDER AND/OR TECHNIQUES INVOLVING CALCULATION OF DEVELOPMENT FACTORS ARE UNSOUND AND LEAD TO INCORRECT RESULTS

- ILLUSTRATE FUNDAMENTAL PRINCIPLES OF STATISTICAL MODELLING (FOR FORE-CASTING RESERVES)

- DISCUSS SOME OF MY OWN WORK IN THE AREA

PROGRAM

A. PRINCIPLES

1. CASE STUDY 1 INVOLVING CHAIN LADDER (AGE-TO-AGE DEVELOPMENT FACTORS)

2. CHAIN LADDER MODEL

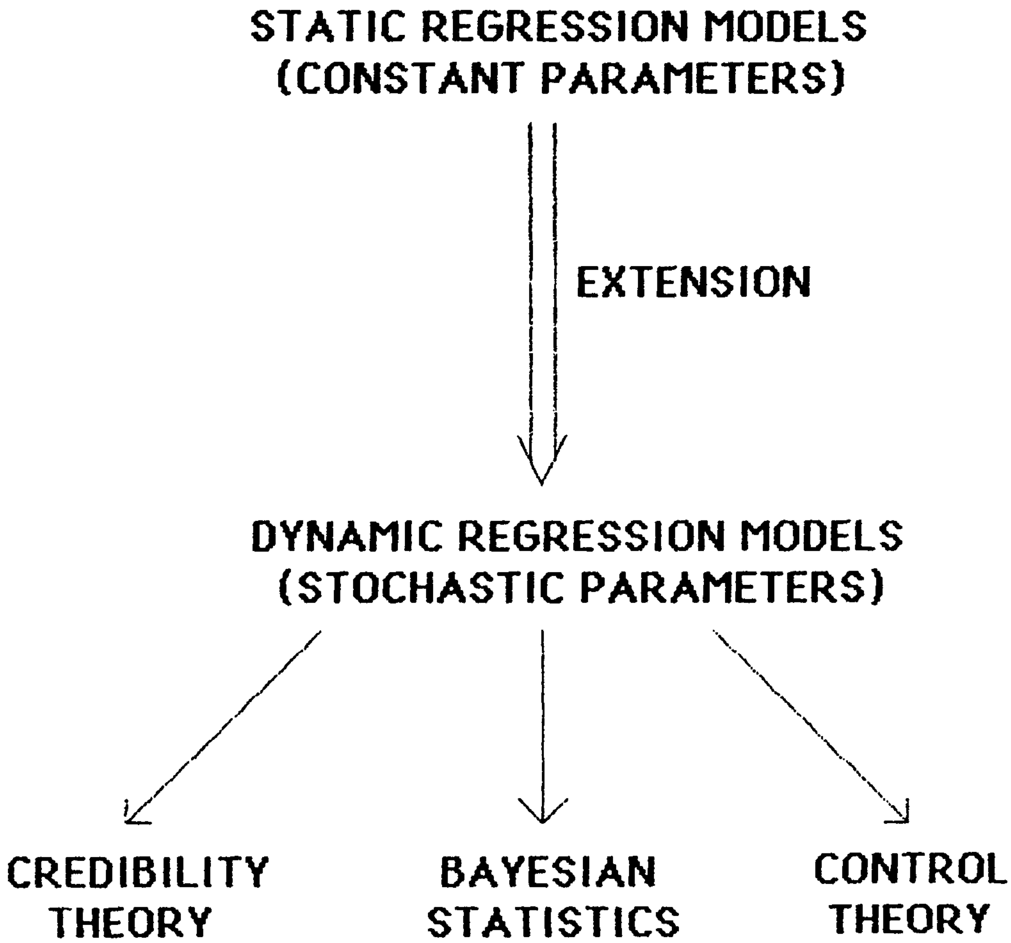
3. DEFICIENCIES OF STANDARD ACTUARIAL TECHNIQUES

4. FUNDAMENTAL PRINCIPLES OF FORECASTING

   - WHAT ARE WE FORECASTING ?
   - SIMPLICITY
   - PARSIMONY
   - SEPARATION OF SYSTEMATIC COMPONENT FROM RANDOM COMPONENTS

5. RE-VISIT CASE STUDY 1 IN ORDER TO ILLUSTRATE PRINCIPLES

MY OWN WORK


STATIC REGRESSION MODELS
(CONSTANT PARAMETERS)
EXTENSION
DYNAMIC REGRESSION MODELS
(STOCHASTIC PARAMETERS)
CREDIBILITY THEORY
BAYESIAN STATISTICS
CONTROL THEORY

DYNAMIC REGRESSION MODELS

1. HOERL CURVES

2. MULTIPLICATIVE ERROR
   (LOGNORMAL)

3. VARYING PARAMETERS

4. INDENTIFICATION

5. VALIDATION AND TESTING

6. ESTIMATION

7. FORECASTING METHODOLOGY

8. STANDARD ERRORS
   (MONITORING - TRACKING FORECASTS)

9. CREDIBILITY

APPENDIX C2

CUMULATIVE PAID LOSSES

ACCI YEAR										
1976	10266	13685	17409	27015	35167	43342	47300	50330	52063	55574
1977	1767	4221	10801	13620	15577	17727	21404	26155	28987	
1978	6232	11375	14042	18320	20609	26824	33097	38002		
1979	4597	8188	14097	19253	23266	26823	28784			
1980	4248	8053	12048	18363	21843	25329				
1981	1643	3720	8821	10728	14002					
1982	3270	10500	12353	16511						
1983	3161	5226	11116							
1984	5305	11383								
1985	6127									

APPENDIX C3

ACCI YEAR	DEVELOPMENT FACTORS								
1976	1.333	1.272	1.552	1.302	1.232	1.091	1.064	1.034	1.067
1977	2.389	2.559	1.261	1.144	1.138	1.207	1.222	1.108	
1978	1.825	1.234	1.305	1.125	1.302	1.234	1.148		
1979	1.781	1.722	1.366	1.208	1.153	1.073			
1980	1.896	1.496	1.524	1.190	1.160				
1981	2.264	2.371	1.216	1.305					
1982	3.211	1.176	1.337						
1983	1.653	2.127							
1984	2.146								

WEIGHTED AVERAGE DEVELOPMENT FACTORS

1.886	1.550	1.382	1.216	1.202	1.138	1.125	1.060	1.067

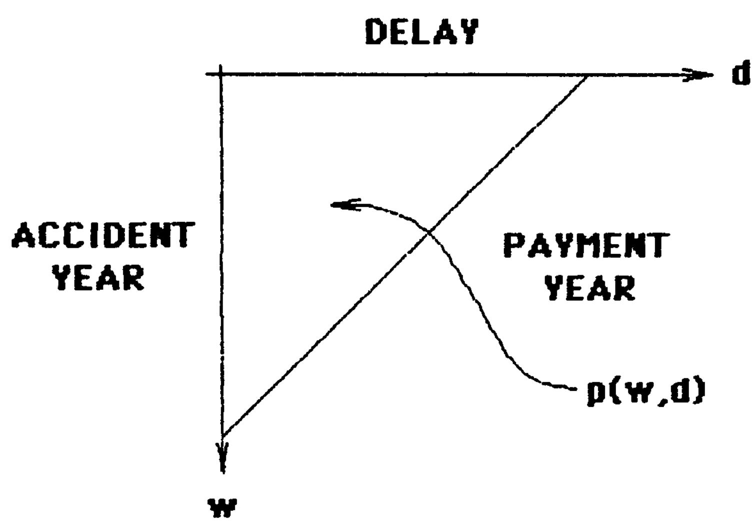
APPENDIX C4

ACCI YEAR	PROJECTED ULTIMATE LOSSES								
1976	10266	13685	17409	27015	35167	43342	47300	50330	52063	55574
1977	1767	4221	10801	13620	15577	17727	21404	26155	28987	30942
1978	6232	11375	14042	18320	20609	26824	33097	38002	40270	42986
1979	4597	8188	14097	19253	23266	26823	28784	32371	34303	36616
1980	4248	8053	12048	18363	21843	25329	28833	32426	34361	36678
1981	1643	3720	8821	10728	14002	16837	19166	21555	22841	24382
1982	3270	10500	12353	16511	20076	24141	27480	30905	32749	34958
1983	3161	5226	11116	15365	18682	22465	25573	28760	30477	32532
1984	5305	11383	17641	24385	29649	35653	40585	45643	48367	51629
1985	6127	11554	17906	24751	30094	36188	41194	46328	49093	52403

APPENDIX C5

ACCI YEAR	PROJECTED NON-CUMULATIVE PAID LOSSES									ACC.YR TOTALS
1976	10266	3419	3724	9606	8152	8175	3958	3030	1733	3511	0
1977	1767	2454	6580	2819	1957	2150	3677	4751	2832	1955	1954
1978	6232	5143	2667	4278	2289	6215	6273	4905	2268	2716	4983
1979	4597	3591	5909	5156	4013	3557	1961	3587	1932	2313	7831
1980	4248	3805	3995	6315	3480	3486	3504	3593	1935	2317	11348
1981	1643	2077	5101	1907	3274	2835	2329	2388	1287	1540	10378
1982	3270	7230	1853	4158	3565	4065	3339	3424	1845	2209	18444
1983	3161	2065	5890	4249	3317	3783	3108	3187	1717	2055	21413
1984	5305	6078	6258	6743	5264	6004	4932	5058	2724	3262	40242
1985	6127	5427	6352	6845	5343	6094	5006	5133	2765	3311	46272
PMT.YR TOTS:		33643	31046	25866	21480	17595	13987	9912	6026	3310	162865

CHAIN LADDER MODEL



$$y(w,d) = \log p(w,d)$$

$$= \mu + a_w + b_d + \varepsilon$$

$$VAR[\varepsilon] = \sigma^2$$

$$\hat{y}(w,d) = \hat{\mu} + \hat{a}_w + \hat{b}_d + \varepsilon$$

$$se(\hat{y}) = s$$

$$\hat{p}(w,d) = \exp[\hat{y} + \tfrac{1}{2}s^2]$$

No. Parameters = No. accident years x 2 − 1

DEFICIENCIES OF STANDARD ACTUARIAL TECHNIQUES

- UNSTABLE (HIGH UNCERTAINTIES)
- BIASED DOWNWARDS
- OVERPARAMETERISED
- DO NOT SEPARATE THE SYSTEMATIC COMPONENT FROM THE RANDOM COMPONENT
- STANDARD ERRORS NOT COMPUTED
- METHOD OF ESTIMATION NON-OPTIMAL
- MODELS NOT TESTED NOR VALIDATED
- THORETICALLY INCONSISTENT

FUNDAMENTAL PRINCIPLES

- SIMPLE MODELS
- PARSIMONY
- CAPTURE SYSTEMATIC COMPONENT
- SEPARATE SYSTEMATIC COMPONENT FROM RANDOM COMPONENT
- STANDARD ERRORS (UNCERTAINTIES)
- TEST AND VALIDATE MODELS
- THEORETICALLY CONSISTENT

FORECASTING REALIZATIONS OF A STOCHASTIC PROCESS

STEPS IN MODELLING

1. PRELIMINARY ANALYSIS
   (EXPLORATORY)

2. POSTULATE MODEL

ITERATIVE

3. ESTIMATE MODEL

4. TEST MODEL

5. VALIDATE MODEL

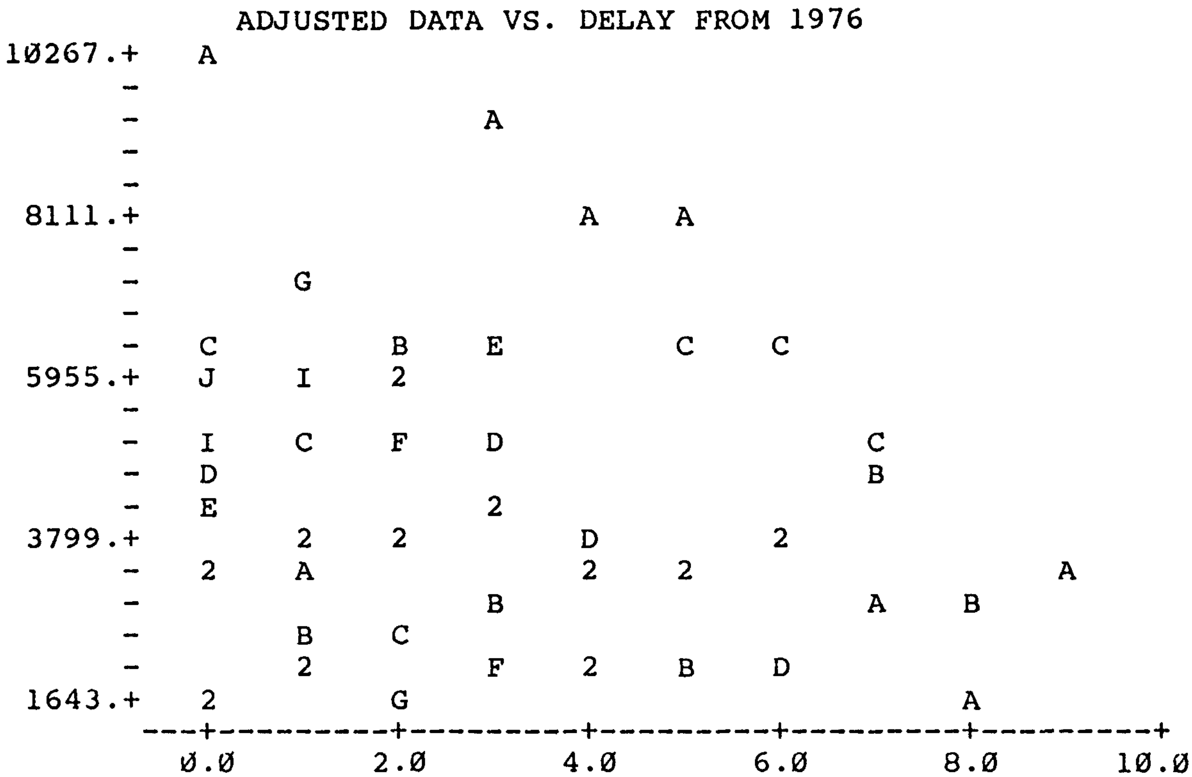


Figure 3.1

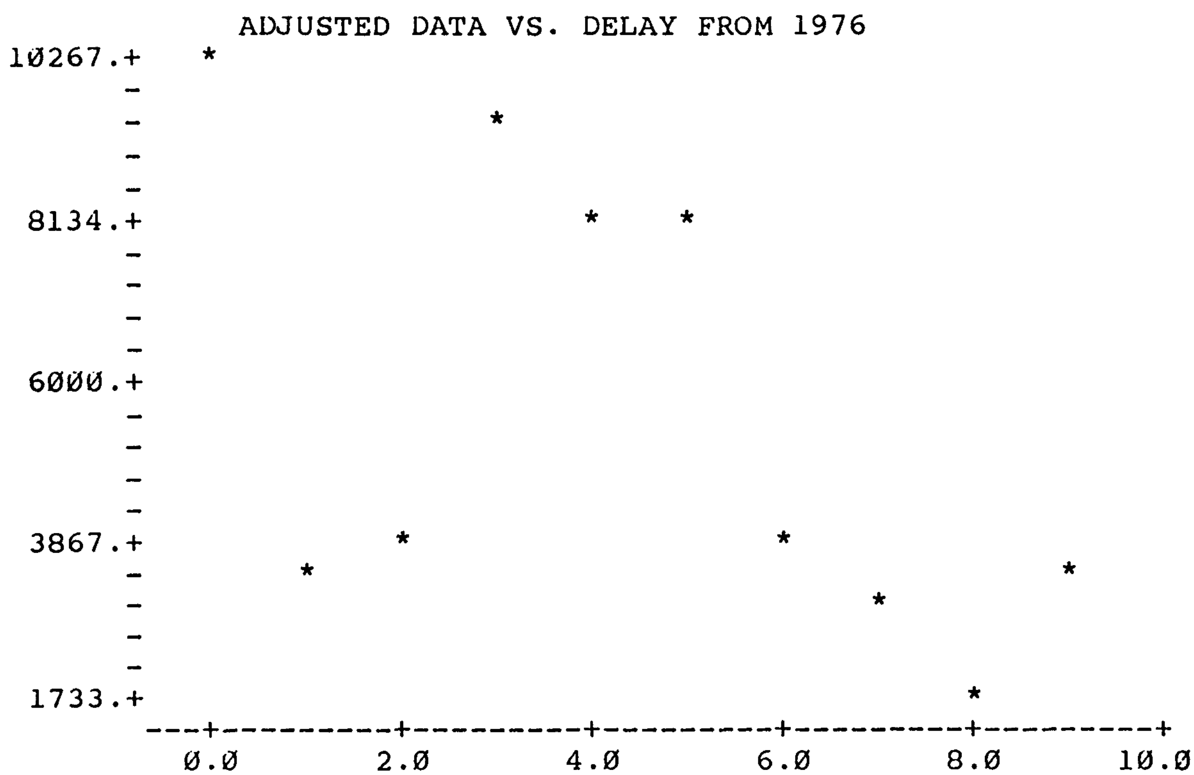


Figure 3.2

MODEL

$$y(w,d) = \log p(w,d)$$

$$= \alpha + \varepsilon : VAR[\varepsilon] = \sigma^2$$

$$\hat{\alpha} = 8.257$$

$$\sigma^2 = 0.2201$$

$$s.e.(\hat{\alpha}) = 0.0633$$

$$\hat{y}(w,d) = 8.257$$

$$\hat{p}(w,d) = EXP[\hat{\alpha} + 0.5 \times (0.0633^2 + 0.2201^2)]$$

$$= 4313$$

$$MEDIAN = EXP[\hat{\alpha}]$$

$$= 3855$$

**** PROJECT case3 ****

EXAMPLE 1

Table 4.1

PARAMETER ESTIMATES

ACCI YEAR	ALPHA	S.E.	T-RATIO	BETA	S.E.	T-RATIO	GAMMA	S.E.	T-RATIO
1976	8.257	0.0633	130.53	0.000	0.0000	0.00	0.000	0.0000	0.00
1977	8.257	0.0633	130.53	0.000	0.0000	0.00	0.000	0.0000	0.00
1978	8.257	0.0633	130.53	0.000	0.0000	0.00	0.000	0.0000	0.00
1979	8.257	0.0633	130.53	0.000	0.0000	0.00	0.000	0.0000	0.00
1980	8.257	0.0633	130.53	0.000	0.0000	0.00	0.000	0.0000	0.00
1981	8.257	0.0633	130.53	0.000	0.0000	0.00	0.000	0.0000	0.00
1982	8.257	0.0633	130.53	0.000	0.0000	0.00	0.000	0.0000	0.00
1983	8.257	0.0633	130.53	0.000	0.0000	0.00	0.000	0.0000	0.00
1984	8.257	0.0633	130.53	0.000	0.0000	0.00	0.000	0.0000	0.00
1985	8.257	0.0633	130.53	0.000	0.0000	0.00	0.000	0.0000	0.00

ALL PARAMETERS ARE SIGNIFICANT

S = 0.4691 S-SQUARED = 0.2201 S-SQUARED(SC) = 0.2248

R-SQUARED = 0.0 PERCENT N = 55 P = 1.0

AIC = 73.83 AIC(SC) = 76.98

*** ERROR ***
R-SQUARED CANNOT BE COMPUTED USING STANDARD FORMULA.

	ESTIMATED SUPERIMPOSED INFLATION (PERCENT)	STANDARD ERROR
1976-1985	0.00	0.00
ANNUAL	0.00	0.00

SIGMA-SQUARED(FUTURE) = 0.2201

EXAMPLE 1

Table 4.2

EXPECTED PAYMENTS/OBSERVED PAYMENTS +--------+ FORECAST MEAN PAYMENTS/STANDARD ERRORS

(PAYMENTS IN $1 S)

YEAR												
1976	EXP:	4313	4313	4313	4313	4313	4313	4313	4313	4313	4313	0
	OBS:	10266	3419	3724	9606	8152	8175	3958	3030	1733	3511	0
1977	EXP:	4313	4313	4313	4313	4313	4313	4313	4313	4313	4313	4313
	OBS:	1767	2454	6580	2819	1957	2150	3677	4751	2832	2161	2161
1978	EXP:	4313	4313	4313	4313	4313	4313	4313	4313	4313	4313	8625
	OBS:	6232	5143	2667	4278	2289	6215	6273	4905	2161	2161	3060
1979	EXP:	4313	4313	4313	4313	4313	4313	4313	4313	4313	4313	12938
	OBS:	4597	3591	5909	5156	4013	3557	1961	2161	2161	2161	3800
1980	EXP:	4313	4313	4313	4313	4313	4313	4313	4313	4313	4313	17250
	OBS:	4248	3805	3995	6315	3480	3486	2161	2161	2161	2161	4420
1981	EXP:	4313	4313	4313	4313	4313	4313	4313	4313	4313	4313	21563
	OBS:	1643	2077	5101	1907	3274	2161	2161	2161	2161	2161	4977
1982	EXP:	4313	4313	4313	4313	4313	4313	4313	4313	4313	4313	25875
	OBS:	3270	7230	1853	4158	2161	2161	2161	2161	2161	2161	5491
1983	EXP:	4313	4313	4313	4313	4313	4313	4313	4313	4313	4313	30188
	OBS:	3161	2065	5890	2161	2161	2161	2161	2161	2161	2161	5973
1984	EXP:	4313	4313	4313	4313	4313	4313	4313	4313	4313	4313	34500
	OBS:	5305	6978	2161	2161	2161	2161	2161	2161	2161	2161	6429
1985	EXP:	4313	4313	4313	4313	4313	4313	4313	4313	4313	4313	38813
	OBS:	6127	2161	2161	2161	2161	2161	2161	2161	2161	2161	6866
TOT.FOR PAYMENT YRS:			38813	34500	30188	25875	21563	17250	12938	8625	4313	194065
STANDARD ERRORS:			6886	6446	5986	5502	4985	4425	3803	3031	2161	18918

Table 4.3

ACC. YEAR	EXPECTED	OBSERVED	DIFFERENCE	%ER	PMNT YEAR	EXPECTED	OBSERVED	DIFFERENCE	%ER
	(PAYMENTS IN $1'S)					(PAYMENTS IN $1's)			
76	43125	55574	12449	28	76	4313	10266	5953	138
77	38813	28987	-9826	-25	77	8625	5186	-3439	-39
78	34500	38002	3502	10	78	12938	12410	-528	-4
79	30188	28784	-1404	-4	79	17250	25926	8676	50
80	25875	25329	-546	-2	80	21563	21477	-86	0
81	21563	14002	-7561	-35	81	25875	25767	-108	0
82	17250	16511	-739	-4	82	30188	22895	-7293	-24
83	12938	11116	-1822	-14	83	34500	38742	4242	12
84	8625	11383	2758	31	84	38813	30924	-7889	-20
85	4313	6127	1814	42	85	43125	42222	-903	-2

```
   STANDARDISED RESIDUALS VS. DELAY
  2.09+   A
      -                  A
      -
      -                       A    A
      -        G
  1.12+   C         B    E         C    C
      -   J    I    2
      -   I
      -        C    F    D                   2
      -   D
  0.14+   E         E    2    D         A
      -        2    A                   B
      -        A              E    2                   A
      -   2                   F              A
      -                  B                        B
 -0.83+             C
      -        B              C
      -        F                   B
      -        H         F    B         D
      -   B         G                             A
 -1.81+   F
       ---+---------+---------+---------+---------+---------+
         0.0       2.0       4.0       6.0       8.0      10.0
```

Figure 4.1

EXAMPLE 1

```
    STANDARDISED RESIDUALS VS. ACCIDENT YEARS
 2.Ø9+   A
     -   A
     -
     -   2
     -                                 G
 1.12+        B    3         E
     -                  D                   H    I    J
     -                                           I
     -        B    2    D         F
     -                  D
 Ø.14+   A         C    D    2         G
     -   A    B         D    E
     -   2              D    2
     -   A                        F    G    H
     -        2
-Ø.83+             C
     -        B    C
     -        B                   F
     -        B         D         F         H
     -   A    B                        G
-1.81+                            F
      ---+---------+---------+---------+---------+---------+
       76.Ø      78.Ø      8Ø.Ø      82.Ø      84.Ø      86.Ø
```

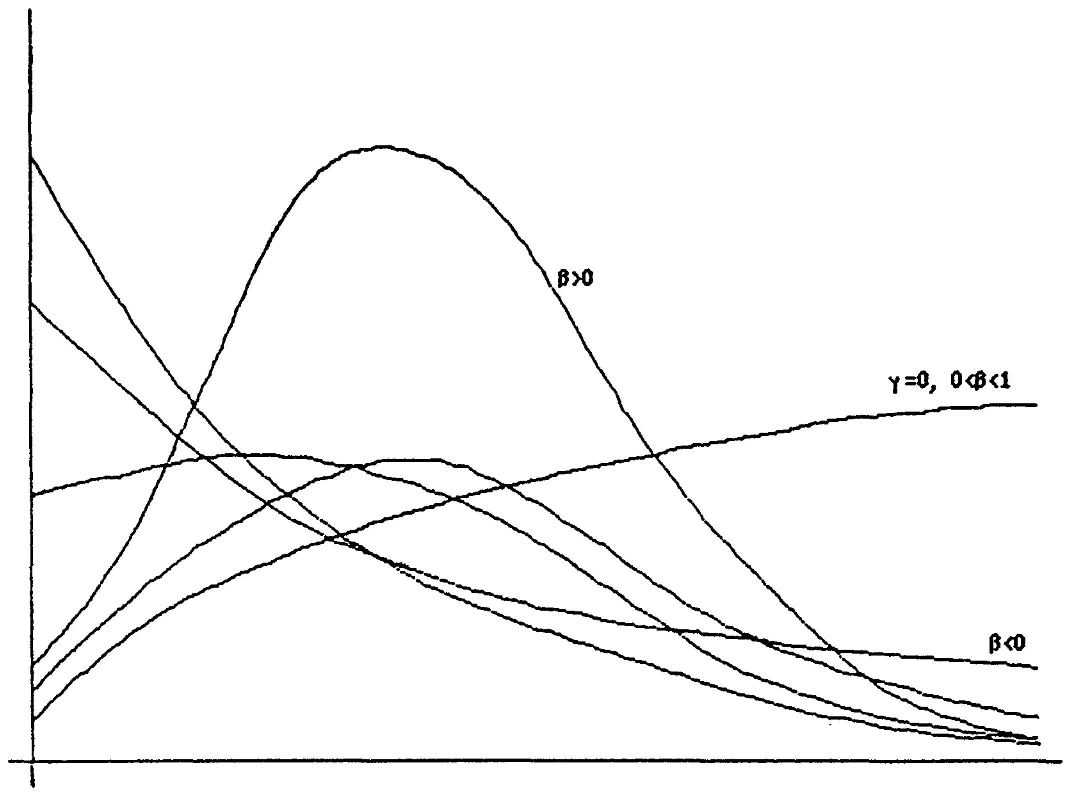
Figure 4.2

```
    STANDARDISED RESIDUALS VS. PAYMENT YEARS
 2.Ø9+   A
     -                  A
     -
     -                       A    A
     -                                      G
 1.12+             C    B                   2    C
     -                            D                   3
     -                                           I
     -                  C              D    F    B    C
     -                  D
 Ø.14+                       E    C    2    D         G
     -             A         D    E         B
     -        A                                  2    2
     -                                 G    2         F
     -                       B                        B
-Ø.83+                       C
     -             B                   C
     -                                 2
     -                            B              2    D
     -        B                                  2
-1.81+                            F
      ---+---------+---------+---------+---------+---------+
       76.Ø      78.Ø      8Ø.Ø      82.Ø      84.Ø      86.Ø
```

Figure 4.3

BASIC MODELLING CONCEPTS

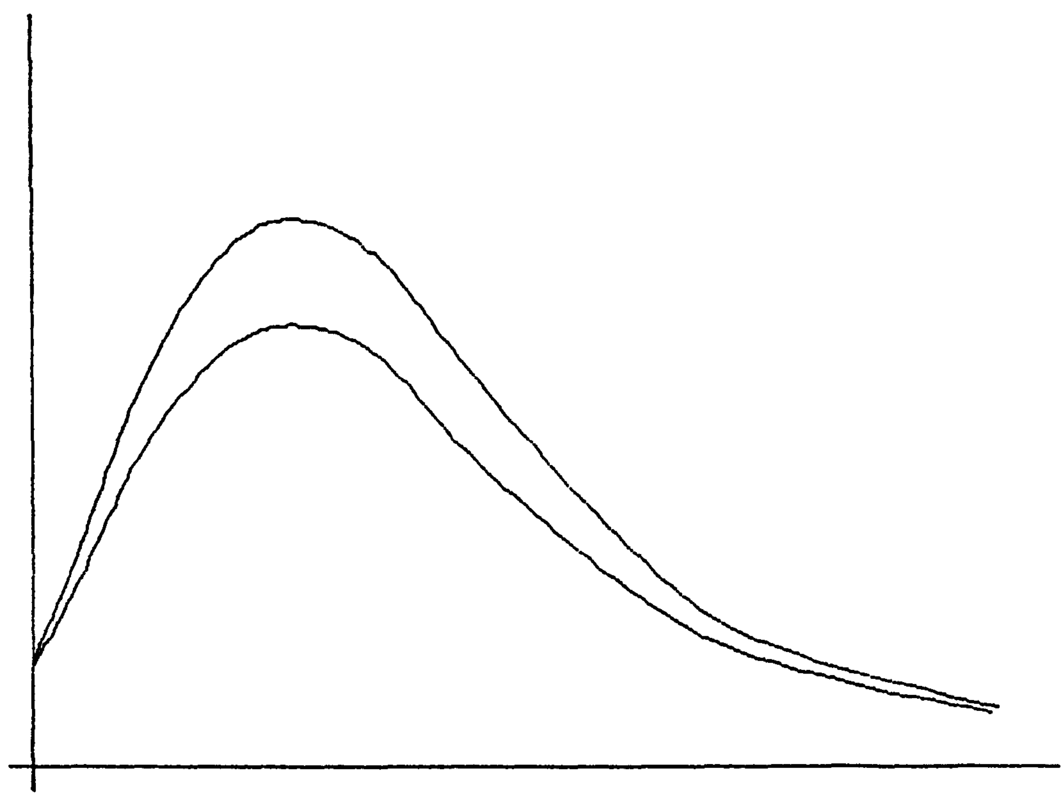
RUN-OFF CURVES



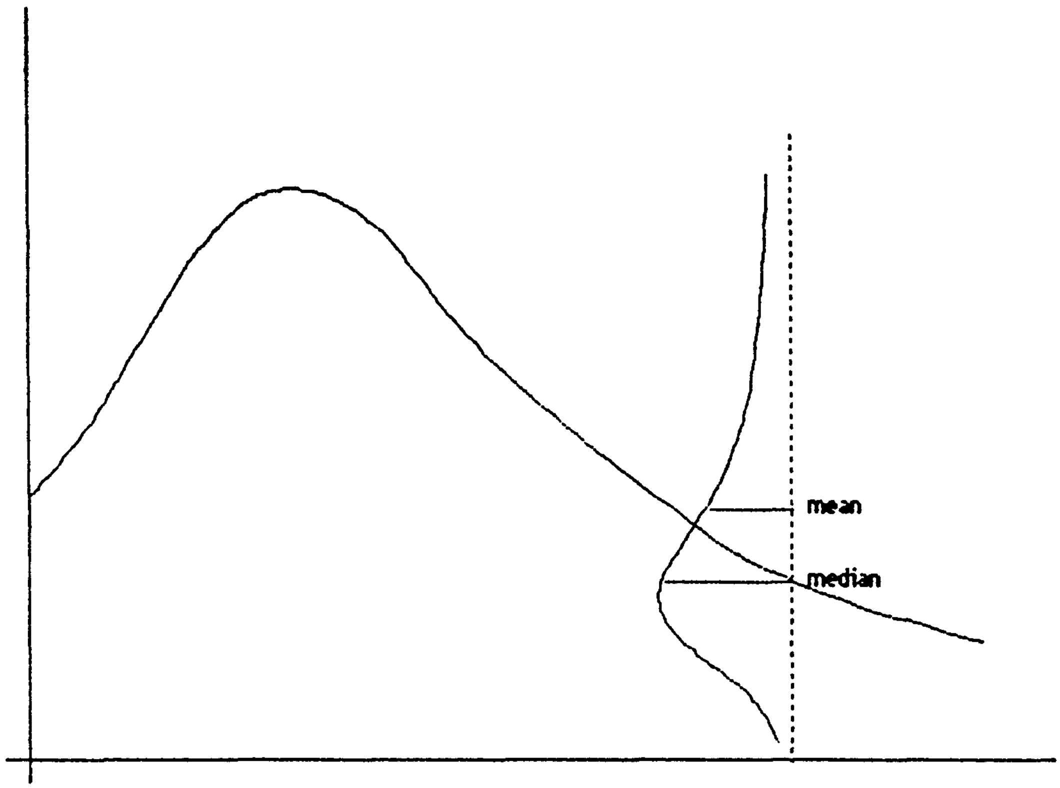
THREE PARAMETERS

ALPHA	BETA	GAMMA
LEVEL	SHAPE	SHAPE
	BODY AND TAIL	TAIL

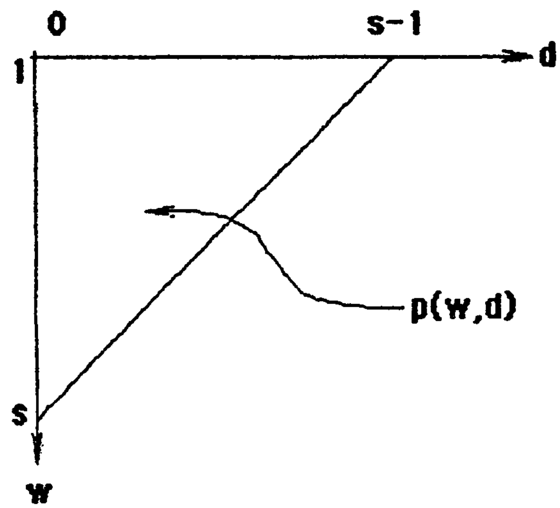
DIFFERENT ALPHAS



DEVIATIONS FROM RUN-OFF CURVES



EXAMPLES OF MODELS



$$y(w,d) = \log p(w,d) = \alpha(w) + \beta(w)\log(1+d) + \gamma(w)d + \varepsilon$$

CHAIN LADDER

$$y(w,d) = \mu + a_w + b_d + \varepsilon$$

SINGLE CURVE

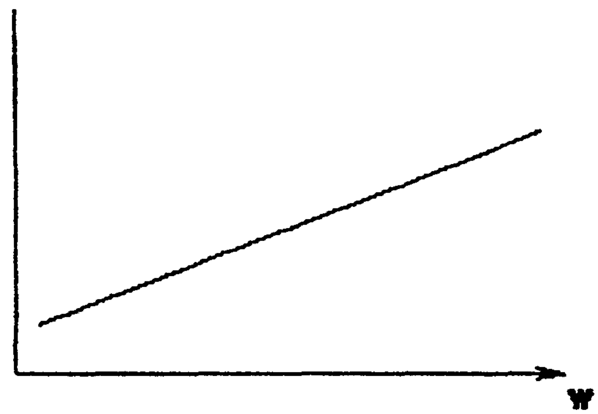
$$y(w,d) = \alpha + \beta \log(1+d) + \gamma d + \varepsilon$$

SMOOTH CHAIN LADDER

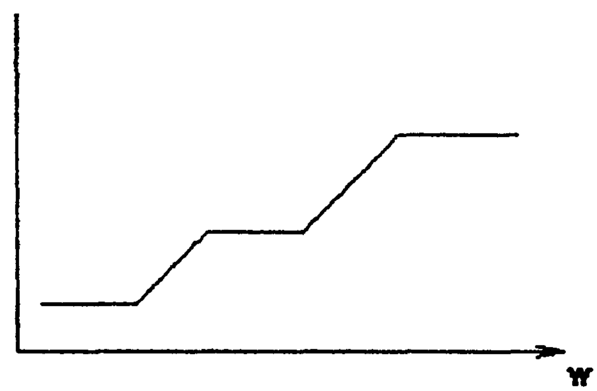
$$y(w,d) = \alpha(w) + \beta \log(1+d) + \gamma d + \varepsilon$$

ANY TRENDS IN LEVEL

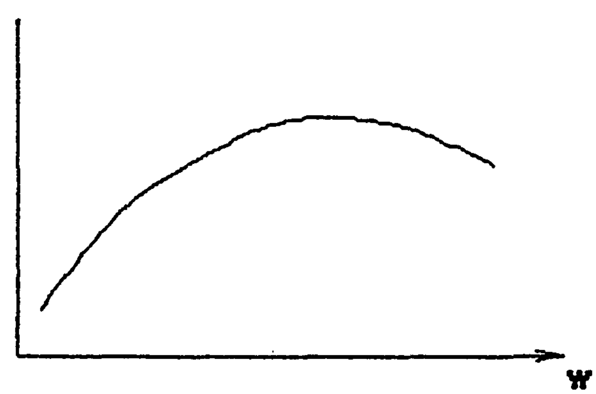
(i)



(ii)



(iii)



PRINCIPLE OF PARSIMONY

THIS IMPORTANT PRINCIPLE CAN BE ACCOMODATED RATHER NEATLY USING THE CONCEPT OF

VARYING PARAMETERS

THERE IS NO NEED TO HAVE A FREE α PARAMETER FOR EACH ACCIDENT YEAR AS IN SMOOTH CHAIN LADDER

IN PLACE

$$\alpha(w) = \alpha(w-1) + \delta \quad : \quad VAR[\delta] = \sigma_\delta^2$$

ANALOGOUS TO EXPONENTIAL SMOOTHING

APPENDIX B2

NON-CUMULATIVE PAID LOSSES
($ 000's)
DELAY

ACCI YEAR	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1968	2173	1988	967	1004	757	320	233	272	228	116	20	142	124	35	34	91	79	125	144
1969	2410	1851	1038	715	552	698	693	317	136	81	258	316	161	142	334	53	87	70	
1970	2234	1890	1232	779	550	576	433	472	289	261	422	395	284	487	56	87	28		
1971	1964	2316	1360	866	1424	665	63	204	362	270	544	199	313	289	113	187			
1972	2549	2675	1693	1918	729	364	350	576	474	233	277	155	176	106	52				
1973	2937	3215	2641	1207	1051	827	853	428	426	303	347	164	169	103					
1974	3256	2623	2093	1283	842	1195	801	533	532	416	338	215	190						
1975	3121	2770	2210	1834	1850	1552	1159	751	691	335	271	412							
1976	2828	3150	2477	3459	1910	801	902	784	771	575	38								
1977	3671	4109	6781	3586	2182	1122	1380	1034	1000	474									
1978	5387	9418	6875	3094	2985	2087	1556	1381	1382										
1979	10364	11870	7732	5630	3231	2340	2844	1851											
1980	11342	11513	8104	6398	5694	2479	3028												
1981	12730	11689	8237	6011	4653	4086													
1982	13229	12026	10584	6691	5065														
1983	12175	11486	8663	6851															
1984	12427	14932	8193																
1985	13728	13339																	
1986	10615																		

APPENDIX B4

ACCI YEAR	DEVELOPMENT FACTORS													
1972	2.049	1.324	1.277	1.082	1.038	1.035	1.056	1.044	1.021	1.024	1.013	1.015	1.009	1.004
1973	2.095	1.429	1.137	1.105	1.075	1.072	1.034	1.032	1.022	1.025	1.011	1.012	1.007	
1974	1.805	1.356	1.161	1.091	1.118	1.071	1.044	1.042	1.032	1.025	1.015	1.013		
1975	1.887	1.375	1.226	1.186	1.132	1.087	1.052	1.045	1.021	1.017	1.025			
1976	2.114	1.414	1.409	1.160	1.058	1.062	1.050	1.047	1.034	1.002				
1977	2.119	1.872	1.246	1.120	1.055	1.064	1.045	1.042	1.019					
1978	2.748	1.464	1.143	1.121	1.075	1.052	1.044	1.042						
1979	2.145	1.348	1.188	1.091	1.060	1.069	1.042							
1980	2.015	1.355	1.207	1.152	1.058	1.067								
1981	1.918	1.337	1.184	1.120	1.094									
1982	1.909	1.619	1.187	1.119										
1983	1.943	1.366	1.212											
1984	2.202	1.299												
1985	1.972													

WEIGHTED AVERAGE DEVELOPMENT FACTORS

2.046	1.386	1.201	1.122	1.073	1.065	1.045	1.042	1.024	1.017	1.017	1.013	1.008	1.004

```
          NORMALISED DATA VS. DELAY FROM 1972
780.+      M
    -
    -   N  2
    -   5  I
    -   2  2
586.+      2
    -         K
    -
    -         4
    -         3
391.+
    -   G        4
    -            J  I
    -      F        K
    -   F        F  J
196.+   4  3     2  2  J
    -   E  2  2  A  F  2  2
    -         3  D  2  G     H
    -            2  B  3  3  2  2
    -               2  3  4  5  5  3  B  D
  2.+                              3  4  3  3  2  A
     ---+--------+--------+--------+--------+--------+-----
       0.0      3.0      6.0      9.0     12.0     15.0
```

Figure 3.1

Table 3.1

REGRESSION FOR ACCIDENT YEARS 1972-1986

PARAMETER	ESTIMATE	ST. ERR OF ESTIM.	T-RATIO
ALPHA	6.040	0.1319	45.78
BETA	0.2828	0.1880	1.504
GAMMA	-0.3816	0.4036E-01	-9.454

S = 0.5684 S-SQUARED = 0.3231

R-SQUARED = 81.6 PERCENT N = 120

```
    STANDARDISED RESIDUALS VS. DELAY
 1.6+                    2     G
    -     3  K     I  J     H           D
    -  N  5  2  3  K           F
    -  7     5  2  J        G
    -              2  3  G  F  E  E        2
 0.3+           F        F     D  F  3     B  A
    -           2  F     D        C     C     B
    -              E  D     2  2     D  A        A
    -  G  F        D  2  2  A  B  2     B
    -        B  A        C  C     A
-1.0+  F  3  E  D
    -  C  2  3     B  2     B
    -  4        C
    -           B  2     A
    -
-2.3+                 A
    -
    -
    -
    -
-3.6+                                E
     ---+--------+--------+--------+--------+--------+-----
       0.0      3.0      6.0      9.0     12.0     15.0
```

Figure 3.2

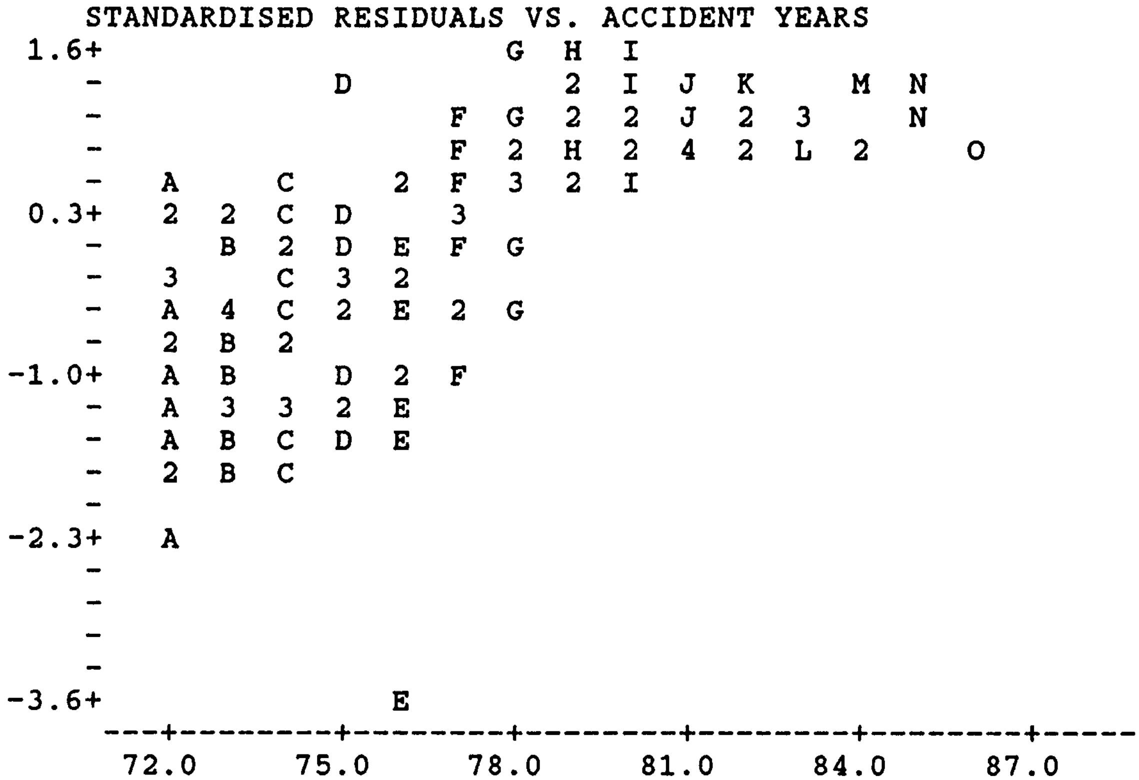


Figure 3.3

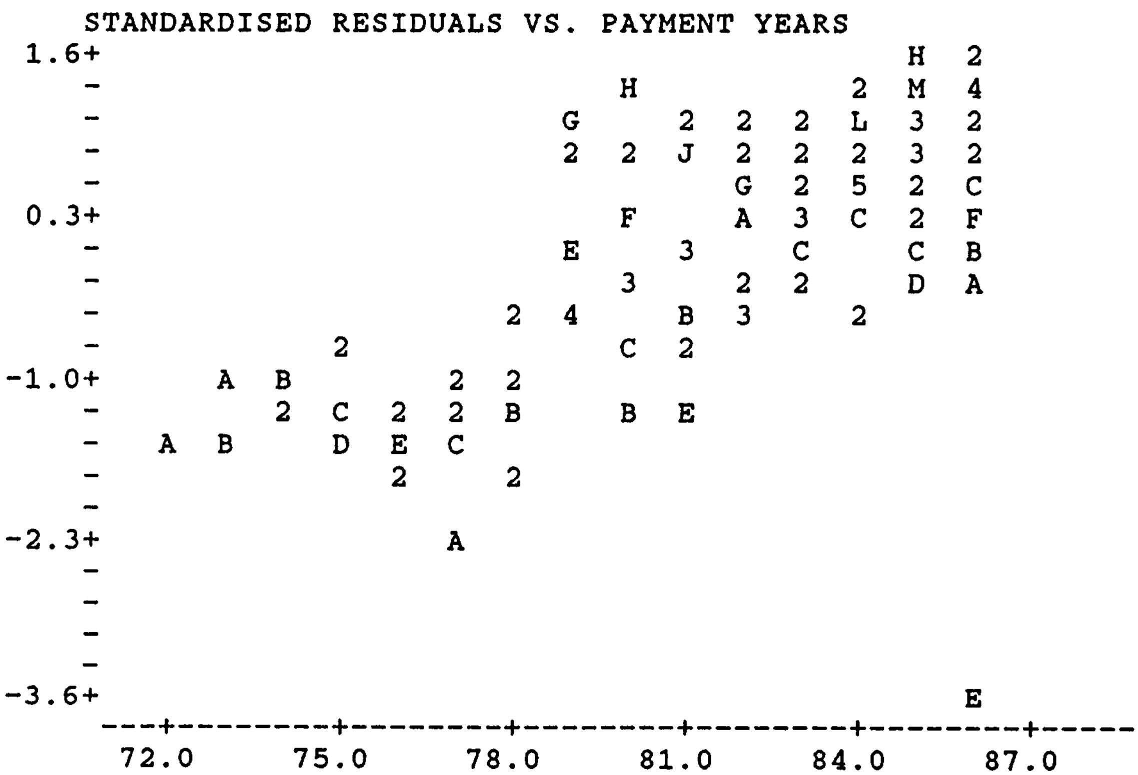


Figure 3.4

EXAMPLE 2

**** PROJECT wcom2n ****

Table 4.4

PARAMETER ESTIMATES

ACCI YEAR	ALPHA	S.E.	T-RATIO	BETA	S.E.	T-RATIO	GAMMA	S.E.	T-RATIO
1972	5.770	0.1492	38.67	0.000	0.0000	0.00	-0.294	0.0141	-20.87
1973	5.770	0.1474	39.14	0.000	0.0000	0.00	-0.294	0.0141	-20.87
1974	5.775	0.1473	39.20	0.000	0.0000	0.00	-0.294	0.0141	-20.87
1975	5.932	0.1481	40.06	0.000	0.0000	0.00	-0.294	0.0141	-20.87
1976	5.710	0.1383	41.30	0.000	0.0000	0.00	-0.294	0.0141	-20.87
1977	6.268	0.1294	48.45	0.000	0.0000	0.00	-0.294	0.0141	-20.87
1978	6.498	0.1214	53.54	0.000	0.0000	0.00	-0.294	0.0141	-20.87
1979	6.674	0.0681	98.06	0.000	0.0000	0.00	-0.294	0.0141	-20.87
1980	6.676	0.0646	103.35	0.000	0.0000	0.00	-0.294	0.0141	-20.87
1981	6.675	0.0631	105.86	0.000	0.0000	0.00	-0.294	0.0141	-20.87
1982	6.676	0.0632	105.70	0.000	0.0000	0.00	-0.294	0.0141	-20.87
1983	6.675	0.0648	103.05	0.000	0.0000	0.00	-0.294	0.0141	-20.87
1984	6.674	0.0678	98.43	0.000	0.0000	0.00	-0.294	0.0141	-20.87
1985	6.673	0.0720	92.63	0.000	0.0000	0.00	-0.294	0.0141	-20.87
1986	6.671	0.0771	86.49	0.000	0.0000	0.00	-0.294	0.0141	-20.87

ALL PARAMETERS ARE SIGNIFICANT

S = 0.2966 S-SQUARED = 0.0880 S-SQUARED(SC) = 0.1620

R-SQUARED = 95.9 PERCENT N = 92 P = 3.7

AIC = 41.17 AIC(SC) = 96.63

	ESTIMATED SUPERIMPOSED INFLATION (PERCENT)	STANDARD ERROR
1972-1986	146.22	35.36
ANNUAL	6.65	1.09

SIGMA-SQUARED (FUTURE) = 0.1400

EXAMPLE 2

Table 4.5

EXPECTED PAYMENTS/OBSERVED PAYMENTS — FORECAST MEAN PAYMENTS/STANDARD ERRORS

(PAYMENTS IN $1,000S)

YEAR																	
1972	E:								587	437	326	243	181	135	101	75	0
	O:								576	474	233	277	155	176	106	52	0
1973	E:							902	672	501	373	278	207	154	115	88	83
	O:							853	628	426	303	347	164	169	103	35	35
1974	E:						1230	916	682	508	379	282	210	157	120	90	210
	O:						1195	801	533	532	416	338	215	190	48	36	61
1975	E:					2015	1501	1118	833	621	463	345	257	197	147	110	453
	O:					1850	1206	1159	751	691	335	271	412	81	60	46	120
1976	E:				2106	1568	1168	870	649	484	360	269	206	153	115	85	559
	O:				3459	1910	801	902	784	771	575	38	94	63	48	36	136
1977	E:			4620	3441	2563	1910	1423	1061	791	590	451	337	251	187	140	1367
	O:			6399	3586	2182	1122	1380	1034	1000	474	185	139	104	79	59	315
1978	E:		8219	6121	4560	3397	2532	1887	1407	1049	803	599	447	334	249	186	2617
	O:		9418	6875	3094	2985	2087	1556	1381	1382	329	247	186	140	105	80	552
1979	E:	13771	10232	7643	5696	4245	3165	2360	1760	1347	1005	750	560	418	312	233	4626
	O:	10364	11570	7732	5630	3231	2340	2844	1851	541	407	306	231	175	132	100	953
1980	E:	14790	11017	8209	6117	4560	3399	2535	1940	1447	1080	806	602	449	335	250	6910
	O:	11342	11513	8104	6398	5694	2479	3028	772	590	437	329	248	188	142	108	1349
1981	E:	16206	12072	8995	6703	4997	3725	2851	2126	1586	1184	883	659	492	363	274	10424
	O:	12730	11689	8237	6011	4653	4086	1128	846	636	479	361	272	206	156	118	1947
1982	E:	16443	12249	9127	6802	5070	3880	2893	2158	1610	1201	896	669	500	373	279	14458
	O:	13229	12026	10594	6691	5065	1530	1146	860	647	487	367	277	209	153	120	2605
1983	E:	15338	11426	8514	6345	4855	3619	2699	2013	1502	1121	836	624	466	348	260	18343
	O:	12175	11456	8663	6851	1910	1429	1071	804	604	455	343	259	196	148	112	3211
1984	E:	15537	11335	8319	6746	5029	3749	2796	2085	1556	1161	866	647	483	361	269	25743
	O:	12427	14932	8193	2654	1953	1484	1112	835	628	473	356	269	203	154	117	4412
1985	E:	16015	11931	9125	6800	5069	3780	2819	2102	1568	1170	873	652	487	364	272	35031
	O:	13728	13339	3596	2682	2004	1499	1124	844	634	473	360	272	206	156	118	5932
1986	E:	13503	10325	7694	5734	4274	3187	2377	1773	1323	987	737	550	410	307	229	39905
	O:	10615	4234	3041	2268	1694	1268	950	713	536	404	305	230	174	132	100	6718
TOTALS PAY YRS			42934	31940	23748	17629	13086	9658	7068	5101	3621	2498	1657	1043	578	229	160790
STANDARD ERRS:			7030	5305	4030	3078	2363	1817	1395	1061	799	591	426	297	191	100	15541

EXAMPLE 2

Table 4.6

ACC. YEAR	EXPECTED	OBSERVED	DIFFERENCE	%ER	PMNT YEAR	EXPECTED	OBSERVED	DIFFERENCE	%ER
	(PAYMENTS IN $1000'S)					(PAYMENTS IN $1000's)			
72	2083	2048	-35	-1	72				
73	3202	2792	-410	-12	73				
74	4364	4221	-143	-3	74				
75	7152	6673	-479	-6	75				
76	7474	9239	1765	23	76				
77	16399	17177	778	4	77				
78	29172	28779	-393	-1	78				
79	48897	45862	-3035	-6	79	33449	34114	665	1
80	50627	48559	-2068	-4	80	39704	38492	-1212	-3
81	52698	47407	-5291	-10	81	45784	40400	-5384	-11
82	49692	47595	-2097	-4	82	50556	45523	-5031	-9
83	41624	39174	-2450	-5	83	53007	47928	-5079	-9
84	36541	35553	-988	-2	84	55387	52916	-2471	-4
85	27946	27068	-878	-3	85	57291	57709	418	0
86	13503	10615	-2888	-21	86	56201	55681	-520	0

```
    STANDARDISED RESIDUALS VS. DELAY
 1.9+            E              E  E     D
    -
    -      M  F     I           2     B     A
    -      3  2     E  J  2  E  D  C  2     2
    -      4  3  5  K  C  3  4  2        C     A
-0.2+   N     2  J  4     2  D           A     B
    -   6           H  2  G  C  B  2  D  B
    -   H        G     3           2              A
    -                  F     B
    -
-2.2+
    -
    -
    -
    -
-4.3+
    -
    -
    -
    -
-6.4+                                 E
     ---+--------+--------+--------+--------+--------+-----
       0.0      3.0      6.0      9.0     12.0     15.0
```

Figure 4.4

EXAMPLE 2

```
    STANDARDISED RESIDUALS VS. ACCIDENT YEARS
 1.9+            D  3
    -
    -   A  B           2  G     I           M
    -   A  B  3  D  2     2  2  I  J  K        N
    -   3     3  D  E  3  G  3  3  J  3  3
-0.2+   A  2  C  2     F  G        3        M  N
    -      3  C  2     F  2  H  I  J  K  L  M     O
    -   2        D  E     G  2  I
    -      B           F
    -
-2.2+
    -
    -
    -
    -
-4.3+
    -
    -
    -
    -
-6.4+               E
     ---+--------+--------+--------+--------+--------+-----
      72.0     75.0     78.0     81.0     84.0     87.0
```

Figure 4.5

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    STANDARDISED RESIDUALS VS. PAYMENT YEARS
 1.9+   E                        E    E    D
    -
    -   F                   B    2    2    G
    -   G    3         A    3    2    2    4
    -   2    2    3    5    3    2    5    3
-0.2+   2    C    F    2    2    J    2    2
    -        2    3    2    3    3    D    2
    -   H         3              2    I    A
    -        B         F
    -
-2.2+
    -
    -
    -
    -
-4.3+
    -
    -
    -
    -
-6.4+                                      E
     ---+---------+---------+---------+---------+---------+
      79.0      81.0      83.0      85.0      87.0      89.0
```

Figure 4.6

1987 CASUALTY LOSS RESERVE SEMINAR

4C - SPECIAL PURPOSE RESERVES

Moderator: Charles I. McClenahan, Partner
Coopers & Lybrand

Panel: Andrew P. Johnson, Chief Actuary
American Mutual Insurance Companies

Kim E. Piersol, Senior Manager
CNA Insurance Companies

Donald P. Skrodenis, Actuary
Allstate Insurance Company

Recorder: John Aquino, Associate Consultant
Coopers & Lybrand

CHARLES MCCLENAHAN: I am Charles McClenahan, your moderator. This is Session 4C - Special Purpose Reserves. This is the third Casualty Loss Reserve seminar in which I have participated in this particular panel. This afternoon we will talk about reserves for special purposes other than loss and loss adjustment expense reserves. Our three panelists are: Andy Johnson, who will talk on reserving for retro returns, Don Skrodenis, who will tell us about uncollectible reinsurance and how to assess reinsurer strength; and Kim Piersol, who will talk about guarantee fund assessment, reserving contingent commissions, and premium deficiency reserves. There will be a question and answer session after the presentations.

Andy Johnson is Assistant Vice President and Chief Actuary of the American Mutual Insurance Companies of Wakefield, Massachusetts. Andy has been with American Mutual for nearly one year. Prior to his association with American Mutual he worked with John Hancock; Aetna C&S, and Aetna Insurance Company.

ANDY JOHNSON: Reserving for retro returns, and that's a little bit of a misnomer because what we're really talking about is reserving for retro returns and additionals. I'm going to talk real briefly about retrospective rating and I recognize that will be kind of old drum for a lot of people here. But I'll spend about two minutes on that by way of introduction. I also want to talk briefly about what's the best documented method of reserving for retro returns which we'll refer to as the Fitzgibbon and Barry methods. Lastly, I want to talk about something that we tried at American Mutual which we call the inventory method for reserving for retros.

What is retrospective rating? Retrospective rating is when ultimate premium varies between previously agreed upon minimum and maximum values, according to the actual loss experience of the individual insured. I think we are all pretty familiar with the retro formula, so I won't dwell on that much. Here's one of my favorite things that I like to tell our underwriting people and sales people all the time. That retrospective rating is really a reallocation of the premium among insureds according to the loss experience, and we really ought to collect the same amount of premium and aggregate. That's in theory and that's before our sales people get a hold of it, so that theory and practice really meet in this instance. Under retro rating we're going to take a couple of looks at loss experience to determine what the premium ought to be at various points in time. Initially, we'll collect a deposit that ought to be something like the standard premium. And eighteen months after the policy inception, we'll look at losses and what we'll calculate what the premium ought to be according to the retro formula. We'll continue to do that every twelve months thereafter until the retro is closed and at that point we'll have our ultimate premium. We stop making retro adjustments either when all losses under the policy are closed, or if the insured and insurer both agree that it is time to stop calculating adjustments. It's important because of the nature of incurred loss development, we expect that the early adjustments will be return premiums because that's generally before losses have been reported. As losses develop in the later adjustments we expect to collect additional premiums. Our retro reserve will be the difference between those ultimate premium values and the premiums collected to date in any given point in time. I've sort of gone with the sign convention here that indicates a positive reserve where we would essentially add the earned premium, and a negative reserve where we reduce earned premium. There are differing accounting interpretations as to just what ought to be allowed for retro reserves. The most liberal of which we would permit a net reserve. That is we would look at both additionals and returns and we post a reserve for the net amount. Something that is a little more conservative--we'll make the same calculation but post the reserve only when the reserve is negative for a reduction in earned premium. The most conservative would require a reserve for returns only and permit no recognition of additional premiums to be collected. Naturally the fifty states are not of one mind on this and it is not really clear exactly how this is treated or what is permitted. It's kind of interesting to note that in the NAIC Zone Meeting in Pittsburgh, which starts Sunday and continues into the early part of next week, they're going to be discussing this very topic and begin to kind of lay the groundwork to form some sort of agreement.

We're going to cover two basic approaches. One of them is sort of the macro approach and that's something that I imagine most of us are familiar with, and I don't want to dwell on that for too long. The second approach is a micro approach or a policy by policy approach. The aggregate approach that Fitzgibbon and Barry have written about a basic change in terminology. And I describe the retro reserve in terms that are slightly different. In the Barry paper, Barry talks about deviations as being the difference between the ultimate premium and the standard premium, which would also be the sum of all of the retro adjustments. The reserve then is the difference between the ultimate deviations and the paid deviations to date at any given point in time.

The Fitzgibbon approach was a simple one. It was a lease squares fit between the ultimate deviation ratio, and that's the ratio of the ultimate deviations, and the ultimate loss ratio. That's done on a policy year by policy year basis. Clearly the expectation is that the higher the loss ratio, the more premium we expect to collect and vice versa. The formula that is determined is applied to ultimate loss ratios by policy year to determine the expected ultimate deviation ratio. We can go back to the prior formula of the ultimate deviation ratio times the standard premium would give us the ultimate deviation in dollars -- subtract the paid deviations to date and that would give us our reserve. Barry took this one step further and said that our expectation of the Fitzgibbon estimate is fine initially and essentially for the first twenty months of a given policy year is completely relied on the Fitzgibbon estimate. As we observed our behavior of our retro book, based on our observation we could adjust our estimate. And there are two components to that. He broke it into first adjustments are going to be estimated by taking the paid deviation ratio at any given point in time and multiplying it by the projection factor. The second and subsequent adjustments we would expect to be additionals. This is simply anticipating some additional loss development. If the loss projection factor or the loss development factor multiplied by the incurred loss ratio. These projection factors are going to be based on studying the historical behavior of the retro book. That's really the method in a nutshell.

The inventory method is not a complicated method. Occasionally I tell my boss that what you need to be an actuary is a keen sense of the obvious. You'll probably agree after seeing this that I do in fact have a keen sense of the obvious. Under the inventory method, we're going to estimate the ultimate losses for each individual policy. We'll calculate the retro premium based on the loss estimate and we'll sum the individual calculations to determine ultimate premiums, and thereby determine the reserve. In estimating ultimate losses we looked at three approaches. We looked at incurred loss development. We tried an expected loss ratio approach. And the hybrid of the two, the Bornhuetter-Ferguson approach. And in order to execute this we need to derive loss development factors. I want to talk about those in a little more detail in a second. We need expected loss ratios by policy year. Obviously we need incurred losses at the last adjustment. We need to recognize that in terms of the loss development there are a couple of possible distortions. One of them has to do with the loss limitation and the fact that if a loss limitation is purchased that losses above the limit will not enter the premium calculation. And the other is that it is entirely possible that losses will be reported after a retro closes. Those will not enter the premium calculation.

In terms of loss development factors, a couple of points. We're going to determine the loss development factors to be applied by adjustment period. That's the way we constructed our database so that when the last valuation of losses will be at the latest adjustment. All policies at their first adjustment will be valued at eighteen months, and we apply a development factor that was essentially eighteen months to ultimate. The second point is that in this micro approach accident year and policy year are the same thing, because we are going policy by policy. We are using accident year loss development.

Lastly, in terms of determining the actual loss development factors we certainly don't want to apply loss development to retros that are already closed. We need to keep that in mind as we determine the loss development factors. As we determine the factors we need to be mindful of the fact that we're applying them to the open policies only. If we were to construct a database of all of our retrospectively rated policies and studied the loss development on those, the ones that are closed early would have loss development of one after they have closed. And the ones that remained open would have some higher amount of loss development. The two combined would have the average loss development for the entire group. We need to be mindful of that fact and reflect that appropriately. Is that clear? It's kind of a confusing point. Actually what we needed to do at this point would be to build a database to rate the individual retrospectively rated policies. You can see that we have the basic parameters to go through that rating process. You can see it's really a simple method. It may not be a simplification of the process but based on our estimates of ultimate losses, we have three sets of those now. We have them for incurred loss development, and we have them for expected loss ratio, and Bornhuetter-Ferguson. We're going to calculate the ultimate premium for each policy and we're going to derive the reserve from that. One of the things that we did that was somewhat useful in terms of defining the universe of estimates was we determined what the reserve would be if every policy came in at minimum, and what the reserve would be if every policy came in at maximum. We approach the loss development maximums as separate techniques, so we determine and estimate using each loss development method for all policies. In other words, we determine an estimate using incurred loss development for all policies as well as the other two methods. That gives us the range of estimates and from there we needed to select an answer.

One final point -- particularly if we're going to use a liberal interpretation. That is we're going to take credit for additionals as well as the returned premiums. As we collect this additional premium there are some people who we still owe money to. We need to reflect the fact that we'll probably still pay some dividends. We need to pay our reinsurers and we need to pay premium taxes. There is also a possibility that we may want to collectability of the additionals as well. That's the method in a nutshell. This is our first time around on it so it is obviously at a very basic level. I think we probably need to do some work in terms of the estimation of the losses because that's clearly a critical element in this. In general, I think this method is fairly responsive to changes in your retro book. It's probably quite responsive to rate adequacy and it's very responsive to changes in case reserve adequacy, and I think it's a useful method.

C. MCCLENAHAN: Thank you Andy. Our next panelist is Don Skrodenis, who is Actuary and Director of Actuarial Services for Allstate Insurance Company. Don has worked for CNA and Armco.

DON SKRODENIS: I have been asked to present my thoughts on how to establish a reserve for uncollectable reinsurance recoverables; a growing problem in our industry today. David McNamara of the Insurance Services Office has been quoted as estimating the amount of the industry's uncollectable reinsurance at approximately $13.5 billion.

Reinsurance recoverables are growing in relation to net worth. At the end of 1979, reinsurance recoverables were $26 billion or 60 percent of surplus. By the end of 1985, reinsurance recoverables grew to $75.5 billion or 96 percent of surplus while this ratio for reinsurers was 113 percent.

Recently, Myron Picoult of Oppenheimer and Company studied twenty-three major insurers and found the aggregated reinsurance recoverables were 128.5 percent of statutory surplus. He also noted that this ratio varied widely by insurer and the type of insurance written, that is personal versus commercial.

An uncollectable reinsurance increases, the financial strength of the property and casualty industry appears to have deteriorated. Conning & Company published a study of the NAIC early warning system results for 1980 through 1985 for 252 P&C companies and 52 consolidated groups.

The Conning and Company findings were as follows:

In 1980, two percent of the companies failed five or more ratio tests. This deteriorated to twenty-three percent in 1985. The test most often failed during 1983, 1984, and 1985 was the two-year operating ratio. This was no surprise since the industry had operating losses in 1984 and 1985. Although the industry was profitable in 1986, one-hundred ten insurers recorded negative returns on net worth, and there were fifteen insurer insolvencies covered by state guaranty funds during that year. This year should be profitable for our industry. But the financial risk attributed to reinsurance recoverables still exists and we need to deal with the problem.

The National Association of Insurance Commissioners has taken steps to address this concern regarding non-recoverables. They have modified the Annual Statement Blank to provide disclosures on the status of reinsurance recoverables. Ceding companies must identify:

a. reinsurance receivership;

b. balances past due because of arbitration proceedings; or

c. balances 90 days past due.

Also, the Emerging Issues Working Group, who advises the NAIC, addressed the issue of how to account for uncollectable reinsurance balances due from insolvent companies. The working group recommended that uncollectable reinsurance balances be written off through the accounts in which they were originally recorded and thereby reverse the corresponding entries.

For our purpose of establishing a reserve for uncollectable reinsurance balances, the general method I will cover today includes the following basic four (4) elements:

1. Assess security;

2. project future recoverables or IBNR;

3. determine applicable offsets;

4. evaluate degree; how bad?

To identify possible distressed reinsurers, A.M. Best ratings and NAIC Early Warning System Ratios are studied for domestic companies. Similar ratios can also be calculated for foreign reinsurers. These financial ratios measure premiums to surplus, reserves to surplus, and retrocession recoverables to surplus to estimate the extent to which the reinsurer is leveraged or, if its balances are exposed to an excessive degree of risk. Obviously, the relative size of policyholder surplus greatly influences the results of these ratios, and represents the possible margin of error. Therefore, whether a reinsurer continuously produces operating profits is most imperative for strength.

In July 1987, the Government Accounting Office (GAO) published a report titled "Property/Casualty Insurer Insolvencies and State Guaranty Funds". The GAO cited five major reasons for the rise in insolvencies since the late 1970's. They were:

1. Underpriced premiums to generate investment funds;
2. inadequate reserves for losses;
3. reinsurance or collectability problems;
4. fraud and incompetence;
5. overexpansion.

Surely, all these reasons have affected the strength of our industry in the 1980's. For reinsurers, underreserving of long-tail lines has been crucial either directly or indirectly through retrocessions.

Historically, development or runoff of past reserves give us an indication of reserve adequacy. Obviously for domestic companies, the annual statement demonstrates this inadequacy. However, for new reinsurers with excess casualty business, many years of development is needed. Note changes in lines and layers of business or in quality of ceding companies can distort these measurements.

In addition to financial ratios, industry information regarding each reinsurer is gathered. We need to know whether the reinsurer demonstrates diligence in underwriting risks and competence in settling claims.

Additional questions we may ask ourselves are:

Who are my reinsurers' retrocessionaires?

How strong are the retrocessionaires?

To what extent is the reinsurer highly leveraged through them?

We need to remember in the case of an insolvency, retrocessional proceeds are a financial asset of the general estate and are not allocated to any specific underlying loss.

Another question debated:

> Is there strength derived from the parent, or from the existence of any guarantee from such parent?

Finally, what is the country of origin for the reinsurer? Government supervision and regulation differ by country and standards of solvency likewise differ. Also, reinsurance transactions require transfers of funds, so large currency fluctuations or restrictions on the free passage of the funds have detrimental effects.

The financial information may be obtained from annual reports, and balance sheets. Major reinsurance brokers prepare financial ratios for distribution to their clients. Obviously, A.M. Best reports are useful. For foreign companies, reports from either Insurance Solvency International, Ltd. or International Insurance Financial Services can be used. As you can see many aspects must be considered, several of which are not clearly apparent on a balance sheet in order to properly make a security assessment.

Now, the second element. How to determine future recoverables. For distressed organizations, all payables, receivables, and outstanding loss reserves are identified. IBNR reserves are projected using exposure units for premiums such as excess participation, and incurred loss for proportional participations. Other methods could be used but these will be covered in the Reinsurance Reserving portion of this seminar.

At this point one must determine any appropriate offsets. These are typically in the form of assumed accounts, retrospective premium accruals, letters of credit, or funds held.

Next, we attempt to evaluate to what degree a reinsurer is distressed. We ask ourselves:

> Are his booked liabilities understated by half of what they ultimately will develop?

What will be the preference among creditors if the reinsurer becomes insolvent? Under insurance solvency laws in most states, a reinsured's claims against the estate's assets are often subordinated to the claims of ordinary policyholders and guarantee funds.

Again, we ask ourselves:

When will creditors most likely be paid?

How fast will a distressed, but solvent company recognize and settle paid loss recoverables, or will the reinsurer demand volumes of loss documentation from the reinsured?

Will recourse to the courts or arbitration be necessary?

Is commutation likely, and at what discounted level?

I have now discussed the four critical areas in determining how and for whom a reinsurance recoverable reserve is established. The result is an uncollectable reinsurance recoverable reserve which will reflect the percentage ultimately uncollectible of the net balance, after any applicable offset for each specific reinsurer.

However, not all methods are foolproof. Although the uncollectable reserve is specific as to reinsurer, there exist shortfalls. Usually, this accrual will be set up only when some evidence is brought forth to identify a "troubled reinsurer". Unfortunately, in a typical case, several years have elapsed and the revenues associated with the business originally underwritten were booked in past years but the company is expensing for the associated uncollectable reinsurance in subsequent years. Obviously, these companies did not properly match revenues with expenses.

To overcome this timing problem, I would suggest that a mortality study of reinsurance companies could be performed. The reserve could be estimated by financial classification, which is annually assigned to reinsurers. For simplicity, we could assume no recoverable at the time a company enters liquidation. The probability of a company in a specific classification moving to another classification or liquidation would be measured. In a simple case, these probabilities could be assumed to remain constant through time. Therefore, by classification we could calculate the probability of entering liquidation. Applying these probabilities which vary with time to an expected payment schedule, the unrecoverable amount would be estimated. This would overcome the difficulties of assessing changes in economic cycles, strategic plans, or management.

Ultimately, we need to establish this reserve when the premium is ceded, no matter how we account for it. Only then, will we be able to quantify the benefit of strong reinsurance security.

In closing, here again is our moderator, Charles L. McClenahan.

C. MCCLENAHAN: Thank you Don. Last but certainly not least is Kim Piersol, who will talk on miscellaneous special purpose reserves. Kim is Senior Manager and Associate Actuary of the CNA Insurance Companies. Kim has worked for CNA, Cigna, and is now back at CNA.

KIM PIERSOL: As Don has pointed out uncollectible reinsurance is really a problem. I just spent the last two weeks with our legal department filing claim forms for the Mission liquidation. It's a very real exposure. Mission was one of our major reinsurers back in the late 70's and early 80's, and it was quite a task to go back there and try to reconstruct all of the reinsurance transactions that took place. What we ended up doing was submitting an IBNR claim for each policy year. Our legal people spent about two weeks filling out claim forms.

The first topic I would like to talk about is guarantee fund assessment reserves, which go hand in hand with the uncollectible reinsurance problem. A lot of the domestic companies who write primary business also write reinsurance, so you can have a double whammy effect if that's what you want to call it. As we know, guarantee funds have been established to kick in as a result of a liquidation or an insolvency to protect primary policyholders. This exposure can be quite large to an insurance company.

If you want to follow my handout, basically what happens when a company is liquidated is a liquidator is chosen, and he puts a freeze on the assets of the company. The liquidator has to determine what the true asset values are.

The ultimate liabilities of various classes of claimants have to be considered, any one which will trigger the guarantee fund if the assets aren't enough to cover these liabilities. You can see, Class 1 claims include the cost and expenses of administration, basically the cost of liquidating the company.

Class 2 claims are unpaid employee's wages less than $1,000. Class 3 claims are all claims under policies for direct losses incurred in subject premium lines, limited to $300,000 per claimant on non-workers' compensation coverages. Class 4 claims are claims on unearned premiums and premium refunds. Class 5 claims are claims of federal or any state or local government. Like I mentioned, if the assets are exhausted before all of the liabilities for the above five classes are satisfied, then the guarantee fund is triggered. The guarantee fund assessments are based on previous calendar year premiums limited to an annual maximum charge of premium for the insurer in the state. Assessments are only charged on subject premium.

I'd like to go over briefly some of the steps that you might want to go through to estimate what your exposure might be to a liquidation, or your exposure to the guarantee fund. This is a really difficult exercise in that you're working with very limited information. Basically what you have to do is for each company which is in liquidation or you think is about to go into a rehabilitation or liquidation, you more or less have to do your own independent valuation of their assets. Basically you're just working with annual statement, SEC Form 10-K, or Best reports, so it's real difficult from the outside to try and get a good feel for what's going on. However, you do know that if they're in a liquidation state they didn't run things too well.

The first step in estimating what your exposure will be for each company is to estimate what the industry assessment will be for the entire industry. And then later on we'll try to determine what our piece of the action is, as far as our individual company. By the way, these numbers are made up, so any similarity to Mission liquidation is purely coincidental. I recommend that you use at least three scenarios here to try and determine what the exposure is. I'll call them optimistic, realistic, and pessimistic.

Estimating the recoverables on the unpaid ceded reinsurance is really tough, because you're working with very limited information. You more or less have to do an analysis of the companies they ceded business to, and what kind of financial shape they are in. You can see in Exhibit A that by including the estimated recoverables of the unpaid ceded reinsurance, the estimated available assets vary quite a bit from $1 billion to $600 million.

Next, we have to evaluate the cost of the claims. The class one estimation is strictly what you think it will cost to liquidate the company, to run off the book, and run off the claims. Probably a good indicator there might be the unallocated expenses, because the primary claims still have to be settled. Class two claims are kind of insignificant when you get down to the bottom line. Class three claims are really difficult to estimate as you might imagine. I know a lot of companies perform peer company studies to see how their reserves relate in relation to their peers. Our company is no exception. However, most peer company reserve runoff tests are based on Schedule P type data, which is net data, net of reinsurance. However, these are direct losses we're talking about here. That becomes really difficult, and one of the major factors in determining what the ultimate liability will be is the reserve adequacy of the company that just was placed in liquidation. Class four claims you can more or less get off the statement. Class five claims in this exercise should be zero.

Now we've got three estimates here of what the gross industry assessment might be. You can see in Exhibit A that the estimates range from $1,270,000,000 under an optimistic scenario to a pessimistic $2.5 billion.

Now that we've zoomed right in to what the eventual industry assessment might be, let's compute what our individual company's share might be of that assessment. If we're working with a company that only wrote business in one state our job is pretty easy. However, in this case we'll assume that the company is a large domestic writer who writes in all fifty states. In Exhibit B we can categorize what the reserves are for the various affected lines on a direct basis by state. Like I said one of the key elements as far as projecting this number is concerned is our perception of the reserve adequacy of those numbers. You can see in our example we've adjusted the workers' compensation reserves upward by a factor of forty percent--GL by fifty-two percent, and our analysis show that our auto liability reserves were right in line with what the insolvent company should be carrying. We've adjusted the reserves by state to reflect that the total all lines needed reserves are $2,500,000,000. This is our estimate of what we feel are the eventual loss payments countrywide.

In Exhibit C we compute our company's market share by state. We can do this by comparing our company's premium to the total industry's premium for each state. We've taken out the non-subject lines premium and surplus lines premium which aren't subject to the assessment to obtain a total subject premium. In the case of Alabama, if our fictitious company wrote $25 million out of an industry total of $1,770,000,000, our share of the eventual assessment will be

1.41%. You can see this particular company writes heavily in Wisconsin so therefore their share of the Wisconsin assessment will be over three percent. There are limits depending on the state. What we do is is we go through each state and determine what the company's market share is for that particular state.

The next step is to determine in Exhibit D what the company's potential cost is. From Exhibit B you can see for Alabama we brought over a potential cost of $21.1 million. Our company's market share in Alabama based on Exhibit C is 1.41%. You can see we estimate our potential cost in Alabama to be--after we adjust for the assets that we feel recoverable. The modification factors on the bottom of Exhibit D correspond to the first exhibit where we took the total assets and subtracted the total liabilities, and whatever was excess would be available to pay claims. For Alabama the potential cost ranges from $151,000 to $295,000. The bottom line is, countrywide the affect is pretty staggering--$17.9 million to $35 million just in guarantee fund assessment.

Some of the problems associated with this estimate is the direct data that we use to estimate what the eventual cost is going to be isn't limited to $300,000. For non-workers' compensation lines the claims are cutoff at $300,000. There's a little bit of overestimation built in because of the limiting effect. This method also assumes that there is no surplus available in the guarantee funds to cover this liquidation, so this is a worst case scenario. Also, prospective rate relief as the result of the assessment is not considered. Needless to say, if we are overestimating the effect by a factor of two, it is still pretty significant. This exercise also indicates that if you have historically placed ceded reinsurance with this company that there isn't going to be anything left to pay your ceded recoverables.

The next topic I would like to discuss is contingent commission reserves. Contingent commissions are designed to give producers a bonus for increasing writings or writing profitable business. Since these commissions are prospective in nature they require that a reserve be established. This reserve is reported in line three of the liability, surplus, and other funds, page 3, of the annual statement.

When determining a method to be used in determining what your contingent commission will be, it's important that your method is equally as valuable in your planning process. These contingent commission arrangements can more or less be designed to fit your needs and at the same times provide an incentive for the agents that are representing you. As a result, I prefer using a method that instead of looking at aggregate data looks at detailed contract parameters and tries to estimate what the eventual contingent payment will be made. That way by varying the parameters that go into the contingent commission agreement, you can do a better job of planning and see how profitable the line is to our company, and at the same time determine an appropriate reserve.

Exhibit A is a made up typical agency compensation agreement. As you can see here the goal is to reward agents who not only write a lot of business but a lot of profitable business. There is no commission if the calendar year written premium is below $100,000, and there is no commission if the calendar year incurred loss and allocated loss adjustment expense ratio is above sixty percent. Basically what happens at the end of the year, the experience of a particular agent or broker is looked at and his incurred losses and premium volume is put into the formula and a contingent commission is generated, which goes back to the producer. In Exhibit A there's usually some kind of stop loss provision. That way if a particular agent has one or two large claims he still has a chance for a bonus. The table I've constructed does not include a provision for IBNR. There are various plans for which you can include an IBNR provision but once you start doing that you can see that by applying an IBNR to an individual agency, equity problems emerge. Everybody's agency is better that the other guy. There usually arises a lot of discussions about how to equitably allocate the IBNR. In this particular example we don't include IBNR, which means new agents are not eligible for this plan until they've been writing for at least three years. The reason for that is apparent. If an agent is writing a lot of commercial lines, his case basis incurred for the first year is going to be extremely low because most of the losses are reported after the year is over. After two or three years we'll start picking up those losses. We can see here too an agent will make out pretty well if he grows very rapidly on a long-tail line.

The method we use to compute what the reserves will be for contingent commission is a simulation model in which we go through each individual agent and try to project what his premium and losses will be at the end of the contract year. Running it through the table we can determine what the ultimate contingent commission will be. As you can imagine that requires collecting a lot of data on an individual agency basis. That is one of the key elements in building this model; we need an accurate history file of individual producers. You can go through and simulate results various ways by varying terms; simulate different loss ratios and premium estimates of the upcoming year. It's a dynamic model and you can take a look at your agent's performance bonus table and make changes and run the simulation through again to see what kind of effect that will have for the payout for the following year. It's very valuable in the planning process. Our company is on a calendar year agent's performance bonus basis, which means all contracts incept January 1st and terminates at the end of the year, and the calculation for the return is usually made in April or May of the following year. By year-end we've got a lot of information and we've got the experience by producer, so we have a pretty good feel for an accurate reserve by year-end.

The next topic is premium deficiency reserves. I heard two gentlemen walk in the room and pick up the handout and they said--that's the one that's always zero. I think the reason it's always zero is if you determine you a need a premium deficiency reserve you're admitting to everyone that you're writing unprofitable business. We don't want to do that. We're in business to make money. As you know we carry a liability on our annual statement for unearned premium reserve. However, most companies make a GAAP adjustment to recognize deferred acquisition costs. It doesn't make sense to recognize a deferred acquisition cost if it's apparent that the unearned premium reserve isn't enough to cover the deferred acquisition cost plus any subsequent losses which may incur above what was anticipated in the pricing. Therefore, the AICPA has concluded that a company should recognize premium deficiencies and to write off the deferred acquisition cost to the extent of the deficiencies and if there's still a deficiency left over you should carry a liability for the balance. One of the big controversies in computing what the premium deficiency reserve should be is the inclusion or exclusion of anticipated investment income. Unfortunately, for a long-tail company, if you do not include investment income in your calculation you're going to come up with a large premium deficiency. As a result the AICPA has concluded that a company should include future investment income in the premium deficiency calculation. That way companies who do write long-tail lines and do some cashflow underwriting might not be penalized. Basically what I did is just pull off the exhibits from an issues paper posted by AICPA on May 16, 1983. I think if you go through those you can sort of see the various methods used in computing what the premium deficiency reserve would be. I won't bore you and go through these exhibits, but they are there for your reference.

GUARANTEE FUND ASSESSMENT RESERVES

Guarantee Fund Procedures for Liquidations

The general sequence of events during a liquidation of an insurance company is as follows:

. A liquidator, who has 120 days to supply the bankruptcy court with a listing of assets, is chosen.

- In order to determine/preserve the asset values, within the first 120 days, the liquidator must place liens on all the existing assets and estimate the portion of the ceded unpaid reinsurance recoverables that will be collected on.

. After the total available assets (including reinsurance recoverables) are determined, the liquidator distributes the available assets in the following order:

- Class 1 - The costs and expenses of administration (e.g., the necessary costs of preserving or recovering the assets of the insurer, the liquidator's compensation, filing fees, attorney's fee and reasonable expenses of the guaranty association in handling claims).

- Class 2 - Unpaid employees' wages less than $1,000.

- Class 3 - All claims under policies for direct losses incurred on subject premium lines (see note below) limited to $300,000 per claimant on non-workers' compensation coverages.

- Class 4 - Claims for unearned premiums and premium refunds.

- Class 5 - Claims of the federal or any state or local government.

. If the assets are exhausted before all the liabilities for the above mentioned five classes are satisfied, then the guarantee fund is triggered.

. Note - Guarantee fund assessments are based on previous calendar year premiums limited to an annual maximum charge (usually 1% to 2% of premium for the insurer in the state) and assessments are only charged on subject premium (i.e., all lines except title, surety, disability, credit, mortgage guarantee and ocean marine in most states).

- Foreign companies licensed in the U.S. can be assessed.

Steps in Estimating Guarantee Fund Assessment Reserves

The steps in estimating a reserve level for future guarantee fund assessments are as follows:

. Estimate industry guarantee fund exposure for each company placed or estimated to be placed in liquidation (see Exhibit A).

- Assets - admitted assets. A subtraction can be made for anticipated uncollectible reinsurance recoverable on paid losses.

- Recoverables on Unpaid Ceded Reinsurance - Various methods and assumptions can be made in estimating this amount. It is suggested that more than one scenario be used, e.g., use optimistic, realistic, and pessimistic assumptions.

- Class 1 Expenses - Estimate cost of administration (including claims handling).

- Class 2 Claims - This class can be assumed to be zero or an assumption can be made that the company is one month in arrears on all of their employees wages.

- Class 3 Claims (See Exhibit B) - An estimation should be made of unpaid direct losses by state using whatever information is available. Carried reserve adequacy should be considered as this may be a major factor in determining the guarantee fund assessment reserve. Aggregate reserve adequacy assumptions can be estimated and used to determine needed reserves as a function of carried reserves (by state, across all accident years).

- Class 4 Claims - This is a rather straightforward estimate that can be based on the latest financial information.

- Class 5 Claims - An estimation can be determined from the convention statement.

. Estimate individual company potential cost.

- Market Share By State (See Exhibit C) - Compute market share by state. This market share, subject to annual maximum limitations by state, is the general factor used to determine a company's assessment by state.

- Company's Potential Cost (See Exhibit D) - The unpaid direct losses by state should be multiplied by the company's market share and adjusted by the optimistic, realistic, and pessimistic modification factor to determine the potential company cost. These modification factors are determined by taking the gross industry assessment and dividing by the Class 3 Claims (realistic) estimate.

. The sum of the estimated individual company potential cost for all known liquidations could constitute the guarantee fund assessment reserve for a particular company.

"Trickle Down Effect" of Insurance Company Liquidation

Individual companies could also be influenced by the effect this liquidation has on other companies (who ceded business to the insolvent company and assumed business from our company). Such companies stand to lose a portion of their surplus should the liquidated company not honor their reinsurance payables.

EXHIBIT A

ESTIMATED INDUSTRY GUARANTEE FUND EXPOSURE

($ IN 000,000'S)

	OPTIMISTIC	REALISTIC	PESSIMISTIC
ASSETS	500	500	300
ESTIMATED RECOVERABLES ON UNPAID CEDED REINSURANCE	700	500	300
ESTIMATED AVAILABLE ASSETS	1,200	1,000	600
CLASS 1	200	250	300
CLASS 2	0	1	2
CLASS 3 (EXHIBIT B)	2,250	2,500	2,750
CLASS 4	20	25	30
CLASS 5	0	0	0
GROSS INDUSTRY ASSESSMENT	1,270	1,776	2,482

EXHIBIT B

CLASS 3 CLAIMS

PROJECTED UNPAID DIRECT LOSSES (BY STATE)

($ IN 000,000'S)

	ADJUSTED, SUBJECT DIRECT LOSS RESERVES*				
STATE	W.C.	G.L.	A.L.	OTHER (SUBJECT)	TOTAL ALL LINES
ALABAMA	2.4	12.6	3.0	3.1	21.1
ALASKA	.4	5.1	2.7	1.7	9.9
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
WISCONSIN	1.6	18.1	4.4	.4	24.5
WYOMING	.2	2.0	5.1	.0	7.3
TOTAL U.S.	250.0	1,500.0	500.0	250.0	2,500.0

*ASSUMES NEEDED RESERVES ARE THE FOLLOWING MULTIPLES OF CARRIED RESERVES:

W.C. - 1.40

G.L. - 1.52

A.L. - 1.00

EXHIBIT C
COMPANY'S MARKET SHARE OF SUBJECT PREMIUM (BY STATE)
($ IN 000,000'S)

STATE	TOTAL PREMIUM ALL LINES/ALL COS		NON-SUBJECT LINES		SURPLUS LINES COMPANIES		TOTAL SUBJECT PREMIUM		COMPANY'S MARKET SHARE
	COMPANY	INDUSTRY*	COMPANY	INDUSTRY*	COMPANY	INDUSTRY*	COMPANY	INDUSTRY*	
ALABAMA	27.0	1,932.6	2.5	84.6	0.5	78.0	25.0	1,770.0	1.41%
ALASKA	8.5	589.8	1.3	28.4	0.0	36.6	7.2	524.8	1.37%
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
WISCONSIN	80.7	2,509.3	0.1	26.9	5.6	58.5	75.0	2,423.9	3.09%
WYOMING	4.6	264.0	0.3	13.8	0.0	6.0	4.3	244.2	1.76%

*EXCLUDING PREMIUM OF LIQUIDATED COMPANY

EXHIBIT D
COMPANY'S POTENTIAL COST OF INSOLVENCY
($ IN 000,000'S)

	EXHIBIT B ESTIMATED CLASS 3 CLAIMS	EXHIBIT C COMPANY'S MARKET SHARE	POTENTIAL COST OF INSOLVENCY*		
			OPTIMISTIC	REALISTIC	PESSIMISTIC
ALABAMA	21.1	1.41%	.151	.211	.295
ALASKA	9.9	1.37%	.069	.096	.135
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
WISCONSIN	24.5	3.09%	.385	.538	.752
WYOMING	7.3	1.76%	.065	.091	.128
	2,500.0		17.905	25.025	35.000

*MODIFICATION FACTORS

OPTIMISTIC - 1,270/2,500 = .508

REALISTIC - 1,776/2,500 = .710

PESSIMISTIC - 2,482/2,500 = .993

CONTINGENT COMMISSION RESERVES

The primary purpose of providing a commission "bonus" to a particular producer is to provide an incentive for the producer to increase writings, write profitable business, or a combination of the two. Other incentives might include retention goals or market plan compliance, but we shall assume a contingent commission contract based on the desire to increase writings in a profitable environment for the purpose of this exercise.

Unlike regular commissions that are "paid" immediately, these contracts are contingent in nature and therefore require a prospective reserve to be established. Reserves for such contracts are carried on line 3 of the liabilities, surplus and other funds page of the fire and casualty annual statement.

An effective reserving method for contingent commission reserves should be one that is equally effective for planning purposes since the terms of the actual agency compensation agreement can have a dramatic effect on the profitability of an insurance company. As a result, it is more important that the reserving method consider the detailed contract parameters than a method that just uses summary information. Not only do we feel more accurate reserves can be estimated, but the method can be used for planning purposes to test the effect contract parameters can have on the projected cost of the agency compensation agreement to the company and therefore affect the projected profitability of the particular line to the company. In this dynamic environment, we can assess the impact to ensure that company objectives are being maintained by the agency compensation agreements.

A typical agency compensation agreement can be found in Exhibit A. These agreements sometimes vary by line (e.g. personal vs. commercial). As you will note, the desire here is to increase the writing of profitable business, so there is no bonus for agents with premium volume under $150,000 or with loss ratios over 60%. There is also usually some sort of stop loss provision in determination of the loss ratio (e.g. occurrences limited to $100,000) so one large claim doesn't blow the producer out of the game.

Since IBNR is <u>not</u> included in the calendar year loss ratio, new agents are not eligible for the agreement until the third year of the plan. This is because case incurred loss ratios should be low for a new agent (especially in commercial lines) because of the lack of case incurred development on prior years in their loss ratio. Agreements can include IBNR in the calendar year loss ratio, but this usually leads to disputes as to how to equitably allocate IBNR to an individual agency. Since the table values can be changed to fit the company's overall goals, there is no real advantage to either including or excluding IBNR from the calculation. If included, the "fairness" of the IBNR provision must be wrestled with by company management.

One method of estimation that is appropriate for both reserving and planning purposes is a simulation model. One can observe in Exhibit A that the key variables in this model should be premium, loss ratio, and contract status of the individual producers. Provisions must also be made for new agencies entering or existing agents exiting the agency compensation agreement. The actual construction of the simulation model is beyond the scope of this presentation. However, I would like to briefly describe some of the input into the models.

One of the key elements in the projection is building an accurate history file of individual producers including premiums, losses, and contract status. By having this information, a projection of future effects can be made by simulating individual agency results, e.g. using a weighted regression based on premium. Parameters can be estimated by using overall premium growth and loss ratio projections for the particular line of business as a whole. Any number of simulations can be run by varying the error term by individual agency. An average of the simulations could be considered a best estimate.

As far as new producers are concerned, a projection should be made by the operations people as to the number of new agents expected for each agency compensation plan. A provision for new producers could be considered by a random draw of producers from the history file that are not now covered by the particular agency agreement, or some sort of weighted draw based on the producers premium volume in the line covered by the agency agreement.

For reserving purposes, the contingent commission reserve would be the estimate of ultimate contingent commission minus contingent commission paid to date. The ideal situation is to have all one-year contracts written on a calendar year basis with disbursement in April or May of the following year. The year-end projection can be made with almost a full year of actual history of individual producer results, so the model can be expected to give a pretty reliable year-end estimate of the payout for the following year.

This model is also ideal for planning purposes. Any or all of the profit bonus factors can be changed and run through the model to examine the effect on the eventual payout. In addition, projected loss ratio and premium growth estimates can be changed, providing management with valuable input into the decision-making process concerning the terms of the agency compensation agreement.

EXHIBIT A

AGENCY COMPENSATION AGREEMENT
PROFIT BONUS TABLE

CALENDAR YEAR WRITTEN PREMIUM ($ IN 000'S)	CALENDAR YEAR LOSS & ALLOCATED LOSS ADJUSTMENT EXPENSE RATIO						
	10%	10-20%	20-30%	30-40%	40-50%	50-60%	60%
	PROFIT BONUS FACTORS EXPRESSED IN PERCENTAGES						
0-100	0	0	0	0	0	0	0
100-250	3.2	2.5	1.9	1.5	1.1	0.4	0
250-500	3.9	3.0	2.3	1.9	1.4	0.5	0
500-1,000	4.8	3.7	2.8	2.3	1.7	0.6	0
1,000-2,500	5.9	4.6	3.5	2.8	2.0	0.7	0
2,500-5,000	7.1	5.0	4.2	3.3	2.4	0.8	0
5,000 or More	8.7	6.7	5.1	4.0	2.9	0.9	0

PREMIUM DEFICIENCY RESERVES

Definition

An insurance company carries an unearned premium reserve on its statutory statement as a liability for the unexpired term of all policies in force. Because of the immediate statutory charge off of certain expenses associated with the writing of the unexpired policies, companies will make a GAAP adjustment recognizing deferred acquisition costs in their income statement and therefore making a recognition for this equity in the unearned premium reserve.

It is apparent that making a GAAP adjustment recognizing deferred acquisition costs makes no sense if the unearned premium reserve is inadequate to cover all losses and expenses for the unexpired term of the policy. As a result, a premium deficiency occurs when future premium is insufficient to cover future losses, loss expenses, policy servicing expenses, and unamortized acquisition costs.

Determination of Premium Deficiencies

Premium deficiencies should be determined by reasonable grouping of business consistent with a company's manner of acquiring, servicing, and measuring profitability of its insurance products. Once it has been determined that a particular grouping contains a premium deficiency, deferred policy acquisition costs are written-off to the extent of the deficiency and, if necessary, a liability is established to cover the amount of the premium deficiency in excess of the deduction in deferred acquisition costs.

Anticipated Investment Income

Unless anticipated investment income is recognized in the premium deficiency calculation, long-tail lines that are usually priced on a discounted basis (such as professional liability) will almost always generate a premium deficiency. As a result, the inclusion or exclusion of anticipated investment income in the premium deficiency projection is subject to the same arguments as recognition of future investment income on loss reserves. However, there is some attempt to argue for recognizing investment income in premium deficiency projections but not in loss reserves. Investment income in the premium deficiency projection relates to <u>actual</u> funds available for investment on particular loss contracts, while the discounting of loss reserve concept imputes investment income on funds that may not necessarily have been generated by those particular contracts.

In an issues paper dated May 16, 1983, the American Institute of Certified Public Accounts (AICPA) concluded that the time value of money should be considered in the computation of premium deficiencies. A complete review of the paper is an excellent source of information on this topic. For the purposes of this discussion, I would like to review briefly the AICPA recommended method for computing premium deficiency.

Premium Deficiency Test-Expected Investment Income Methodology

1. Contracts should be grouped consistent with the manner of acquiring, servicing, and measuring the profitability of the contracts.

2. The amount of investment income to be used should be the future earnings expected to be generated from the investment of net cash available from in-force premiums (as opposed to only the unexpired term). Accordingly, the period over which the investment income will be realized is the entire period of claim settlement.

3. See Exhibit A

4. One of the problems associated with this methoc as recommended by the AICPA is that if the cumulative cash balances turn negative, (loss contracts) negative investment income (i.e. lost opportunity cost) is considered and illogical results are produced. In this situation, a longer claim payment tail will increase the amount of premium deficiency even though later payments would be better from an economic viewpoint.

Premium Deficiency Test-Discounting Methodology

An alternative method of computing premium deficiency reserves can be found in Exhibit B (recognizing only unexpired term) and Exhibit C (recognizing in-force). A comparison of the results obtained in considering the entire in-force book indicates that the difference in income from operations results from discounting the cumulative profits (see Exhibit D).

Financial Statement Presentation

If a premium deficiency (as defined above) is recognized to exist, the premium deficiency should first be recognized by charging any unamortized acquisition costs to expense to the extent required to eliminate the deficiency. If the premium deficiency is greater than unamortized acquisition costs, a liability should be accrued for the excess deficiency.

EXHIBIT A-1

ANTICIPATED EXPERIENCE ON GROUP OF IN-FORCE POLICIES

($ IN 000'S)

	EARNED ON UNEXPIRED	UNEARNED	IN-FORCE
PREMIUM	182,000	168,000	350,000
EXPECTED LOSS AND LOSS EXPENSE RATIO	78%	78%	78%
EXPECTED LOSS AND LOSS EXPENSE	141,960	131,040	273,000

EXHIBIT A-2
COMPUTATION OF EXPECTED INVESTMENT INCOME

YEAR	CASH OPENING BALANCE	PREMIUMS RECEIVED	UNDERWRITING COSTS PAID	CLAIMS	MAINTENANCE COSTS	CASH ENDING BALANCE BEFORE INVESTMENT INCOME	CASH AVERAGE BALANCE	INVESTMENT INCOME
			30.16%		.83%			(7.0%)
1981	-	350,000	(105,581)	(45,427)	-	198,992	99,496	6,965
1982	205,957	-	-	(81,682)	(1,046)	123,229	164,593	11,522
1983	134,751	-	-	(57,985)	(742)	76,024	105,388	7,377
1984	83,401	-	-	(36,691)	(469)	46,241	64,821	4,537
1985	50,778	-	-	(27,082)	(347)	23,349	37,064	2,594
1986	25,943	-	-	(17,581)	(228)	8,134	17,038	1,193
1987	9,327	-	-	(6,552)	(87)	2,688	6,008	421
		350,000	**(105,581)**	**(273,000)**	**(2,919)**			**34,609**
					EXPECTED INVESTMENT INCOME (1982-1987)			**27,644**

ASSUMPTIONS

(1) INSURANCE CONTRACTS ARE ISSUED AND PREMIUMS ARE COLLECTED EVENLY THROUGHOUT THE YEAR AND UNDERWRITING COSTS ARE INCURRED AND PAID AS PREMIUMS ARE COLLECTED.

(2) CLAIMS ARE PAID EVENLY THROUGHOUT THE YEAR.

(3) MAINTENANCE COSTS ARE .83% OF PREMIUMS AND ARE PAID IN THE SAME PATTERN AS CLAIMS.

(4) INVESTMENT INCOME IS EARNED ON AVERAGE ASSETS AND IS REINVESTED.

(5) HISTORICAL YIELD IS 5.5%; HOWEVER, THE EXPECTED YIELD WHICH GIVES CONSIDERATION TO THE HISTORICAL YIELD, NET CASH INVESTED AT NEW MONEY RATES AND ANTICIPATED REINVESTMENT RATES, IS 7.0%.

EXHIBIT A-3
PREMIUM DEFICIENCY TEST
USING EXPECTED INVESTMENT INCOME
AS OF DECEMBER 31, 1981
(PROFITABLE CONTRACTS)

Unearned premiums at December 31, 1981		$168,000
Less Expected Costs (Undiscounted):		
Claims and Claim Adjustment Expenses (see A-1)	$131,040	
Maintenance Costs (see A-2)	2,919	
Amortization of Policy Acquisition Costs (25% of unearned premiums)	42,000	
		175,959
Premium Deficiency Before Expected Investment Income		(7,959)
Expected Investment Income (see A-2)		27,644
Excess of Income over Costs		**$19,685**

EXHIBIT B-1

COMPUTATION OF PRESENT VALUE (DISCOUNTING) OF CLAIMS AND MAINTENANCE COSTS TO BE INCURRED

PAYMENT YEAR	CLAIMS RELATED TO 1982 EARNED PREMIUM	MAINTENANCE COSTS	TOTAL CLAIMS AND MAINTENANCE COSTS	PRESENT VALUE INTEREST FACTOR	PRESENT VALUE OF CLAIMS AND MAINTENANCE COSTS
1982	41,933	1,046	42,979	.96500000	41,475
1983	36,691	742	37,433	.90186915	33,760
1984	19,656	469	20,125	.84286837	16,963
1985	15,725	347	16,072	.78772744	12,660
1986	10,483	228	10,711	.73619387	7,885
1987	6,552	87	6,639	.68803160	4,568
	131,040	**2,919**	**133,959**		**117,311**

Explanation

This exhibit calculates the present value as of December 31, 1981 of claim payments (and maintenance costs) for expected claims. Assumptions, including a 7%, compounded annually, interest rate, are the same as in Exhibit A. The present value factor used is the average of the beginning of the year and the end of the year factors to adjust for the payment of claims and maintenance costs evenly throughout the year.

EXHIBIT B-2
PREMIUM DEFICIENCY TEST
USING DISCOUNTED CLAIMS AND MAINTENANCE COSTS TO BE INCURRED
AS OF DECEMBER 31, 1981

Unearned Premiums at December 31, 1981		$168,000
Less Expected Costs:		
Present Value of Claims and Maintenance Costs To Be Incurred (see B-1)	$117,311	
Amortization of Policy Acquisition Costs (25% of unearned premiums)	42,000	159,311
Excess of Income over Costs		**$ 8,689**

EXHIBIT C-1
COMPUTATION OF PRESENT VALUE (DISCOUNTING)
OF ALL UNPAID CLAIMS AND MAINTENANCE COSTS

PAYMENT YEAR	CLAIMS TO BE PAID	MAINTENANCE COSTS	TOTAL CLAIMS AND MAINTENANCE COSTS	PRESENT VALUE INTEREST FACTOR	PRESENT VALUE OF CLAIMS AND MAINTENANCE COSTS
1982	81,682	1,046	82,728	.96500000	79,833
1983	57,985	742	58,727	.90186915	52,964
1984	36,691	469	37,160	.84286837	31,321
1985	27,082	347	27,429	.78772744	21,606
1986	17,581	228	17,809	.73619387	13,111
1987	6,552	87	6,639	.68803160	4,568
	227,573	2,919	230,492		203,403

Less claim liability recorded at December 31, 1981:		
Claims related to 1981 earned premium	141,960	
Less - Claims paid in 1981	45,427	96,533
		106,870

Explanation

This exhibit calculates the present value of payments to be made for all claims and maintenance costs subsequent to December 31, 1981. Assumptions, including a 7%, compounded annually, interest rate, are the same as in Exhibit A. The present value amount is then compared to the recorded claim liability (the ultimate unpaid claim costs on the expired portion of the contract). The difference represents (a) the discount on incurred claims, plus (b) the discounted amount (present value) of expected claims and maintenance costs to be incurred subsequent to December 31, 1981. The present value factor used is the average of the beginning of the year and the end of the year factors to adjust for the payment of claims and maintenance costs evenly throughout the year.

EXHIBIT C-2
PREMIUM DEFICIENCY TEST
USING DISCOUNTED UNPAID CLAIMS AND MAINTENANCE COSTS
AS OF DECEMBER 31, 1981

Unearned Premiums at December 31, 1981		$168,000
Less Expected Costs:		
Present Value of Claims and Maintenance Costs Net of Recorded Liability (see C-1)	$106,870	
Amortization of Policy Acquisition Costs (25% of unearned premiums)	42,000	
		148,870
Excess		**$ 19,130**

EXHIBIT D
COMPARISON OF
EXPECTED INVESTMENT INCOME AND DISCOUNTING METHODS
AS OF INCEPTION OF CONTRACTS FOR
PROFITABLE CONTRACTS

	EXPECTED INVESTMENT INCOME METHOD	DISCOUNTING METHOD
Premiums	$350,000	$337,749
Claims	273,000	231,527
Policy acquisition costs	87,500	84,437
Other underwriting expenses	18,081	17,448
Maintenance costs	2,919	2,406
	381,500	335,818
Income (loss) from underwriting	(31,500)	1,931
Investment income	34,609	-
Excess of income over costs	$ 3,109	$ 1,931

Explanation

The above compares the results of a premium deficiency computation for the entire group of policies under the anticipated investment income approach (Exhibit A) versus the discounting approach (Exhibit C). The difference in income from operations results from discounting the cumulative profits.

C. MCCLENAHAN: Before we open it up for questions from the audience I have a couple of questions for the audience. How many people here are responsible for all or part of the loss reserving at their company as opposed to consultants? Of those, how many companies carry reserves for unrecoverable reinsurance? How many companies carry a guarantee fund assessment reserve? How about a contingent commission reserve? How many companies don't have enough in their loss reserves to worry about these other things? I want to think these gentlemen for covering five very complicated subjects in a very short period and open it up for questions from the floor?

[QUESTION]

C. MCCLENAHAN: The question is a company is not insolvent can we book a reserve from recoverable reinsurance?

I'm not going to speak for the AICPA, the problem is we need that reserve from recoverable reinsurance. Is it determinable is your question -- it might be matching revenues and expenses but their is a question about determinable. I think on the basis we can show from past history through the study that we can calculate that there is a probability that there is a need for that reserve. If you don't set up the reserve there is a solvency question. There is a question for short-term benefits like buying cheap reinsurance. There are questions regarding -- it looks like cheap reinsurance but in the long run even if a company goes insolvent it might be well worth the purpose in the analysis. As far as making determinable that's a question. The problem that we have is that as long as we're booking that through a reserve number -- and I personally would rather treat it as a separate calculation for a reserve. On a statutory basis where backing all of the entries in because of uncollectible reinsurance, we take an extreme case, maybe we have a line of business as a tail of five years. On a gross basis before reinsurance, and then you're cutting down to have a more homogenous grouping on a net basis after excess reinsurance and you'll end up with a ten-year tail, because you're backing those entries out and they're coming up in your Schedule P developments as loss reserve deficiencies. My opinion is that both of those items should be separated when the calculation is made and hopefully to the extent of showing the recoverable at the front end. If you turn your question around -- can you also show that all that reinsurance that you're showing as recoverable is indeed 100% recoverable. That's how I would attack the problem.

[COMMENT, INAUDIBLE]

The emerging issue is coming through and the annual statement is coming out and they're saying that for insolvent companies they're spreading it out. They're not even saying insolvent companies. If you've got a line of business or an exclusion on a reinsurance contract and you've been showing that you've been ceding those losses and now there is an arbitration with that reinsurer to the extent that you maybe should never have shown a recoverable in the first place, that's coming up -- that's being part of it. They're even going as far as saying if there is a current account that's past due ninety days, there's a long lag in reinsurance and there might be recoverables on companies that have always paid -- maybe slowly but have always paid -- but may not have paid within ninety days -- going through the broker market or on an international basis.

[QUESTION]

C. MCCLENAHAN: The question involves the inventory method of retro reserving, and the question as I understand it was how do you use the inventory method in those states which do not allow netting of retro additionals against retro returns?.

A. JOHNSON: That's a good question and a very difficult one to answer because I think we're really still dealing in unchartered waters for the time being. We're working in the state of Massachusetts to be able to book for what we have a reserve. How the other states are going to treat it, as I mentioned there is no consistency on this. I don't know when to expect that there would be consistency.

[COMMENT, INAUDIBLE]

A. JOHNSON: The methods will certainly give a couple of answers. One method may in fact support the contentions of the other. The accounting questions have yet to be resolved, the merits of the methods notwithstanding.

C. MCCLENAHAN: Any other questions? Well please join me in thanking these three people for a very enlightening presentation.

RESERVING FOR RETRO RETURNS

CASUALTY LOSS RESERVE SEMINAR

SESSION 4C

SEPTEMBER 10, 1987

Andrew P. Johnson
Assistant Vice President &
Chief Actuary
American Mutual Companies

RETROSPECTIVE RATING

* Ultimate Premium varies between previously agreed upon minimum and maximum values according to actual loss experience of individual insured

* Retro Formula:

$$\text{Retrospective Premium} = \left(\text{Basic Premium} + \text{Converted Losses} + \text{Excess Loss Premium}\right) \times \text{Tax Multiplier}$$

Subject to Minimum, Maximum Values

* E (Retrospective Premium) = Standard Premium - Premium Discount

RETRO ADJUSTMENTS

1st Adjustment: $R_{18} = (B + CL_{18} + E) \times TM$

2nd Adjustment: $R_{30} = (B + CL_{30} + E) \times TM$

3rd Adjustment: $R_{42} = (B + CL_{42} + E) \times TM$

. .

. .

. .

Final Adjustment: $R_{ult} = (B + CL_{ult} + E) \times TM$

* Retros close when
  - All losses closed; or
  - Insured, insurer agree to close

* Impact of case incurred loss development
  - Early adjustments: Returns
  - Later adjustments: Additionals

RETRO RESERVE

* Retro Reserve = Ultimate Premium - Premium Collected to Date

* Accounting Interpretations

  - Permit reserve for net amount of retro additionals and returns

  - Permit net reserve only when anticipated returns exceed anticipated additionals

  - Require "returns only" reserve

DETERMINATION OF RETRO RESERVE

2 Basic Approaches

* Aggregate (Macro)

  Fitzgibbon/Berry

* Inventory (Micro)

DETERMINATION OF RETRO RESERVE

AGGREGATE METHOD

(FITZGIBBON/BERRY)

*	Ultimate Deviations	=	Ultimate Premium - Standard Premium
		=	Sum of all retro adjustments
*	Retro Reserve	=	Ultimate deviations - paid deviations

DETERMINATION OF RETRO RESERVE

AGGREGATE METHOD

(FITZGIBBON/BERRY)

* Fitzgibbon

  - Least squares fit between ultimate deviation ratio and ultimate loss ratio

  - Formula applied to ultimate loss ratio by year to determine expected ultimate deviation ratio

* Berry

  - Fitzgibbon estimate (DR1)

    - 100% weight months 1 - 20

    - Decreasing to 0% at month 60

  - Complement (DR2)

    - 1st adjustments = paid deviation ratio x deviation projection factor

    - 2nd+ adjustments = loss projection factor x incurred loss ratio

    - Projection factors based on historical data

DETERMINATION OF RETRO RESERVE

INVENTORY METHOD

- Estimate ultimate losses for each individual policy
- Calculate ultimate retro premium for each individual policy
- Sum to determine total reserve

ESTIMATION OF ULTIMATE LOSSES

Three Approaches

- Case incurred loss development
- Expected loss ratio
- Bornhuetter - Ferguson

Need

- Loss development factors
- Expected loss ratio by policy year
- Case incurred losses (last adjustment)

Potential Distortions

- Loss limitation impact
- Losses reported after retro closes

ULTIMATE RETRO PREMIUM CALCULATION

INVENTORY METHOD

- Database For Retro Policies

  Line of Business
  Effective/Expiration Dates
  Latest Valuation Date
  Standard Premium
  Basic Premium
  Minimum Premium
  Maximum Premium
  Case Incurred Losses (limited)
  Excess Loss Premium
  Tax Multiplier
  Premium Collected to Date

- Based on estimated ultimate losses, calculate expected ultimate retro premium for each policy

- Range of Estimates

  Contractual Minimum

  Incurred Loss Development
  Bornhuetter - Ferguson
  Expected Loss Ratio

  Contractual Maximum

NET RESERVE CALCULATION

Ultimate Premium

\- Premium Collected to Date

Gross Reserve

Gross Reserve

\- Dividends, Reinsurance & Taxes

Net Reserve

1987 CASUALTY LOSS RESERVE SEMINAR

4D - REINSURANCE RESERVING III

Moderator: Allan M. Kaufman, Consulting Actuary
Milliman & Robertson, Inc.

Panel: Abbe Bensimon, Asst. Vice President
General Reinsurance Corporation

Spencer M. Gluck, Vice President & Actuary
Kramer Capital Consultants, Inc.

Frank Wilkinson, General Partner
E. W. Blanch & Company

Recorder: Malkie Mayer, Consultant

ALLAN KAUFMAN: When I was asked to moderate this session I was asked to help select the topics that might be covered. In order to do that I made a trip to Disney World. What I did there was to survey a sample of reinsurance actuaries. Fortunately there were a number of reinsurance actuaries there at the Casualty Actuarial Society meeting. Donald Duck and Mickey Mouse did not have any suggestions for this topic to be covered by this panel. What we plan to cover are two general areas. Our first topic will be financial reinsurance products. The second general area is reinsurance pricing and the reinsurance cycle. I'll introduce the panelists to you. They'll make their presentations and then we'll take questions after they have all completed their sessions. Abbe Bensimon our first speaker will discuss tax oriented financial reinsurance products. Abbe is an Assistant Vice President at General Reinsurance Corporation in their underwriting department. In that capacity she has been in the front line in developing and analyzing treaties with various degrees of risk for General Re clients. Abbe is a fellow of the Casualty Actuarial Society and a member of the American Academy of Actuaries. Our second speaker on the topic of using pricing information in reinsurance reserving is Spencer Gluck. Spencer is Chief Actuary and Senior Vice President at Kramer Capital Corporation. Prior to joining Kramer Capital Corporation, Spencer worked at Peat Marwick Mitchell & Co., in insurance services office. He has significant experience in dealing with loss reserving and other issues for insurers and reinsurers. Spencer is a fellow of the Casualty Actuarial Society, and a member of the American Academy of Actuaries. Our last speaker Frank Wilkinson will discuss the reinsurance underwriting cycle from his perspective as General Partner of E. W. Blanch & Company. E. W. Blanch is an international reinsurance intermediary. In addition to his other responsibilities the actuarial service unit and the reinsurance financial information unit report to Frank. We'll begin our discussion with Abbe.

ABBE BENSIMON: Financial reinsurance has developed into an increasingly sophisticated array of products, ever since the quota share coverage was discovered as the way to retrieve the equity in the unearned premium reserve. It behooves ceding companies and reinsurance alike to understand what financial products are currently out there; how they help in coping with new tax law; and how they are viewed by outside interests. In order to have the best opportunity for success in our ever changing industry, these are the areas I will explore with you today. My comments on financial reinsurance products will for the most part take on the viewpoint of the ceding company. The reinsurer might or might not want to market a financial treaty based on its balance sheet. The true catalyst in effecting a mutually successful transaction must be the ceding company. It is the cedent who views its perspective income statements and balance sheets and determines whether improvement on them could and should be made. The cedent has a far more active interest in entering into the financial treaty than the reinsurer. For the reinsurer the prime motivators in entering into a financial treaty are volume, profits, and possible tax advantages. Without further ado let's begin at the beginning.

Just what defines a financial reinsurance product? Here I've written the risk transfer of the agreement is subordinate to the goal of eliciting surplus income and tax benefits for the ceding company. Let's focus on the key points of this definition. First, risk transfer -- in order for the agreement or treaty to be viewed as insurance and hence be accorded appropriate statutory gap and tax consideration, risk transfer must exist to some extent. Second, subordinate -- the primary interest into entering such an agreement is not one of risk transfer. Therefore, protection must be in place in that agreement to ensure against too much of it from taking place. That is, the agreement should define the extent of risk transfer. Three, eliciting income and surplus benefits. Financial reinsurance releases the untapped potential in an insurance company's balance sheet, which exists as a result of conservative booking practices. A financial product within the codified rules dictated by the NAIC, FASB, and the IRS can draw out or elicit some of that unkept income in surplus.

Financial reinsurance has been around for a while but has been given a recent shot in the arm by the new tax law. Revived interest in these treaties can be specifically pinpointed to:

1. Sources of capital drying up for both stock and mutual companies. Competition once again is rearing its ugly head, plus the new tax law will be gauging at least $7 billion dollars from the industry over the next five years. Perhaps, for these reasons investors are not that excited over the insurance industry's prospects and this interest has shown itself in their valuation of stock insurance companies in the marketplace. For stock insurance companies according to Business Insurance, the stock market over the past year had a lackluster zero percent growth as compared with the S&P 500 which exhibited 39% growth. Investors don't seem as willing to put their capital in the insurance industry. Mutual companies don't even have the luxury of tapping the investing public. Short of restructuring, the mutual whose results have been mixed need capital infusions. Financial products are a legitimate alternative in the acquisition of additional surplus.

2. The new tax law now taxes the discount in the loss reserves and the equity in the unearned premium reserve. The introduction of this new taxable income is eased in slowly to prevent undue hardship on insurance companies financial by means of two provisions -- fresh start and amortizing the equity in the 12/86 unearned premium reserve over six years. Thee provisions while benefiting the existing company do almost nothing for the start-up company. The new tax law could be crippling to the start-up by holding back income and subsequent build up of capital without providing the mechanism for relief.

3. The regular tax rate goes from 40% in 1987 to 34% in 1988. To minimize taxes paid, the cedent might want to speed up deductions and delay income. This effect can be achieved as a by product of financial reinsurance.

4. In good years some companies find it advantageous to strengthen their IBNR reserves because they can afford it, plus, they would have once received the added benefit of being able to deduct these reserves dollar for dollar in the computation of their taxes paid. The discounting of a company's loss reserves under the new tax law allows a smaller deduction relative to the increased reserves, and there is a greater chance of the IRS going after the company for overreserving. Financial reinsurance might create a more tax effective way to achieve the same result of banking for a rainy day.

5. The alternative minimum tax rate is 20% and the regular tax rate after 1987 is 34%. If a company finds itself in the position of being one type of taxpayer one year, and predicts it will be another type in the future, minimization of taxes paid can be achieved by channeling deductions in the higher tax rate year and income in the lower tax rate year. Financial products can be effective in this regard as a sophisticated tax planning tool.

Financial products come in three flavors. The most common ones take on one of three forms: quota share covers; loss portfolios; and catastrophe funding covers. All of you I'm sure are familiar with the quota share cover. A quota share cover transfers a portion of the cedent's unearned premium reserve to the reinsurer with the reinsurer paying the cedent at the time of transfer a commission in line with the equity contained in the unearned premium reserve. This transaction allows the cedent to speed up the realization in the equity of the equity in the unearned premium reserve so statutory income is boosted and consequently surplus so the financial balance sheet looks healthier. The next few sheets in your handout elaborate on the mechanics of the quota share cover, and I'm just going to go right through them like that. Let's go to loss portfolios.

Another financial product which gained the limelight when interest rates were at an all time high is the loss portfolio. In a loss portfolio agreement the reinsurer agrees to assume the cedent's reserves on contractually designated claims for payment equal to the discounted value of those reserves plus a fee. By entering into a loss portfolio the cedent is enabled to release into current earnings the future investment income expected to be generated by these ceded reserves. Most portfolios on existing reserves will probably become a thing of the past. Some reasons for this are:

1. The cedent's typical underestimation of transfer reserves which made these covers unprofitable to reinsurers.

2. A reinsurer would not be able to deduct assumed reserves dollar for dollar in the calculation of taxes under the new law. The reinsurer loses significant tax advantages it once had into entering a loss portfolio agreement.

3. After tax investment rates are smaller due to current low yields, and the new tax law taxing tax exempts.

4. As a result of abuses on the part of a number of insurance companies and the significant short-term earnings distortions that occur, the insurance departments no longer recognize surplus generated from loss portfolios as being the same as the company's other surplus. The new found surplus is segregated on the company's annual statement.

A new type of loss portfolio coming into vogue is the prospective loss portfolio. In such a cover the reinsurer agrees to cover cedent's future losses in excess of a certain loss ratio at a reduced premium, in anticipation of receiving future investment income. The discount on the premium can be quite high depending on the reinsurer's attachment point and the lines of business involved. In addition, maximum investment income can be earned on an after-tax basis if the reinsurance is placed offshore in a tax haven. The prospective loss portfolio does not immediately impact income in surplus. Its effects are only felt after the subject premium is earned and losses from them are incurred.

While the greatest weakness of the standard loss portfolio is the mandated segregation of new found surplus, herein lies the strength of the prospective loss portfolio. The prospective loss portfolio requires no special disclosures beyond what develops on Schedule F since it is viewed as a standard reinsurance treaty. Since losses expected to be transferred exceed premiums ceded onto the treaty, surplus benefits will develop on both the statutory and gap basis. Further advantage emerges in the improvement of the premium to surplus ratio.

A numerical on this slide illustrates the operation of the prospective loss portfolio. The reinsurer prices the 35% excess 65% cover at 15%. It is anticipated that the 15% premium when earning investment income offshore, will accumulate a pot large enough to pay the 35% when the liability becomes due. In this example, the premium to surplus ratio is reduced by 50%, and the expected loss ratio drops 24 points. The greatest risk to the reinsurer in this transaction is that the 35% becomes payable faster than anticipated.

Another type of financial reinsurance that is gaining popularity is the catastrophe funding cover. In its operation the cedent would pay premium over time to the reinsurer in the expectation of drawing down the accumulation of total premium plus generated investment income when the covered loss requires payment. How does this cover differ from a typical property catastrophe cover, or casualty contingent cover? Since the agreement is done with the financial rather than risk transfer objective, the cumulative collected premium is similar in magnitude to the cumulative reinsurance provided in the treaty. In a typical risk transfer catastrophe agreement, the reinsurance limits would be far greater than the reinsurance premium received. Put another way, the reinsurer expects to realize a profit on this one cover, not just on average over all the covers it writes, as would be the expectation on its nonfinancial cat-covers where risk transfer is the main objective, although this average profit should be higher because the reinsurer assumes greater risk. If the expected losses from this financial catastrophe funding cover do not materialize as originally expected, then attachment points could be lowered in future years to bring the coverage in line with the price.

The other key difference is the line of business that makes such a cover suitable. Except for the first one -- property catastrophes; latant injuries, hard to place lines such as extra contractual obligations; directors and officers; and pollution; plus an overall combined ratio cover would not be willingly written in your run-of-the- mill catastrophe cover.

The appeal of catastrophe funding covers for the cedent is the deductibility of premiums and the possibility of maximizing investment income on these premiums when the session is done offshore. The effect is not unsimilar to an IRA where deductible contributions earn tax sheltered investment income. The contributions and investment income only get taxed when the account is tapped for withdrawal. The possible insurance company looking to bank profits for future lean years might find the catastrophe funding cover an effective tax planning an effective tax planning device, while at the same time the way to get around difficulties in securing insurance for its own unwanted exposures.

A company is an alternative minimum taxpayer, if the alternative minimum tax exceeds the regular tax calculation. The alternative minimum tax is a penalty tax, because it throws into its calculation adjustments called preference items that would not be subject to tax in the regular tax formula. Because the regular tax rate of 40% or 34% is higher than the alternate minimum rate at 20%, maximization of after-tax income can be achieved by either boosting taxable income if one finds oneself with a higher alternative minimum tax, or reducing taxable income if the regular tax is higher. Implementation of this strategy ultimately converges the regular tax and alternate minimum tax calculation. Put another way, deductions should be emphasized in years where the higher regular tax rate prevails and taxable income should be sought when facing the ultimate minimum rate of 20%. Let's look at each financial reinsurance product in its ability to achieve desirable tax savings results in the face of the new tax law.

The quota share coverage continues to be an effective financial tool in improving an insurance company's statutory balance sheet. The new tax law's impact on the quota share cover depends on the reinsurer's commission to the cedent due to revenue offset. Revenue offset is a provision of the new tax law which adds 20% of the change in the unearned premium reserve to taxable income. Because a quota share decreases the cedent's unearned premium reserve, revenue offset decreases taxable income by 20% of the unearned premium reserve session. Whatever the reinsurer pays in commission increases taxable income. As a result, if the reinsurance commission is 20% of the unearned premium reserve, then regular taxable income is not accelerated at all if you compare it with regular taxable income had the quota share not taken place. If the reinsurer's commission is greater than 20%, the regular taxable income is sped up, a strategy that benefits the alternate minimum taxpayer. Conversely, if the reinsurer's commission is less than twenty percent, then taxable income is slowed down favoring the regular taxpayer. Since the reinsurance commission generally exceeds twenty percent in a quota share cover, quota shares will be more effective from a tax standpoint for the alternate minimum taxpayer.

The new tax law has marginal impact on a past or prospective's loss portfolio's effectiveness in strengthening the balance sheet. The reinsurer in its assumption of the ceded reserves would now only be able to deduct its discounted value and not its nominal value in its calculation of taxes. This loss of benefit can be easily circumvented by ceding the loss portfolio offshore. The comments I made before on past loss portfolios still apply. It is the second class treatment of loss portfolio generated surplus that is turning the standard loss portfolio into a dinosaur.

The new tax law and this year's overall insurance industry profits should cause a great interest in the catastrophe funding cover. In profitable years, and if no net operating losses exist, presumably the insurance company will be a regular taxpayer. Premiums ceded under the treaty will be tax deductible at the regular tax rate. In the catastrophic year, when the cedent might be an alternative minimum taxpayer, losses recovered under the treaty will be boosted at the 20% alternate minimum rate. The tax effectiveness of this cover this year will be further enhanced by the higher regular tax rate of 40%. Tax deductions from the 1987 premium paid under the treaty will have that much more value.

Another transaction that slows down current taxable income is the reassumption of reinsured losses through commutation. If an insurance company for some reason, like a disagreement on reinsurance pricing, or severing the reinsurance relationship, wants to take back responsibility for the reserves a reinsurer holds under a treaty between the two of them, the reinsurer to relinquish its liability, gives the company a payment equal to the discounted value of the reassumed reserves. This transaction effectively slows down statutory income for the insurance company because it assumes undiscounted losses for a discounted payment by the reinsurer. Taxable income is less impacted because of the discount in deducting losses. But generally, the reinsurers payment is less than the discounted losses in the tax calculation, so taxable income will still be decreased by such a transaction.

A financial product must have risk. If it does not then its existence won't be recognized by some outside party, even those for whom the insurance company is entering into the agreement in the first place. A strict banking arrangement that contains insufficient risk will be collapsed by the state insurance departments, the company's accountants, or the IRS. If it appears to exist for tax avoidance alone, the IRS will collapse it. Under Section 845 of the Internal Revenue Code, the IRS might even collapse 1/2 of the deal. While there's yet to be an example of this sort of thing happening, this would conceivably allow the IRS to win on both sides of the transaction. These threats are all the more intimidating because the rule book hasn't yet been published on what defines sufficient risk.

In closing I would like to summarize the main points of this discussion on financial products. Depending on which type of financial products -- quota shares, loss portfolios, or catastrophe funding covers is selected, and how it is designed, Statutory gap and taxable income in surplus can be increased or decreased. Positive taxable income is sought by the alternative minimum taxpayer -- negative taxable income is sought by regular taxpayer. The use of offshore tax havens can create a mismatched tax and income effect on cedent and reinsurer. The cedent could book premium deductions as a result of entering into a catastrophe funding cover, but the tax haven reinsurer would not have to pay taxes on that premium income. The prospective loss portfolios create income for the cedent, but the reinsurer does not have the corresponding loss because it carries discounted reserves on its book. Offshore tax havens is reinsurers in financial products can be advantageously to maximize profits and minimize taxes within the rules of the game. But in order for these benefits to be reaped, the existence of risk transfer is vital.

The last point I'd like to touch upon will hopefully prevent any one of you from making the accusation that I haven't once mentioned loss reserving in my discussion in this session of reinsurance reserving. With all the balance sheet manipulations taking place as a result of financial reinsurance, it is quite obvious that untouched loss reserving triangles can be an absolute horror show. All the financial products I've described either reduce the premium percentage-wise far greater than the IBNR should be reduced, or increased loss payments will decrease reserves or show no payments at all while decreasing reserves. The point is financial reinsurance could make prior statistics on loss reserve developments; incurred loss ratios; and paid loss ratios absolutely useless. These statistics can't predict the future because the future's course has been changed as a result of entering into such a financial product. The only way to restore the usefulness and bring credibility into the IBNR reserving methodology is to build up the triangles and premiums as if the financial reinsurance does not take place at all. Once that is done set the IBNR reserves and after the fact, reduce the IBNR as it would be affected by the financial reinsurance.

SPENCER GLUCK: The subject of my talk is going to be using pricing information in the reinsurance reserving process. It's going to be a talk which basically is about reserving. It's going to throw up some relatively simple actuarial methods. First I'll talk about why it's important to use pricing information in the reinsurance reserving process. I'll show some relatively simple techniques for incorporating the pricing information at the reserving process. Finally, we'll talk about the hard part which actually is measuring pricing information in some way that is useful.

[SLIDE 1]

Let's first talk about why. You have a simple application of typical loss development. The data is not exactly real but it's loosely based on a true story. The line of business you're looking at is a mixed casualty excess business. It's got some auto and some other types of GL. Many of you have worked with triangles of these kinds. If you'll look at the development factors to ultimate, in Column 3, you would have to call this long-tailed excess reinsurance. However, it's not that long of a tail. I'm sure many of you have seen much longer ones. What's wrong with this method? What's wrong with just doing it the standard way? The hardest part of course is getting that development factor to ultimate column. Many reinsurance companies haven't been in existence long enough or don't have long enough data, or the data may be erratic, and you'll have to supplement with some industry sources. I don't want to dwell on that point too long because I haven't come up with any alternatives. So let us say that whether you're doing what it says here or what I'm going to say later, somehow you're going to come up with a loss development pattern. I'm not going to give you any additional help in doing that.

The big problem here is -- let's look at that 1986 number. We've got a development factor to ultimate of 10.6, and as I said this is only a moderately long-tailed excess reinsurance. Any time you multiply a number by 10.6, you don't get a very good projection --3.86%, the one before, is a little bit better but it's not that much better. When you're working with a very large development factor you're going to get very erratic results-- unstable, unreliable. That's pretty much the big reason why straight loss development is not a great technique in and of itself for very long tail lines. Let's move on to the most commonly used alternative.

[SLIDE 2]

Here is what we usually call the Bornhuetter-Ferguson method. The part of its name is a bit of a misnomer, in my opinion, is method. Just to run through it very quickly if there's anybody who's unfamiliar with it, Column 4, which says portion of ultimate unreported is just the exact same information as the loss development factors you saw on the previous sheet. You come up with IBNR by multiplying the portion unreported by the expected losses in Column 3. The reason I say method is a bit of a misnomer is that very simple idea on which the paper is based, a very good idea and it would be just a terrific technique if you new what the expected losses were. If you knew what the expected losses were before you started, then all actuarial work would be a very simple technique and we would mostly be out of jobs. Usually the way people use the Bornhuetter-Ferguson technique is they get to expected losses by taking the premiums in Column 1 and they multiply them by a prior loss ratio, or an expected loss ratio. The question in the whole technique is where does that come from? As a matter of fact that's the most important thing in the calculation. The rest of the calculation is relatively simple. The ones you see up there are not the ones you'll typically see -- usually you'll see round numbers. You'll notice that those aren't round numbers but that's because I didn't want to make an extra slide. In the remaining slides we're going to do some calculations to determine that column or to calculate that column using pricing information.

In the Bornhuetter-Ferguson technique, when you just leave it like that, and you don't talk about where the expected loss ratios come from, it can be severely abused and it is frequently severely abused. It's so subjective that it gives an air that a calculation has been done when really an answer has been made up, and I've seen it used that way many times. I say that if you can't tell me in specific terms where your a priori loss ratios came from, if you just say well they were my general judgment, then that's what your answer is. It's a general judgment and it's not calculated at all. I'd like to advocate that we calculate that column. Whether we can do that very well though, you'll have to see as we go on.

[SLIDE 3]

In the next session I'm going to talk about using pricing information to help us get the a priori loss ratio column. We can hop onto the next page now. The main form that I'm going to put into that pricing information is the one that you see in Column 2 -- loss ratio index. This technique which I've used to calculate it has been called the "Cape Cod Technique" in a lot of the literature. I haven't the vagueness idea where that name comes from, but I didn't make it up. Just running through the technique, the loss ratio index in Column 2 is only a relative measure. I don't presume to know in advance of looking at the loss data what the loss ratio is going to come out to be. By looking at trends in pricing information and creating a price index, I've done some analysis and this is based on changes in prices offset against inflation and other factors. This is how I expect the loss ratio to change year-to-year, and I have for purposes of convenience, set the 1986 value equal to one. It's only an index and it only counts in it's relative value. Combining Columns 1 and 2 to get Column 3, I have what is going to be my exposure base in this calculation. This is my supposedly unbiased predictor of what the ultimate losses will come out to be. In column 4, the portion of ultimate reported, we're still looking at that same loss development pattern. That's the reciprocal of the development factors to ultimate. Column 5, for a lack of a better name I have called the reported exposure base. And you can see it's the exposure base in Column 3 times the percentage of reported. We'll just consider that an intermediate step in the calculations for the moment. Column 6, losses incurred through 12/86 -- that's just the current reported incurred losses. Column 7 -- projected current adequacy loss ratio is six divided by five. You'll notice here that if I had multiplied Column 6 times the development factor to ultimate, and divided by the premiums in Column 3, that would have given me the exact same results you'll see in Column 7 in all respects but one, and the only difference is on the total number on the bottom. The total number on the bottom is the total of Column 6 divided by the total of Column 5, and that's the number we're really going to use from this calculation. What we've done is relative to our loss exposure ratio -- the exposure in this case is premiums at current rate adequacy based on a weighted average of all the years combined. The weights are based on the volume of losses reported to date or correspondingly, the exposure times the percentage reported. We're giving more weight to an older more developed year, in which we have better confidence in our projection of ultimate losses.

Finally in Column 8, we just take that total result 1.086, and that becomes the 1986 result, and we multiply that by the loss ratio index, and that gives me the a priori loss ratios which I've used on that Bornhuetter-Ferguson page, so those were not arbitrary assumptions any more. What we've really done here is rather than figuring out from some outside source like what the underwriter told us -- that we had some great knowledge in advance what the loss ratio would be. We assemble pricing information to see how the loss ratio changed year-to-year, and then we're using the experience of all the years combined to project the expected loss ratio for each year. What we have here is a stabilizing technique. For those of you who have the handout, if you look at the comparison of the first two pages you will see what effect this had. And I have to confess that I monkeyed with the numbers to make it have a bigger effect than it really did. In this particular example we have a significant increase in the estimate of ultimate losses comparing Column 7 on the Bornhuetter-Ferguson page to Column 4 on the development page. I've got a $4.3 million increase in the projection. What caused this, if you'll look back to the development page, is that we've got very low loss ratios projected by the development method for 1985 and 1986 -- lower than we would have expected them to be from a look at the pricing information. Basically, this method gives a little more weight to the older years and a trended forward version of the older years in projecting the later years. You can do the same thing on a very informal basis with the Bornhuetter-Ferguson method. For example, projecting out by development methods the older years -- looking at your changes in pricing, and thereby just using the Bornhuetter-Ferguson method on the last couple of years. But to do that you still have to try and draw an arbitrary line. These years and older are stable enough to use development. These years and newer are not. This is a much more natural way to accomplish the same thing, that weighted average is really based on how much information's ultimate projected loss ratio uses. All of this is just relatively easy calculations, it's how do you come up with that loss ratio index -- that's the hardest part of all.

How do we measure relative rate adequacy? Let me talk first about the major considerations that I looked at.

1. Whether reinsurance rates changed?

2. If we assume those reinsurance rates were stated as a percentage of primary premiums, as they normally are, what is the primary rate adequacy been like.

3. The leveraged effect of inflation.

To those unfamiliar with the term, inflation in the reinsurance layers will run at a higher rate than inflation in a lower layers. So even if primary rate adequacy is maintained constantly throughout the period. And we took the same reinsurance percentage of that throughout the period, we would have decreasing rate adequacy at the reinsurance level. Just to show you the factors that I've used to get to this particular loss ratio index.

[SLIDE 4]

Here I've just laid out the factors I've used for each of those columns. A primary loss ratio index -- that's to measure the rate adequacy at the primary level. The excess rate index-- that's a measure of the actual reinsurance rates that were charged. The leveraged effect of inflation thrown in there at a completely arbitrary 4% per year. Column 4 is calculated from Column 1 divided by Column 2 and multiply it by Column 3, and that creates your excess loss ratio index. Now I have to go back another step and say what did I do or what are the alternatives for doing each of these pieces.

Let's talk about the excess rate index first -- that's the most work. That's the type of information that's the hardest to get. There's no published industry statistics that I've ever seen on excess rates, and even within your own company, it's difficult information to compile. You have changes and limits in retention over the years. I haven't seen many companies that try and compile that in any kind of summarized format. Actuaries I've known work on the reinsurance pricing side for an individual contract will have that kind of information. But to try and put together an overall rate adequacy index for the company for a line of business at the company to use in a reserve analysis, is not something I've seen done too often but I've tried to do it a couple of times. I guess the best of all possible worlds was well, if all of that rate information on every treaty you write is in your computer somewhere, that somehow maybe you can tap into it. But if you can't you can always take a sample. Our first consideration is whether a sample is enough. The particular index I use was only based on about thirty casualty excess treaties from a particular company. It didn't represent more than twenty-five percent of the total database. The answer is -- statistically speaking it's too much variance to say that's a reliable sample. On the other hand the markets do tend to move together. It may be a reasonably good indicator. Even a sample from one company may be a reasonably good indicator of another company to the extent that the market moves together.

How do you deal with changes in limits in retention? What I did for my sample is, first I only picked treaties that they were on for five or six years. I was looking at about a nine year data history that I had to create this index for. Frequently at some point in the five or six year period that they were on a treaty there was a modest change in the limit retention. There I used a model -- I think it was a log normal model. In this case pareto distributions are sometimes used, or you could use increased limit factors as a more empirical distribution. If the changes in limit retention are not really large, it's not going to be all that sensitive. You might almost break it and consider them as new treaties.

A practical consideration -- what about the fact that most of the contracts are not in force through the nine year period. I have to create a nine year index. What I've done there is I had to do a lot of calendar year to calendar year comparisons. If I'm comparing 1985 average rates to 1984 average rates, I averaged the 1985 rates only for those contracts which were also in effect for 1984. I average the 1984 rates only for those contracts which were also in effect for 1985 and compare the two to get a change in rates for those two years. That was a more complicated process than you might think. When you laid all the treaties out to deal with treaties dropping in and out of the database. Again, if there is a big enough change in limit and retention of the treaty it is probably best treated as a new treaty, rather than making it based on a model or an increased limits factor adjustment for the difference in limits and retention. That is in effect what we did to create the excess rate index. It is simple a matter of averaging a sample of rates, and I'll talk a little more at the end again about the issue of a sample -- about the necessary imperfection in this process and whether it's my opinion that it's still worth doing, even though it's obviously imperfect.

Moving back to column one, the primary loss ratio index. There was no way that this or most companies monitor rate adequacy for the particular companies that were insured. Rather we just pulled some Best data on primary companies, and noted what loss ratios they were reporting. I think we used a thirty percent auto liability -- seventy percent general liability rate, which was roughly equivalent to what we felt was in the reinsurance book that we were looking at. Just looked at the actual reported loss ratios in combined industry Schedule Ps. This was a little out of date, that was at the end of 1985 -- that is what we had available. We artificially bumped the '85 numbers a little bit figuring that industry reserves were probably deficient at that time and that was mostly going to hit the '85 accident year harder than other accident years. The 10% difference between '86 and '85 was a judgment that was thrown out at that time before the '86 data was in.

Leveraged effective inflation -- well there are more theoretically perfect ways of doing that than making it up at 4% a year, to the extent that you have increased limit factors; loss variations; theoretical loss distributions available, obviously that is something that can be measured but it will vary by limited retention -- it's a complicated factor. We did look at that, and in fact, in creating the excess rate index where we already had to make adjustments for changes in limits and retention, I considered as one step and in one process building that in as well. Basically, most of the theoretical distributions I've looked at seem to suggest that the leveraged effective inflation rate in many of these layers may well be higher than 4% a year. I think that was a little optimistic--4% a year. We put all of this together and we have a somewhat imperfect excess loss ratio index. But if you look at the values of that index, it's not highly at odds with what you might think just by observing the industry. It's probably if anything, I was expecting it to come out a little more severe in the difference between the good and bad years in the cycle. But I peaked out in 1983 and 1984, and pretty bad in 1982. All of these things are probably no surprise to anybody who was in the industry. This is based on one company -- it was a small company but they weren't small contracts, only small participation in larger contracts that were around the industry. This particular index might well be reasonably indicative of a large number of reinsurance companies. That takes you through the entire process I went through in doing these calculations. I would like to see more reinsurance companies more carefully monitoring on a company-wide basis overall rate adequacy. As we can see, even with a big company, if the development factors to ultimate are high enough, using a pure development approach is much to erratic. What can you do? I like the idea of monitoring it directly by building systems which monitor directly so that you don't have to rely on a sample. Make up a loss ratio index based on your judgment and your observation of market conditions. It's better than making up a loss ratio. The way Bornhuetter-Ferguson is frequently used and abused -- an expected loss ratio is made up. If you make up a loss ratio index, then at least you are still forced to respond to the actual data. It's still not an answer for every company. There are going to be brand new companies -- companies that are only in business two or three years, where even if you combine the experience of all the years old and new, you still say I don't have a reliable enough basis to project, and maybe you will try and find some outside sources to help you arrive at the loss ratio. I guess my experience being an auditor for a number of years I lost patience with excessive subjectivity because when you have that much subjectivity it is hard to use it in a completely objective manner, if you'll pardon the confusion of terms. There are political pressures on every actuary, and the more you can calculate what you have done and the less you have to just purely select it, the more defensible your result will be, and the more defensible it will be to an auditor. A better result is a somewhat more objective result. The stability issue in development of the problem going to the pure Bornhuetter-Ferguson as it is commonly used to me is too subjective. Frequently a person can't really tell you at all where those expected loss ratios came from. Here's a way to do it a little more precisely, by going directly to pricing information. I should point out that I don't want to misrepresent the "Cape Cod" method. There's nothing specific in the method that says it is based on premiums and a loss ratio index. It's just a method of using a weighted average of all of the years combined to set an expected relationship to an exposure base. And any exposure base that moves with the expected losses would work equally well. In fact, in primary data, that's a little off of the topic if you project ultimate claim counts relatively accurately in a stable base, and trend ultimate claim counts, that makes a very nice exposure base for using the Cape Cod method. Okay, here's the Cape Cod method for you, it's relatively easy to do. The loss ratio index is hard to do, but I would advocate that actuaries, especially those in reinsurance monitor relative pricing adequacy, and they will be able to project reserves in a way that is more stable on the one hand, and still reasonably objective on the other hand.

FRANK WILKINSON: Good afternoon. I'm going to give a twenty minute whirl wind tour of the reinsurance cycle. My subject matter is the reinsurance underwriting cycle: current and the future. I will cover three major areas of the cycle. First, look at the historical reinsurance cycle over the last twenty some odd years; next look at aggregate figures and try to analyze them. And finally, on an anecdotal basis, look at the last full cycle which I'm assuming began in 1980.

[SLIDE]

This shows the reinsurance cycle from 1965 through 1986. There are a couple of observations. First, these are statutory results. My guess is that if we were looking at underwriting year figures, the swings would be even more dramatic. That is, the good years would be better and the bad years worst. This is so because in the bad years companies have a tendency to underreserve and then try to catch up in the good years. This slide presents bar graphs in reverse of a combined ratio, so if the year is above the breakeven line, there is an underwriting profit -- below, there is an underwriting loss. From the slide we see that there are very few years with an underwriting profit; also we see that the cycle tends to run for a ten year period.

[SLIDE]

Next let's look at the reinsurance cycle but superimpose the insurance underwriting cycle on the same slide. A couple of observations: the two cycles tend to run in the same direction; however, the insurance cycle is less severe than the reinsurance cycle. Also, except in a few years, the insurance cycle tends to show more favorable underwriting results.

Why is the reinsurance cycle more severe than the insurance cycle? For a couple of reasons. First, the reinsurance underwriting cycle is subject to what I call the multiplier affect in that the reinsurance rates are applied to insurance premiums. This means when we have price decreases in both insurance and reinsurance, we have a double affect on the drop in reinsurance premiums. The reverse is true when there are rising insurance and reinsurance rates. Another reason is that reinsurance is basically unregulated, i.e., reinsurers have the freedom to price the product. Reinsurers are not burdened with regulation; this has led to less stability in pricing which contributes to the cycle swings. A third reason is that reinsurance tends to be longer tailed than primary, therefore, more difficult to price. With this difficulty to price, over optimism or over pessimism comes into play thereby exaggerating the cycle.

Lastly, reinsurance is an easy entry business. The result of easy entry in the late 70's and early 80['s was excess capacity which tended to act irrationally in the market place from a reinsurance pricing standpoint, thereby putting additional pressure on the downward cycle.

Next, I'd like to look at the players in reinsurance, because, when describing the cycle, it helps if we group the players into various categories. This can be done in any number of ways. For today's purposes the major category split is domestic and international. The next split is of domestic markets between the direct writers and the brokerage markets.

Looking first at the direct writers and some of their characteristics. There are fewer, but larger; the top five reinsurers in size are direct writers. Direct writers have a tendency towards facultative versus treaty. They also have a tendency in the treaty area towards more working versus capacity business. Certainly, this has been true when looking at the dominance of property catastrophe business with brokerage reinsurers. Another tendency of direct writers has been more of a casualty orientation. A number of the direct writers were formed back in the twenties and thirties because there was a lack of reinsurance capacity available in the casualty area.

Looking at the domestic brokerage markets, I will categorize them by ownership. One of the major such categories is subsidiaries of insurance groups: American Union (American States), Constitution Re (Crum & Forster), Kemper Re (Kemper) are but a few. Also, the category are U.S. reinsurance subsidiaries or branches of foreign insurance groups, Gerling Global and Skandia America are examples.

The second category is reinsurance departments or wholly owned management companies. CNA and Allstate are examples of reinsurance departments. Examples of wholly-owned management companies would be Hartford Re (for Hartford), and Constitution State Management (for Travelers).

The third category of brokerage reinsurers is subsidiaries of non-insurance companies. This was a group that blossomed in the late 70's, and except for a few exceptions are gone. As a group, its underwriting track record has probably been the worst. For whatever reason, the entry into the insurance business by the industrial world has not been a success. Examples of casualties in this area are Constellation Re and Universal Re. Dorinco, a Dow subsidiary, is still active and seems to be an exception.

The fourth category is independently owned management companies, i.e., a management company that contracts with an insurance company to write reinsurance. These types of reinsurers were more prevalent during the soft market, and with one or two exceptions are no longer a major factor.

The fifth and last category is the publicity traded reinsurers. During the last three or four years, there has been an emergence of new publicly traded reinsurance companies; this is a product of the tightening market with its resulting potential for increased profitability.

Looking at the international category, Lloyd's of London is still by far the largest and most important market. There has been a rapid growth in membership of Lloyd's during the 1980's. The London company market also has expanded. Prior to 1980, there were probably only three or four London companies that consistently followed Lloyd's leads on U.S. reinsurance business. This has expanded over six fold. London is a very large player in U.S. catastrophe business. Western Europe and Japan are still large markets although many of the major insurance groups in these areas now have formed U.S. subsidiaries and are no longer actively writing abroad. The Bermuda market had about an eight year life cycle, it began to emerge in the mid-seventies when captives and high interest rates -- it looked like a cornucopia of profits. It was the classic case of looking at the last three years and expecting the next three years to be similar, i.e., ignoring the cycle.

What happened to the marketplace when we had these new reinsurance entries? One of the main repercussions was a strain on existing talent. When the markets increased from 70-120 markets, there had to be another 50 chief underwriting offices and/or chief executive offices. The result was individuals with as little as three years experience were running companies; there experiences had only been during a profitable period. They did not have the battle scars of a prior down cycle.

Another repercussion was pressure for premium growth -- if new reinsurers is formed and the staff hired, even if management concludes that reinsurance prices are too cheap, it has a difficult time not writing business since it must justify its existence. This is what happened in the early 80's and caused what I call a feeding frenzy when it came to writing business. A small increase in capacity (5% to 10%) can have a larger relative effect on reinsurance market prices because it can result in completing placement. If a cover stalls at eighty or ninety percent and the client wants a 100 percent placement, then there has to be a rate increase to attract additional capacity. During the early 80's the opposite occurred. Large capacity from new reinsurers with large retrocessional support was available. What this meant was that new players came in with no track record and fairly limited capitalization but were able to commit large lines. These large reinsurance capacities were especially used in the unregulated insurance area, such as E&S insurance. The result of unregulated reinsurance providing cheap capacity to the unregulated E&S markets was an especially underpriced reinsurance product.

Lastly, there were certain types of reinsurance that emerged during the soft market. One was reinsurance on a general agency basis where there was a largely passive front company. Very similar to this was the department or program reinsurance done by many of our large reinsurance groups, i.e., an insurance group which reinsurers off eighty to ninety percent of the business from a particular department or insurance program. This means the major reason for the insurer to write the business became override rather than underwriting driven. Lastly, there was the emergence of the automatic facultative treaty, which is a legitimate form of reinsurance but became over abused during the 1980's; it became a treaty written by facultative reinsurers whereby the ceding company had total discretion on the reinsurance pricing.

[SLIDE]

What was the results of all of this? First, there were dramatic insurance and reinsurance price declines. The reinsurance declines were most severe in areas of unregulated insurance.

[SLIDE]

Secondly, reinsurance premium volume grew. Looking at the premium volume of '82 through '86, there are two reasons for the growth. One is, more reinsurance business was being written. As mentioned, general agency and specialty reinsurance programs emerged. That increased volume but also increased exposures probably by a greater amount. The other way volume grew was due to rate increases, which increased volume without correspondingly increasing exposures. The '83 and '84 volume increases were strictly due to an increase of exposure -- '85 was probably a combination of rate increases, and increases of exposure. And the 1986 volume increases were exclusively rate increases.

[SLIDE]

We now come to my one slide on loss reserves -- the loss reserve deficiencies during this soft market period. With a universe of about seventy-two reinsurance companies, the bar graph shows the one-year loss development as percentage of policyholders surplus in '82, '83, '84 and '85. Note the dramatic increase between '82 and '85 in the impact of loss development on the subsequent year's policyholder surplus. For the 1985 year, 30% or more of the surplus was consumed through prior year's loss development by twenty-nine percent o the reinsurers.

[SLIDE]

This last slide illustrates the operating results of the soft market. I wasn't able, without a great deal of research, to go back and construct aggregate operating losses, so this slide does shown the changes in the surplus account for reinsurance companies from '82 through '86. '85 shows a substantial drop in the aggregate surplus.

The cycle began to change at year end 1983, when reinsurers started anticipating their results for '83 and saw some very disturbing numbers. Although '84 was part of the hardening phase, it really was more or a bridge year. Only certain segments of the reinsurance market began to tighten. Retrocessional capacity began to dry up. As a general rule, where there had been rate decreases in '81 through '83, the business effective at the beginning of '84 was pretty much of a renew "as is". During 1984, however, there was a continuing hardening of the cycle; we saw a dramatic increase in the number of reinsurers with financial difficulties -- Unigard, Ideal Mutual, Universal Re, Delta American, Constellation, are reinsurers that either went insolvent or were so severely impaired that they were operating only by computing losses with deep discounts or negotiating other more favorable settlement terms.

The second result of the hard market phase was underwriting conservatism. Probably, the most dramatic factor in the contraction of capacity during the tight market was not reinsurer exit but restrictions by the continuing reinsurers. It became a mind set plus the retrocessional capacity that had fueled the market during the early 80's collapsed. The company that had the $5 million capacity was now writing a $250,000 net line. Because of rate increases many reinsurers began having premium writings to surplus problems. The rate increases made the writings to surplus ratio higher, which further restricted the capacity which resulted in additional rate increases. The types of reinsurance that had expanded earlier -- the general agency programs and the facultative treaties evaporated.

As important an impact as rate increases were during this down phase, coverage restrictions were at least as significant. Some of the more onerous from the ceding company's perspectives, were annual aggregate limits on excess of loss covers, (125-150% of the premium for the year) and sunset clauses where losses reported after a certain date were not covered. These became standard on much of the casualty treaty business.

On the flip side, there were a few reinsurers that became aggressive during this period. Mentally some of the other reinsurers may have wanted to become aggressive but they were so badly beaten up financially that they didn't have the wherewithal to take advantage o well priced business. I mentioned early that there was an emergence of some publicly trade reinsurance companies. The ones that got an early start in 1986, generally were the more aggressive. On an underwriting year basis, the 1986-1987 results when they finally settle out, will no doubt prove to be one of the most profitable in recent history.

Let's look at this year -- 1987 -- which I'm calling a bridge year. Reinsurers are having the best published results they have had in ten years. Because it takes 12-18 months for reinsurance price increases to flow into the balance sheet, reinsurers can never completely enjoy success. When success shows itself in the published result they know that the cycle is beginning to run into trouble again. The first half of 1987 is such an example. It's one of the few periods where reinsurance results are superior to the insurance results. The six months combined ratio is just over 100. Again, with good published results the underwriters start becoming more receptive. In the property area there has been renewed competition for business. One casualty there's been an elimination of many of the onerous coverage restrictions that were put into effect during the '85 - '86 period. Currently underwriters appear to be more liberal in the coverage area hoping to preserve the pricing. The next phase o the softening phase will probably include rate decreases.

Herbert Goodfriend of Prudential-Bache made an industry profit projection through 1989. For '87 he expects a break even underwriting year; 1988 is projected to be the best year for reinsurers; 1989 again right at break even. If the reinsurance underwriting cycle is at break even the year is considered very good. I would say that people I have talked to within the reinsurance industry tend to be less optimistic. However, I do think the consensus (and also my opinion) is that the next down cycle will not be as severe as the last one.

First of all, the last was the most severe down cycle in modern reinsurance history, so it shouldn't be considered the norm. Second, I think a lot of the so-called innocent capacity has left the market permanently. There will be a re-emergence of some of the types of reinsurance products and programs that were prevalent in the soft market, but hopefully on a more responsible basis. The facultative treaty is re-emerging but the general agency and specialty reinsurance programs certainly in the foreseeable future, will not re-emerge to any great extent. There's a current trend among the major insurance groups to take back more business and keep larger nets. When that's being done insurers are not living off of reinsurance and there tends to be more responsible pricing of the primary insurance. The reinsurers currently writing in the working casualty area, where some of the large underwriting losses emanated during the last sot cycle, are different players and more sophisticated. During the '80's, outside the direct reinsurers and a few of the larger brokerage markets, there were virtually no actuaries involved with pricing of reinsurance. That has changed dramatically over the last three to four years. In addition, reinsurers are now doing regular underwriting and claims audits; they are now minding the store. The cycles won't disappear, but they will not be as severe, at least the next time around. Thanks.

ALLAN KAUFMAN: Are there any questions?

QUESTION: Will prospective loss portfolio transfers be worded similar to loss portfolio transfers, i.e., where only risk is investment income risk?

ABBE BENSIMON: The treaty provisions define exactly what losses are subject to the treaty. In a historical loss portfolio the losses define will be one which have already been incurred and whose reserves are already on the cedent's books. A prospective loss portfolio's losses as defined by the treaty are future losses, ones which will be incurred in a future time period which is also defined by the treaty. The cedent never reserves for those losses that are the subject of the prospective cover. There will never be loss reserves attributed to the thirty-five percent layer up on the cedent's book -- not ever. It is really your typical excess of loss reinsurance cover; the reinsurer and the cedent are partners on that particular book of business, and share in the profits or losses generated from it.

ALLAN KAUFMAN: Another way to think about that is particularly the regulations on retrospective portfolios talk about what you're doing to losses already incurred. and this hinges on whether the loss already incurred. If you do it prospectively you've never recorded on your books the excess layer that has been referred to. Therefore, you could say that's a loss that hasn't been incurred because the regulation related to doing a portfolio for losses already incurred there on the slide.

QUESTION: What happens when loss portfolio becomes prospective portfolio transfers?

ABBE BENSIMON: You mean whether it's a portfolio transfer. I think that question arises because there is definitely a reinsurance contract. There's a contract where there's a ceding company would say is a reinsurance contract. Both parties would say that it is a reinsurance contract -- outside parties; auditors; insurance companies; and the IRS could question whether or not it is a reinsurance contract. That issue remains-- that's a separate question from whether it's a retrospective loss portfolio transfer. In fact you don't even get to the loss portfolio question unless it's agreed that it's reinsurance to begin with.

QUESTION: HOw were retrospectively rated contracts used in the calculation of the rating index?

SPENCER GLUCK: I avoided them in my selection of a sample. That's all I can really tell you. I think it is probably most appropriate to use the maximum rate as the index played in that context because that's the rate we insure a risk for. Retrospectively rated contracts, to the extent that the premium is booked to the current calendar year, certainly makes a substantial complication in any kind of reserve projection that you're going to base on premium. To ask the question back -- how many companies have a method for tracking additional premiums in or out on retrospective rating back to the original year of the contract as opposed to booking them in the current calendar year. I guess there's always an issue of premium development. And on all of my exhibits I talk about ultimate premium but the traditional base reason for premium development is simply slow or lags according to premium audits and the like. Premium development caused by retrospective rating is a different issue. I prefer to see it segregated. All the same issues that come up in retrospective ratings for workers' compensation has been around a long time. The answer is that I didn't have too much retrospectively rated contracts in the database I was working with, and I avoided the contracts, so I'm not going to give you an answer as if I've come up with some easy way of dealing with that problem.

QUESTION: Describe automatic facultative and how do they compare to treaties?

FRANK WILKINSON: Automatic facultative was basically an outgrowth of a convenience of doing individual fact, and you've got a block of business which is fairly homogeneous and you set certain guidelines. It was more of an administrative streamlining initially, and then I think they got to be a bit of a competitive tool. They really were treaties with everything but by name. My recollection is that they really started in the 1980's, and that there really weren't many in existence. There was a lot of discretion in setting the pricing. They were abused, they've gone by the wayside. I still personally think that in certain situations if they're monitored properly they still have a lot of value.

QUESTION: How did the high interest rates in the 70's affect the soft market and what is your opinion of interest rates in the future?

FRANK WILKINSON: The second question was in regard to the high interest rate of the mid-70's certainly triggered the entry of the company's in the late 80's, and so-called cashflow underwriting. We all know the investment income is the main ingredient of our profit, but I guess when the mentality comes that generating cash is the first priority. We can't seem to keep a perspective on our underwriting. Even if interest rates go back up to what they were in 1972-73, if they go up to about 200 bases points from where they are now, I think people will still have enough in their memory of where we were -- that's not going to be a major factor. I think if the reinsurers go crazy, the temptation is going to be too great. There's one major insurance group, and what they call their national accounts, which is their large business, in the early 80's had $200-300 million worth of business in that department. They didn't buy any treaty reinsurance and bought virtually all facultative down to even buying aggregates on their nets, and they had virtually no exposure. That type of situation cannot gender responsible underwriting.

QUESTION: You're a responsible reinsurance broker -- If underwriters start writing low rates, what would you do?

FRANK WILKINSON: Do you mean am I taking the high road or the low road here? We're responsible reinsurers intermediaries, but we're not responsible for security however. Obviously, our job is if we have a strong conviction that the reinsurer is going to me its financial obligations. I think that is our key criteria. What we need to do however is to give the complete picture to our ceding company. For example, a lot of people left London in the early 80's. They got cheaper rates domestically. I mentioned they went from 120 back down to 80 markets during the tight phase, a lot of these people wanted to come back to London. London had capacity problems, and London simply said -- look, I'm going to stick with the people that stuck with me. You're at the end of the que right now. These are the kind of things that we need to tell our people. If we find a market that we think is acting irresponsibly to the degree that it's going to financially impair itself in the future, I think we need to point that out to our market. We don't pick the markets we have to point out the points to the buyer. We're probably a little more sophisticated in our analysis and probably a little wiser from having some battle scars ourselves.

CASUALTY LOSS RESERVE SEMINAR

MINNEAPOLIS, MN

REINSURANCE III

REINSURANCE UNDERWRITING CYCLE

by
Frank S. Wilkinson, Jr.
E.W. Blanch Co.
Minneapolis, MN

September 10, 1987

THE UNDERWRITING CYCLE

REINSURANCE UNDERWRITING CYCLE

1. HISTORICAL REINSURANCE CYCLE

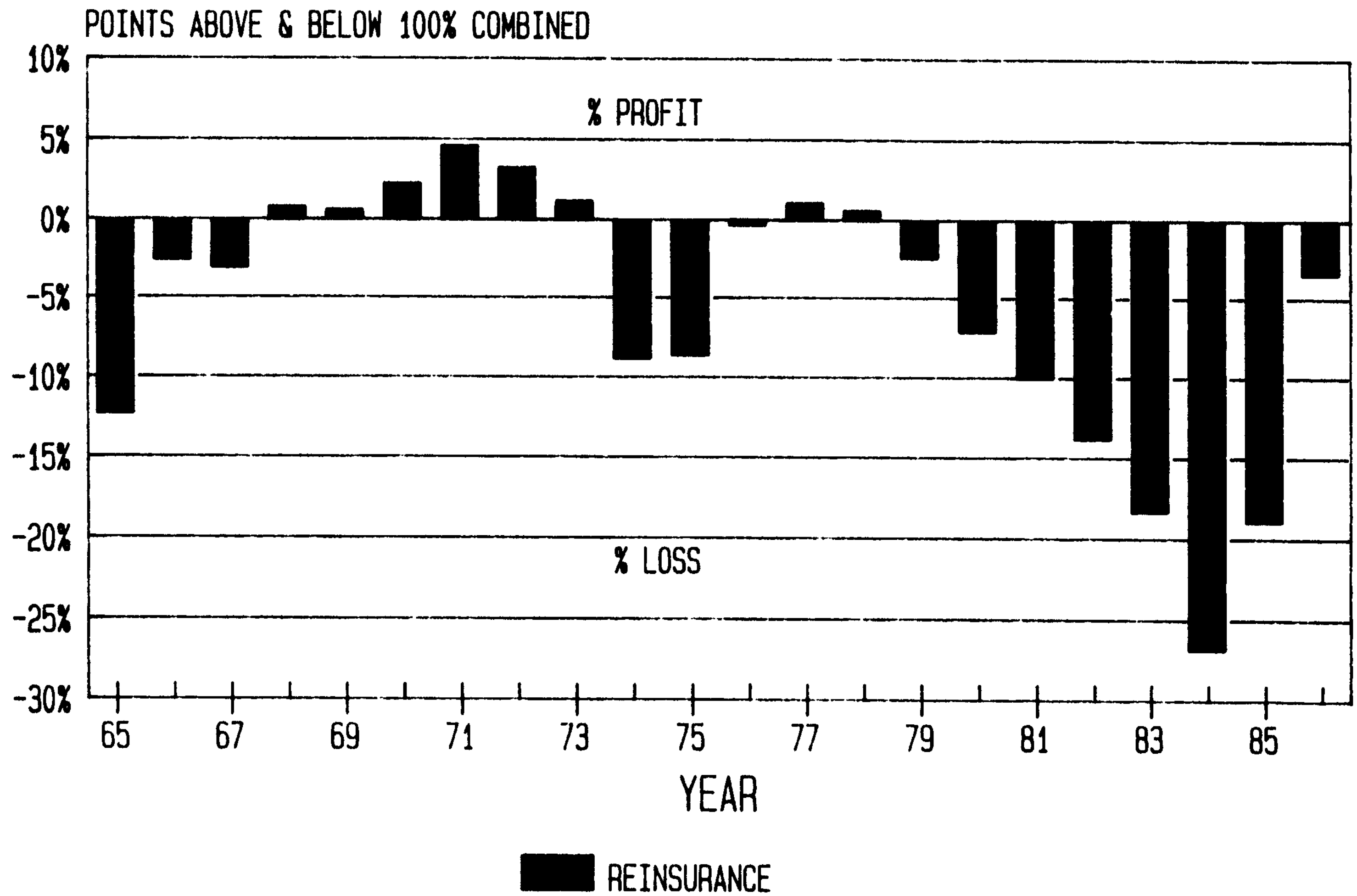
   - LONG TERM PROFILE OF PLAYERS

2. DESCRIPTION OF THE LAST FULL CYCLE

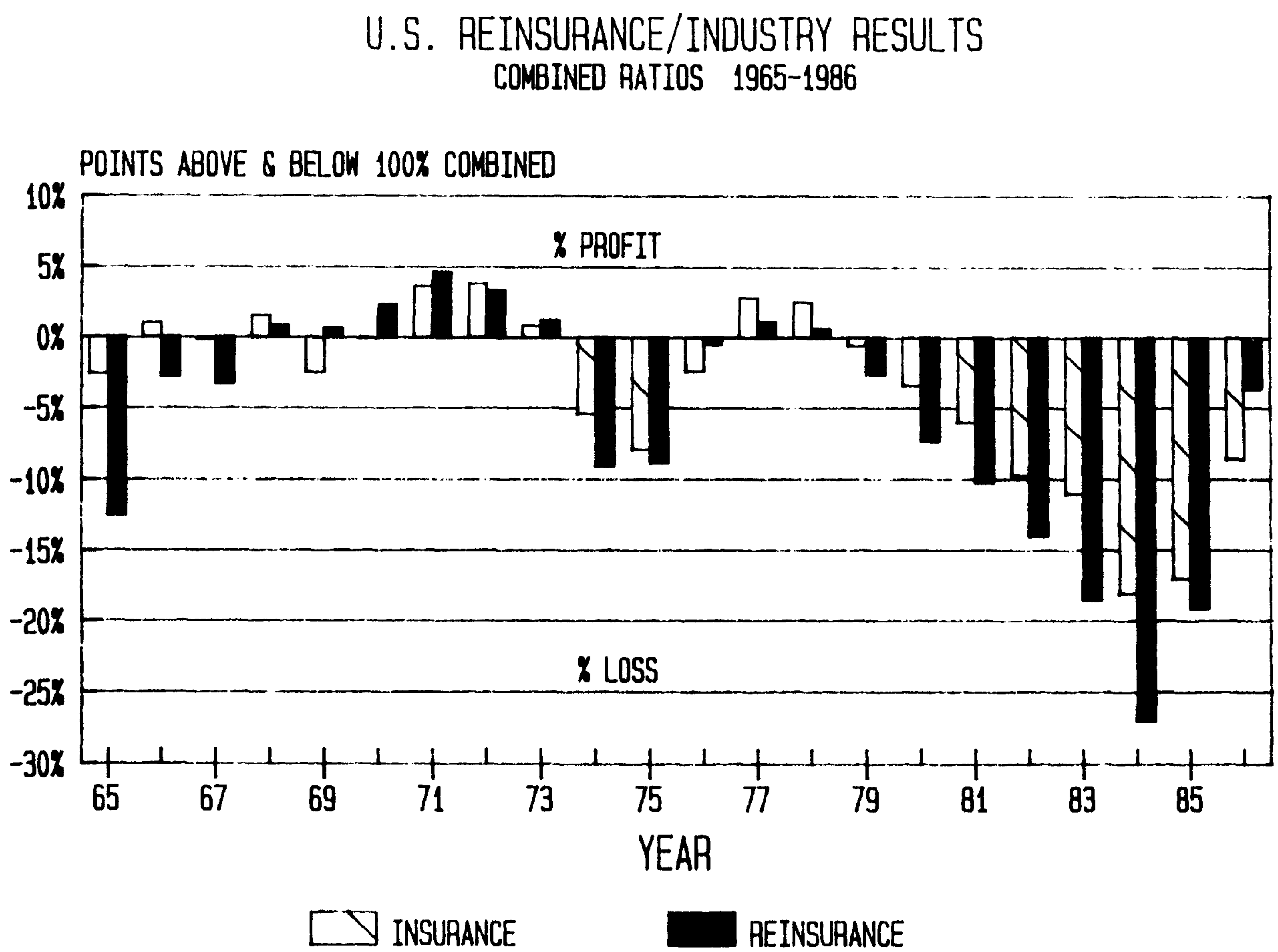
   - 1980 TO PRESENT

3. THE FUTURE UNDERWRITING CYCLE

U.S. INDUSTRY RESULTS
COMBINED RATIOS 1965-1986



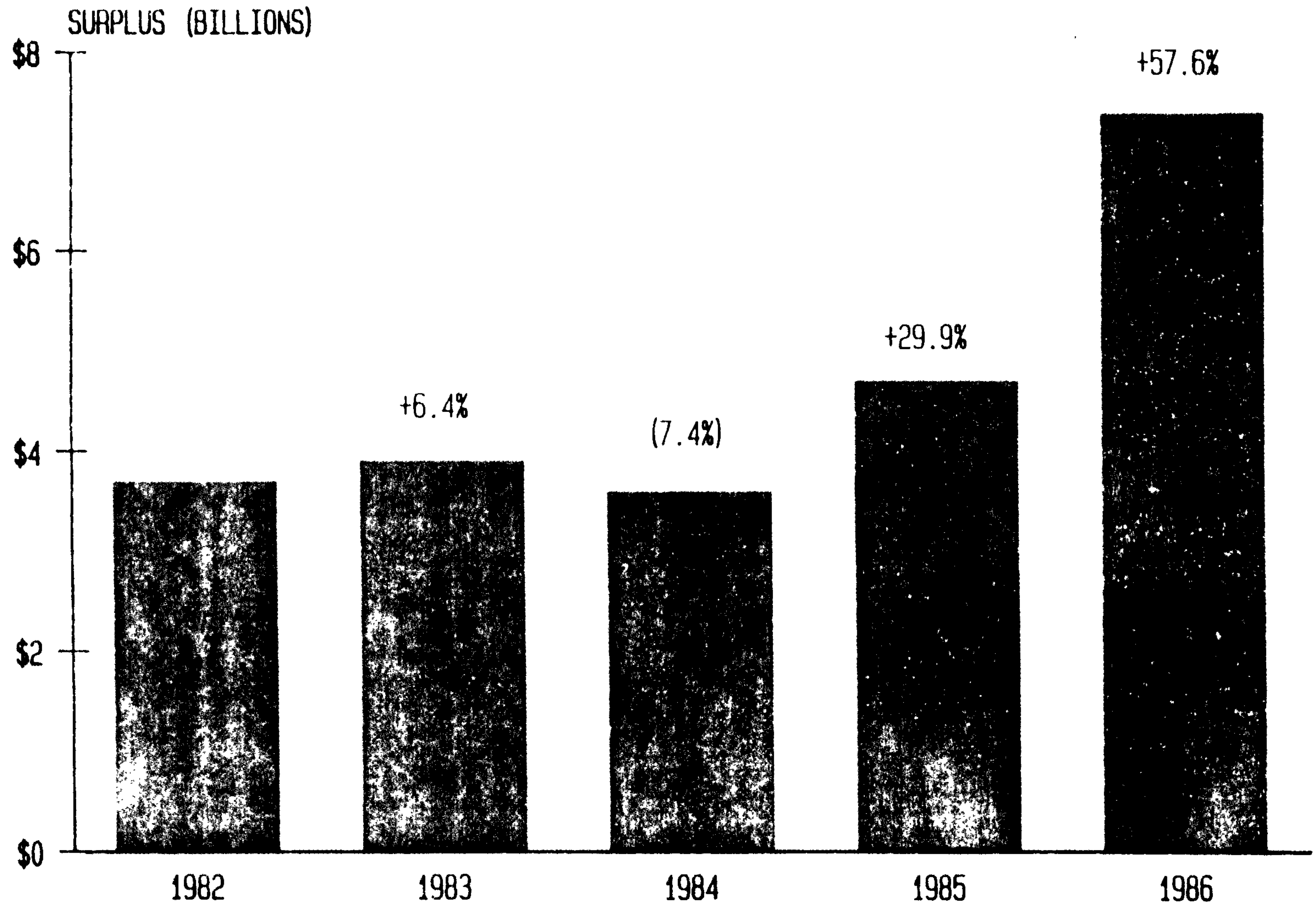
Source: RAA



Sources: Reinsurance - HAA
Insurance - A.M. Best

740

SURPLUS - 59 REINSURANCE COMPANIES



SOURCE: RAA

THE MARKETS FOR U.S. REINSURANCE

- DOMESTIC
  - DIRECT MARKETS
  - BROKERAGE MARKETS
- INTERNATIONAL

DOMESTIC REINSURERS

DIRECT MARKETS

- THE LARGEST - TOP 5 IN SIZE

- TENDENCY TOWARDS

  - FACULTATIVE (VS. TREATY)

  - WORKING (VS. CAPACITY)

  - CASUALTY (VS. PROPERTY)

THE MARKETS FOR U.S. REINSURANCE

BROKERAGE MARKETS

DOMESTIC

- SUBSIDIARIES OF INSURANCE GROUPS
- REINS. DEPTS. OR WHOLLY OWNED MGMT. CO.
- SUBSIDIARIES OF NON-INSURANCE CO., ie ARMCO
- INDEPENDENTLY OWNED MGMT. COMPANIES
- PUBLICLY TRADED COMPANIES

THE MARKETS FOR U.S. REINSURANCE

BROKERAGE MARKETS

<u>INTERNATIONAL</u>

- LONDON (LLOYDS AND COMPANIES)
- WESTERN EUROPE
- JAPAN
- BERMUDA
- CANADA AND ALL OTHERS

REINSURANCE CYCLE

CHARACTERISTICS OF THE SOFTENING PHASE (1980 - 1983)

- GROWTH IN THE NUMBER OF NEW MARKETS
  - U.S. LARGE MARKET SHARE (45%)
  - EASY ENTRY INTO REINSURANCE
  - STABLE POLITICAL/ECONOMIC CLIMATE
  - NO GOVERNMENTAL RESTRICTIONS
  - PRIOR PERIOD PROFITABLE

REINSURANCE CYCLE

CHARACTERISTICS OF THE SOFTENING PHASE (1980 - 1983)

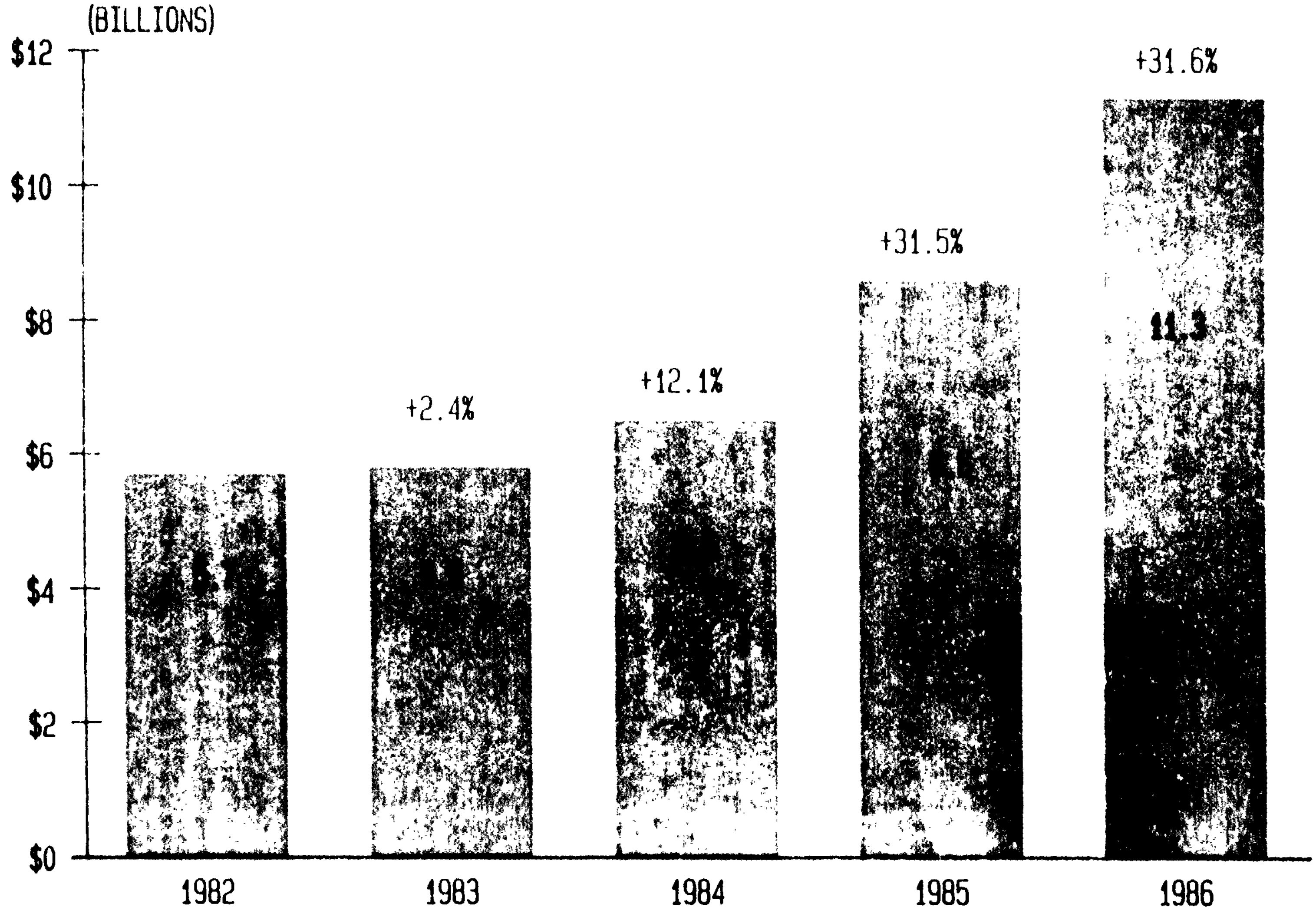
- GROWTH IN THE NUMBER OF NEW MARKETS
- STRAIN ON EXISTING TALENT
- PRESSURE FOR PREMIUM GROWTH
- LARGE CAPACITY/RETROCESSIONAL SUPPORT
- EMERGENCE OF :
  - GENERAL AGENCY/SPECIALTY REINSURANCE
  - AUTOMATIC FACULTATIVE

REINSURANCE CYCLE

RESULTS OF THE SOFTENING CYCLE
(1980 - 1983)

- INSURANCE AND REINSURANCE PRICING DECLINED
- REINSURANCE PREMIUM VOLUME GREW
- LOSS RESERVE DEFICIENCY
- LARGE OPERATING LOSSES

REINS. PREM. WRITTEN - 71 US REINS. ORG



SOURCE: RAA

REINSURANCE CYCLE

CHARACTERISTICS OF HARDENING PHASE (1984 - 1986)

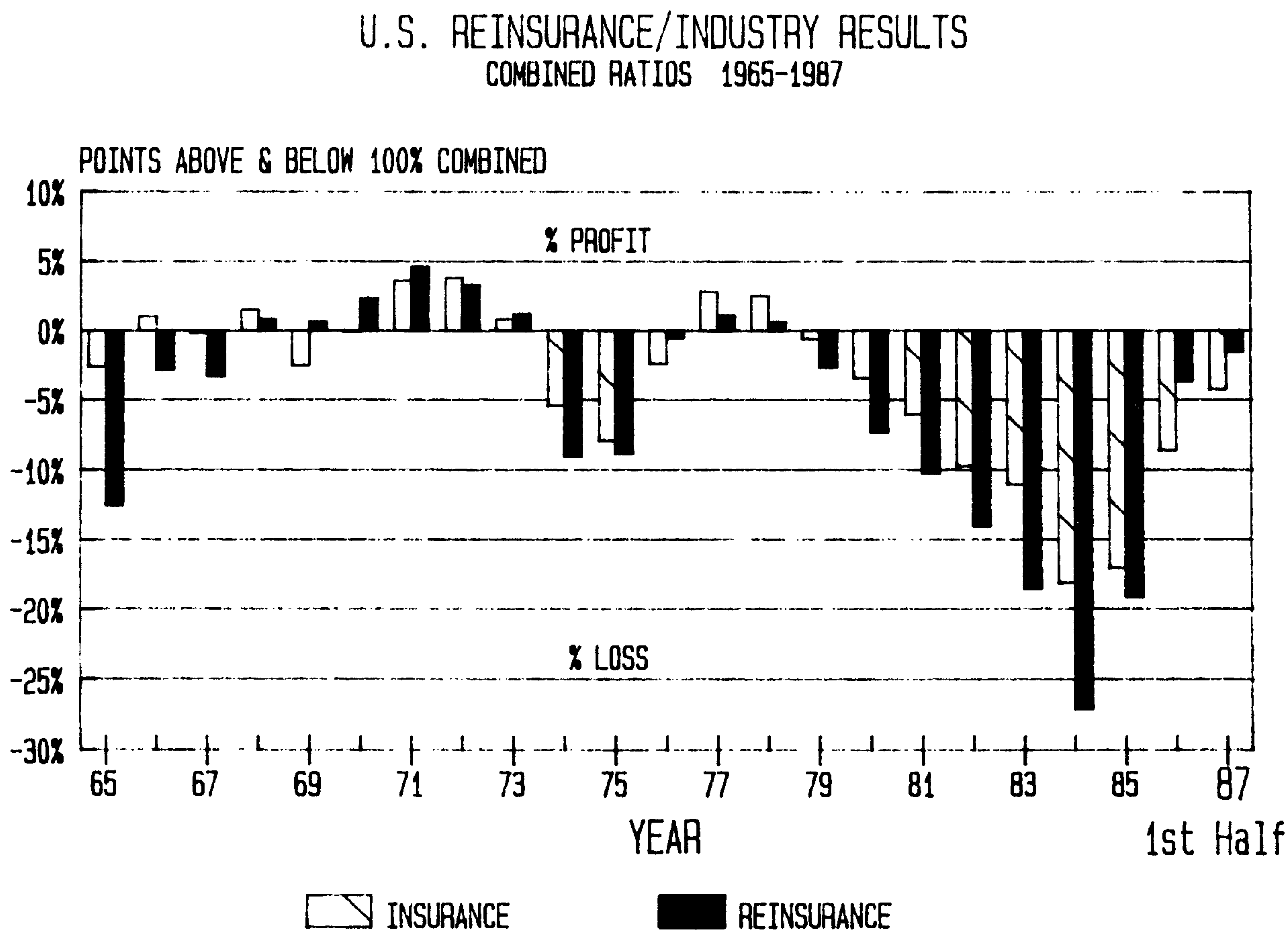
- REINSURER EXIT/REINSURER INSOLVENCY
- UNDERWRITER CONSERVATISM
- LIMITED REINSURANCE CAPACITY FOR :
  - LONG TAIL CASUALTY
  - RETROCESSIONAL COVERS
  - GENERAL AGENCY/SPECIALTY PROGRAMS
  - FACULTATIVE TREATIES
- COVERAGE RESTRICTIONS
- AGGRESSIVENESS OF A FEW REINSURERS

REINSURANCE CYCLE

1987

A BRIDGE YEAR

- EXCELLENT PUBLISHED RESULTS
- INCREASED RECEPTIVITY OF REINSURERS
- LIBERALIZATION OF REINSURANCE TERMS

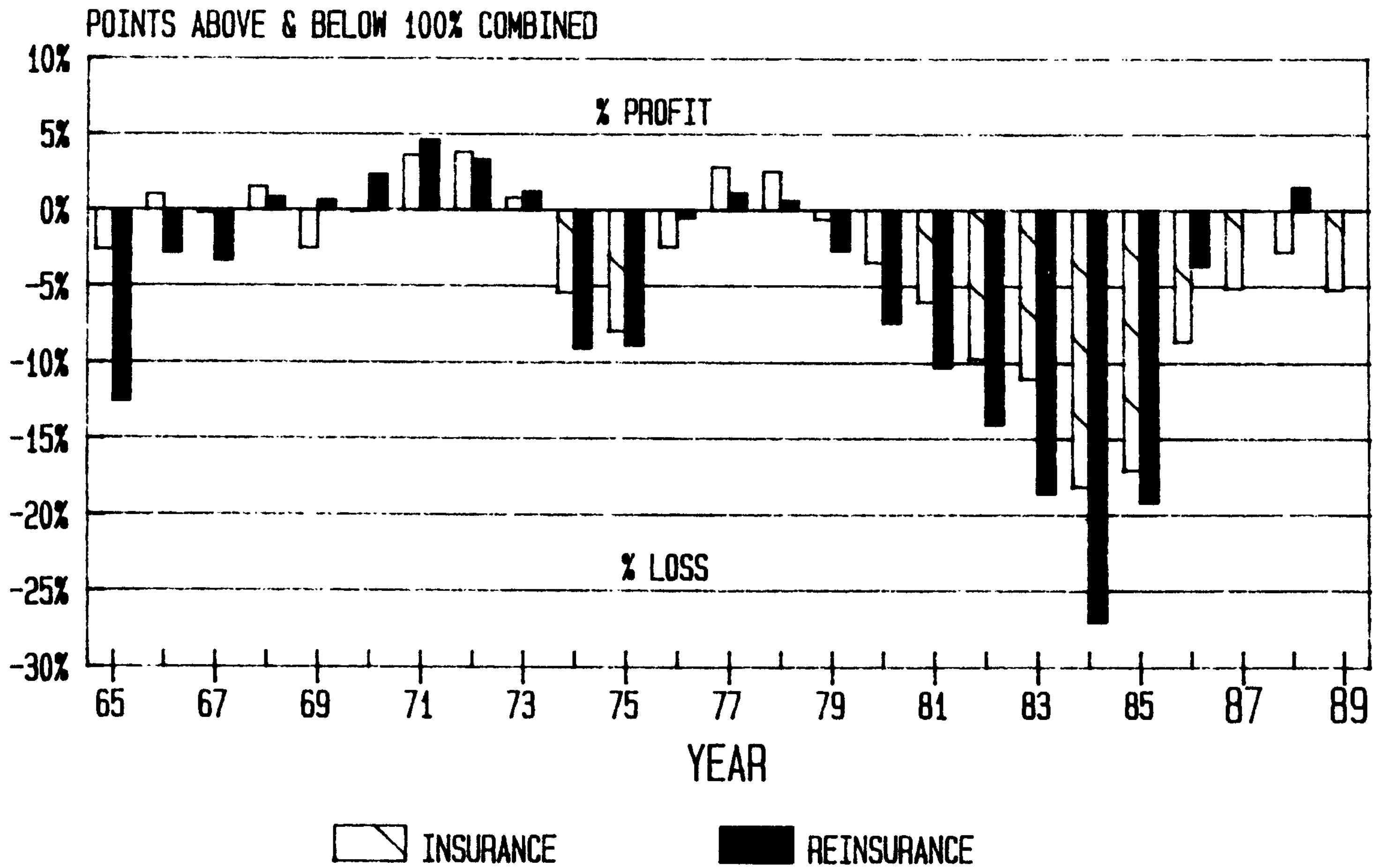


Sources: Reinsurance - RAA
Insurance - A.M. Best

THE FUTURE:
1988 AND BEYOND?

U.S. REINSURANCE/INDUSTRY RESULTS

COMBINED RATIOS 1965-1989



Sources: Reins. - RAA; Ins. - A.M. Best
Estimates: 1987-89 Prudential-Bache

What Defines A Financial Product

The Risk Transfer Element of the Agreement is Subordinate to the Goal of Eliciting Surplus, Income, and Tax Benefits for the Ceding Company.

Renewed Interest In Financial Products

- Alternative Capital Sources Drying Up
- New Tax Law's Onerous Effects on Start-ups
- Drop in 1988 Regular Tax Rate
- IBNR Strengthening Not as Financially Effective
- Balancing the Regular Tax and Alternative Minimum Tax Calculations

Standard Financial Products

I. Quota - Share Covers

II. Loss Portfolios

III. Catastrophe Funding Covers

Quota - Share Covers

Cedes Off a Portion of Unearned Premium Reserve
to Release Equity

Effect on Cedent	Effect on Reinsurer
1. Reduces P:S Ratio 2. Boosts Statutory Earnings and Surplus	1. Boosts Volume, Investment Income, Fees 2. Lends Surplus to Cedent

Limiting The Risk Of Quota - Share Covers To Reinsurer

- Sliding Scale Commissions
- Variable Deductible Sensitive to the R-I's Loss Ratio

Quota - Share Example
Cedent Position

Premium = $100M
Surplus = $ 20M
Cession = $ 21M
Equity = $ 30%

1. Old P/S = 5.0
   New P/S = 3.0 =
   (100 - 21)/(20 + 30% x 21)

2. Accelerated Stat. Income = $6.3M

3. Taxable Income Only Grows
   $2.1M = (30% - 20%) x 21
   Due to Revenue Offset

Quota Share Example, Cont'd

- Reinsurer Lends Surplus Temporarily to Cedent
- Equity in Unearned Premium Reserve Cession Equals:

  30% of \$21M = \$6.3M

- Besides Equity, Additional Capital to Support Cession = \$7M = 21/3 if R/I Writes at 3 to 1

  - If Limited Risk Cover, Support is Partially Illusory Because Cedent is Obligated to Cover Deficiencies in UPR

Loss Portfolios

- **Loss Reserves Transfered by Cedent to Reinsurer at Discounted Value**
- **Effectively, Converts Future Investment Income Into Current Earnings**
- **For Cedent, Boosts Statutory and GAAP Results; Could Strengthen Loss Reserves and Balance Sheet**
- **For Reinsurer, Books Taxable Losses, Earns Some Investment Income and Fee**

Loss Portfolio's Fall From Grace

- Frequently Understated Undiscounted Reserves
- New Tax Law Reduces Reinsurer's Tax Benefits
- New Investment Income Tax Rates
- Insurance Department's Segregation of New-Found Surplus

Twist On Loss Portfolios: Prospective Loss Portfolio

- Reinsurer Underprices Certain-to-be-Paid Excess of Loss Ratio Cover in Anticipation of Future Investment Income

- If Attachment Point is High Enough, and a Long-Tailed Line is Subject of Cover, the Discount in the Excess Layer Can be Substantial

Prospective Loss Portfolio Benefits

- Obviates Disclosure Requirements of State Insurance Departments
- Improves Statutory and GAAP Results by Ceding More Losses Than Premium
- By Reducing Premium and Boosting Surplus, P/S Ratio is Lowered

Prospective Loss Portfolio Example
Cedent Position - Underwriting Only

NWP = NEP = $100M

Surplus = $25M

Expected Loss Ratio = 100%

35% xs 65% Cover

15% Price

B-T Income = 35M - 15M = 20M

Old P/S = 4.0

New P/S = 1.9 = (100 - 15)/(25 + 20)

New L/R = 76.5%

Catastrophic Funding Covers

- Cedent Pays Premium Over Time to Reinsurer in Expectation of Drawing Down the Accumulated Value When the Inevitable Loss Requires Payment

- Key Distinction From Property Cat Covers or Contingent Casualty Covers: Premium on Par with Coverage Limits

- Ideal Lines of Business for This Cover:
  - Property Catastrophes
  - Latent Injuries
  - Hard-to-Place Lines (ECO, D&O, Pollution)
  - Overall Combined Ratio

Catastrophic Funding Covers: Operation

- Deductible Premiums For Cedent
- Ceded to Off-Shore Companies
- Premiums Earn Temporarily-Untaxed Investment Income
- Investment Income And Premium Only Taxed When Used to Cover Loss, or Returned as Dividend; Similar in Effect to "IRA"
- Smooths Earnings For the Profitable Company

Financial Products And The New Tax Law

To Maximize After-Tax Income, Equate Taxes Calculated Under the Alternative Minimum Tax Formula and the Regular Tax Formula.

- **Alternative Minimum Taxpayer Seeks to Boost Taxable Income**

- **Regular Taxpayer Seeks to Reduce Taxable Income**

Maximizing After-Tax Income

I. Quota-Share Cover

- Statutory Purpose Left Intact
- Taxable Income Can Go in Any Direction, Due to Revenue Offset Provision; if Reinsurer's Commision is:
  - (1) Equal to 20%, No Acceleration of Taxable Income
  - (2) Greater Than 20%, Income Sped Up - Good For A-M Taxpayer
  - (3) Less Than 20%, Income Slowed Down - Good For Regular Taxpayer

Maximizing After-Tax Income, Cont'd

II. Loss Portfolios on Existing Reserves

- Taxable Income Sped Up Only Slightly From that Generated by Retaining Loss Reserves, Due to Discounting in Tax Calculation
- Statutory Benefit in Question Because Extra Surplus Arising From Transaction is Segregated
- Fast Becoming a Dinosaur

Maximizing After-Tax Income, Cont'd

III. Catastrophe Funding Cover

- Reduces Taxable Income in Good Year for Regular Taxpayer
- Increases Taxable Income in Bad Year for A-M Taxpayer
- Drop in Regular Tax Rate in 1988 Enhances Cover's Benefits

Maximizing After-Tax Income, Cont'd

IV. Reassuming Reinsured Losses Through Commutation

- Slows Income Down by Reassuming Undiscounted Losses for a Discounted Loss Payment by Reinsurer
- Mitigated by Discounting in Tax Law; Commutation Should Be Based on a Slower Payout Than that Used in Tax Law

Financial Products And Insurance Risk

- Strict Banking Arrangement Prohibited. Deal May be Collapsed by State Insurance Department, Company's Accountant, or IRS.
- Cannot Be Motivated by Tax Considerations Alone. Section 845 of IRC Enables IRS to Collapse One-Half of Deal. IRS Wins on Both Sides of Transaction.
- No Definition of Sufficient Risk

Financial Products: Conclusion

- Can Accelerate, Decelerate, Boost or Reduce Statutory, GAAP and Taxable Income and Surplus

- Can Have Mismatched Effects on Ceding and Assuming Companies with Help of Tax Havens

- Need to be Engineered with an Element of Risk Transfer

- Must be Removed in Loss Triangles When Setting Reserves

PROJECTION OF ULTIMATE LOSSES
BY DEVELOPMENT METHOD

Mixed Excess Casualty

Accident Year	(1) Ultimate Premiums	(2) Losses Incurred thru 12/86	(3) Devel. Factor to Ult.	(4) Projected Ultimate Losses (2) x (3)	(5) Projected Ultimate Loss Ratio (4)/(1)
1978	$3,000	$2,500	1.26	$3,150	105.0%
1979	4,500	2,900	1.34	3,886	86.4%
1980	4,700	4,200	1.43	6,006	127.8%
1981	3,600	4,900	1.54	7,546	209.6%
1982	3,500	4,500	1.76	7,920	226.3%
1983	4,100	4,200	2.06	8,652	211.0%
1984	5,300	4,000	2.57	10,280	194.0%
1985	6,100	1,200	3.86	4,632	75.9%
1986	4,000	100	10.61	1,061	26.5%
	$38,800	$28,500		$53,133	136.9%

PROJECTION OF ULTIMATE LOSSES BY BORNHUETTER-FERGUSON METHOD

Mixed Excess Casualty

	(1)	(2)	(3)	(4)
Accident Year	Ultimate Premiums	A Priori Loss Ratio	Expected Losses	Portion of Ultimate Unreported
			(1) x (2)	
1978	$3,000	123%	$3,690	0.206
1979	4,500	127%	5,715	0.254
1980	4,700	122%	5,734	0.301
1981	3,600	133%	4,788	0.351
1982	3,500	178%	6,230	0.432
1983	4,100	205%	8,405	0.515
1984	5,300	198%	10,494	0.611
1985	6,100	132%	8,052	0.741
1986	4,000	109%	4,360	0.906
Total	$38,800		$57,468	

	(5)	(6)	(7)	(8)
Accident Year	Expected Unreported Losses	Losses Incurred thru 12/86	Projected Ultimate Losses	Projected Ultimate Loss Ratio
	(3) x (4)		(5) + (6)	(7)/(1)
1978	$760	$2,500	$3,260	108.7%
1979	1,452	2,900	4,352	96.7%
1980	1,726	4,200	5,926	126.1%
1981	1,681	4,900	6,581	182.8%
1982	2,691	4,500	7,191	205.5%
1983	4,329	4,200	8,529	208.0%
1984	6,412	4,000	10,412	196.4%
1985	5,967	1,200	7,167	117.5%
1986	3,950	100	4,050	101.3%
Total	$28,967	$28,500	$57,467	148.1%

PROJECTION OF A PRIORI LOSS RATIOS BY "CAPE COD" METHOD

	(1)	(2)	(3)	(4)
Accident Year	Ultimate Premiums	Loss Ratio Index	Premiums at Current Rate Adequacy	Portion at Ultimate Reported
			(1) x (2)	
1978	$3,000	1.130	$3,390	0.794
1979	4,500	1.165	5,243	0.746
1980	4,700	1.127	5,297	0.699
1981	3,600	1.227	4,417	0.649
1982	3,500	1.636	5,726	0.568
1983	4,100	1.888	7,741	0.485
1984	5,300	1.825	9,673	0.389
1985	6,100	1.219	7,436	0.259
1986	4,000	1.000	4,000	0.094
Total	$38,800		$52,922	

	(5)	(6)	(7)	(8)
Accident Year	Reported Exposure Base	Losses Incurred thru 12/86	Projected Current Adequacy Loss Ratio	A Priori Loss Ratio by Year
	(3) x (4)		(6)/(5)	(2) x Total (7)
1978	$2,692	$2,500	0.929	122.7%
1979	3,911	2,900	0.742	126.5%
1980	3,703	4,200	1.134	122.4%
1981	2,867	4,900	1.709	133.3%
1982	3,252	4,500	1.384	177.7%
1983	3,754	4,200	1.119	205.0%
1984	3,763	4,000	1.063	198.2%
1985	1,926	1,200	0.623	132.4%
1986	376	100	0.266	108.6%
Total	$26,243	$28,500	1.086	

LOSS RATIO INDEX

Mixed Excess Casualty
(30% Auto Liability, 70% General Liability)

Accident Year	(1) Primary Loss Ratio Index	(2) Excess Rate Index	(3) Leveraged Inflation @ 4.0%	(4) Excess Loss Ratio Index (1)/(2) x (3)
1978	0.708	0.458	0.731	1.130
1979	0.754	0.492	0.760	1.165
1980	0.819	0.574	0.790	1.127
1981	0.946	0.634	0.822	1.227
1982	1.079	0.564	0.855	1.636
1983	1.147	0.540	0.889	1.888
1984	1.164	0.590	0.925	1.825
1985	1.100	0.868	0.962	1.219
1986	1.000	1.000	1.000	1.000

1987 CASUALTY LOSS RESERVE SEMINAR

4F - CONSEQUENCES OF UNDERRESERVING

Moderator: Stephen P. Lowe, Consulting Actuary
Tillinghast/TPF&C

Panel: Robert Bailey, Sr. Vice President
E. W. Blanch Company

William F. Richards, Asst. Vice President
Aetna Life & Casualty

Alan Zimmerman, Vice President
Smith Barney, Harris Upham & Company

STEPHEN LOWE: Good afternoon. I'm Steve Lowe, and this panel is entitled the "Consequences of Underreserving." This panel has run for several years now. Each panelists is going to speak for about twenty minutes or so on the topic, and that should leave plenty of time for questions at the end from the audience. I've been a participant on this panel in the past, and questions from the audience are always lively and perhaps as entertaining as the presentations.

Our three panelists bring three different perspectives to the question of reserve adequacy. We have a representative from a major insurance company. We have an individual who takes the investors' point of view and looks at the industry from the viewpoint of an investor. And, we have an individual who is involved with a reinsurance broker who is interested in reinsuring the primary industry. I've asked each panelist to address the consequences of underreserving from those perspectives, although I've given them considerable latitude to wander as far afield as they choose.

In dealing with underreserving, I think we need to look both at the consequences for individual companies who find themselves to be in the position of inadequate reserves, and also the consequences for the entire industry in circumstances where the industry itself, in the aggregate, is underreserved. To save time, I think I'll introduce all three panelists at this point, rather than getting up and playing musical chairs in the presentation.

First, closest to me is Bill Richards who is an Assistant Vice President in Aetna's Corporate Actuarial Department. Bill has responsibility in monitoring

Aetna's overall reserve adequacy on the casualty lines, and also for monitoring the adequacy of Aetna's peer group. Next is Bob Bailey who is Senior Vice President at E. W. Blanch, located here in Minneapolis. Bob has a long career and is probably known to many of you. He's been in a number of different positions, and has very recently joined the Blanch organization. Finally, at the far end, is Alan Zimmerman who is Vice President with Smith Barney. Alan is an Investment Analyst commenting on the insurance industry and offering some prognostications on that industry. He was a panelist here last year and the year before that, and has done such a good job that we keep inviting him back. However, before I let the panelists get started, I have some introductory comments. I want to kind of set the stage for each of the panelists.

First, I think the question that comes immediately to my mind whenever we come to the discussion of underreserving, and this is particularly the case when we're talking about an individual company whose reserves are not quite adequate, is - What exactly does it mean to be adequate? It seems to me that we have in the literature some terms that we toss around and use to speak about the industry regarding reserve adequacy. I think, however, those terms are pretty fuzzy and thought the presentation at lunch, by Bill Hager, suggested that, if we're going to dance in this arena, we may need to do a better job of tightening up those terms.

What exactly does it mean to be adequate? We do loss reserve opinions which say that reserves make a good and sufficient provision. What does good and sufficient mean? What would it mean if we said the reserves are good, but we didn't say that they were sufficient; or, we said that they were sufficient, but they weren't for some reason good? Some people talk about reserves including a margin for conservatism covering reasonable fluctuation. That's a life actuarial term and is sort of "slopping" over into the casualty area. If you can, define reasonable fluctuations. If you can't, then I guess the next step is to decide what constitutes plausible as well.

I think all of these terms relate to reserves and the adequacy of reserves, and I think they are somewhat fuzzy as to definition. I think that the reason they are fuzzy is because it is a complicated question. Having been involved in issues associated with discounting and whether reserves should be discounted at some length, I have, over the last several years, mulled over this problem at considerable length. It seems to me that there are four alternative reserve measures that either exist or are emerging. Each of these measures has its own constituency, and each attempts to address a particular problem or principle that the constituency feels is most important. They are not each mutually exclusive, but they each have a slightly different emphasis. I thought it would be worthwhile to touch on each one very quickly so that we get a flavor for what they are.

The first one we all know and love. Any reserve is a provision for an associated liability, and, traditionally, the two have been treated largely as synonymous (i.e., reserves are stated at full value at a level that is equal to the estimated claim liabilities). I think the strongest advantage of this approach, and it may be compelling, is that this is a simple measure -- it is objective and it is verifiable. One can retrospectively test whether the reserve provision actually was equal to or less than the claims that have actually emerged subsequently to the reserve date. I think that's certainly the traditional measure, and there are individuals in the industry who feel quite strongly that it is still the appropriate measure and that we still should not make any changes in how we measure adequacy.

The second measure simply takes the first and says we should discount those liabilities. We should take our expected estimates of the liabilities and state them on a present value basis, using market rates. I think this measure is also simple and objective, although verification is a little more complicated because you have to figure out what the discount was at every point and time and emphasize the discount, taking that piece out. I think, however, it is still fairly objective. This measure includes no margins for adverse deviations, because proponents of this measure say that is the job of surplus, or some other balance sheet item should be provided for items. The reserves should be clean, and they should be the expected values discounted at market rates. I guess I'd also point out to those of you who are not followers of FASB that, based on their recent pronouncements in the universal life area particularly, this may be where GAAP accounting ends up. The accounting profession is struggling with the issue of what reserves ought to be for GAAP, and they're looking at more than just casualty loss reserves. They're looking elsewhere at all items that involve time value of money, liabilities, and assets that are long term. Their current thought process is that the best measure is the expected present value; and, if adverse events occur subsequently, then you take your lumps at that point in time. To include a margin would be tantamount to setting up a contingency reserve.

The last two are more complex. I think to try and understand the essence of it, the market value takes the approach that, when you sold the policy, you charged more than expected costs and you include a profit provision for taking the risk. If you were to sell the liabilities, you would have to pay the profit margin because the risk is still there; and, if the prices are set by the market, the reinsurers are presumably to write 100% reinsurance. They are going to want the same price that you charged directly, so that margin belongs there because it's part of the market value of the liabilities.

The last one tries to introduce an additional adjustment, and tries to put the liabilities on the same basis as the assets. This is the valuation actuary concept where, because the assets aren't at market value, the bonds are at amortized costs. Maybe one needs to look to the asset side of the balance sheet at the same time and should get a consistent basis on the balance sheet to put the balance sheet in balance.

Those are the four measures, and I thought it would be interesting to try and construct a simple example.

Suppose we had a payment four years out that is $100, but the actual payment is normally distributed (we don't know what the payment will be) with a standard deviation of something like $20. There is no other risk than what the actual payment would be. In that kind of situation, what would the appropriate reserve be in each case? I went through some calculations that I'm not going to go over because we'll lose our train of thought and it would be a waste of time. The nominal liability is $100 -- that's what we expect to pay and that ought to be our reserve. Assume interest rates are 7%, then maybe the GAAP reserve is 81.63, which is the present value of the $100. I computed a market value where I said there is some variation in losses if we assume that the market is trying to price to a 95% confidence interval. I'm not saying that the market is or isn't. Hypothetically, however, if we were priced for that confidence interval, and that is what the market wanted for a risk premium, then the present value at 7% of a 95% confidence interval number is $133. If we had $133, we would have a 95% chance of being able to pay the claim rather than a 50-50 chance.

Finally, the asset value approach says - What is the value of my assets? Suppose the bonds that are backing this were purchased when interest rates were 9% rather than 7%, and those assets are backing the same liability but have a different value, then we need to adjust. The point is that each of these measures can be quantified, I think, but as you go down the list, it gets a little more complicated with each step. I think an important point is that the market value is higher than the nominal liability. It is possible that risk margins need to be higher and adequate reserves that would contemplate to that reserves need to be higher than the nominal liability. Of course, it's also true that, if that is the case, I think prices need to be higher as well. I'm not suggesting that we charge $100 and put up a reserve of $108. I am saying, if the market value of those liabilities is $108, then we charge $108, even though the present value of expected liability is only $81.

I like market value. I like that approach, even though I think it is hard to do. I know how to do it in the real world, but it seems to me that market value gives you the best measures of the liabilities. In theory, you could go out to the reinsurance market and discharge the liabilities by purchasing reinsurance and by letting someone else run them off. I know we can't do that in the real world, but my approach is to say that the reserve is adequate if it reflects conservative assumptions as to timing and amount of liability payments and interest earnings. At least in theory, the liabilities can be transferred to a third party at a price equal to the reserve. As I have tried to suggest, that could be greater than or less than the nominal liabilities; and, to a large extent, it depends on how much risk there is in the liability which also should be reflected in prices. We end up with a situation where prices reflect risk and the reserves also ought to reflect the degree of risk. That seems intuitively pleasing to me. As I mentioned, it is possible that this market value could be less than the nominal reserves. It might be for primary workers' compensation business. It could be equal to the nominal reserves by coincidence, or for professional liability or D and O coverage, where I think prices are very definite, currently, and probably should be well above expected costs, with large profit margins in them. It is possible that those reserves should be adequate so we can say they are good and sufficient where we can make a good provision.

That is really all I had on adequacy. I couldn't resist, however, making a comment on the industry reserve position. In reviewing the SEC loss reserve disclosures, one of the things that struck me as interesting is that we talk about the inadequacy of the reserve in the industry. The industry is 15% inadequate, or whatever the current number is. Some people think that gap is being narrowed, but what is interesting to me is we still have a pretty good dispersion of reserve positions. In 1986, there were still three companies whose 1985 reserves during 1986 developed favorably by more than 5%. They could go back up again, I suppose, in 1987. We had a bunch of companies who were in the plus or minus 5% range. In the other extreme, we have some commercial companies who are well over 25% reserve strengthening in one calendar year against the reserves at the beginning of the calendar year. I think with the industry reserving problems, the most salient thing is that there is wide divergence in reserve positions amongst the companies -- maybe less so now than there was a year or two years ago - but still pretty wide divergence. I've said everything I want to say, so I will turn it over to Bill Richards.

1987 Casualty Loss Reserve Seminar

CONSEQUENCES OF UNDERRESERVING

1987 Casualty Loss Reserve Seminar

CONSEQUENCES OF UNDERRESERVING

FOUR ALTERNATIVE RESERVE MEASURES

- Nominal Liability
- Expected Present Value
- Market Value
- Asset Related

SOME VERY FUZZY TERMS

- Adequate
- Good and Sufficient Provision
- Reasonable Fluctuations
- Plausible Fluctuations

A QUICK EXAMPLE:

Nominal Liability	=	100.00
EPV @ 7%	=	81.63
Market Value	=	108.57
Asset Value	=	102.70

THREE POSSIBILITIES

$$\text{Market} < \text{Nominal}$$

$$\text{Market} = \text{Nominal}$$

$$\text{Market} > \text{Nominal}$$

ADEQUACY

A reserve is adequate if it reflects reasonably conservative assumptions as to the timing and amount of liability payments, and the interest earnings over the life of the reserve; such that, at least in theory, the liabilities could be transferred to a third party at a price equal to the reserve.

SEC DISCLOSURES - STRENGTHENING IN 1986

5 companies	> +25%
11 companies	+ 15% to +25%
26 companies	+ 5% to +15%
18 companies	- 5% to + 5%
3 companies	< - 5%

BILL RICHARDS: The title of this particular session is the "Consequences of Underreserving". Before I can discuss the consequences of underreserving, I have to know what underreserving is. Or stated another way, how do I know when the reserves are adequate? What standard or target do I use for measuring the held reserves?

As Aetna the property/casualty business is split into two very separate and distinct divisions: personal lines and commercial lines. For personal lines (primarily auto and homeowners) which payout relatively quickly (one to two years), the uncertainty around the target is fairly small. This contrasts sharply with our commercial lines where we are concentrated in such lines as Workers' Compensation, Product Liability, and Medical Malpractice. These reserves can pay out over thirty or forty years. The range of uncertainty around the target for these lines is much greater. In the case of Product Liability we sometimes worry that the range is unbounded.

One o my responsibilities in Corporate Actuarial is to prepare an opinion of the adequacy of the reserves for these two divisions so that the Corporate Actuary can assure the Chairman as well as the divisions that the reserves are adequate. For many years we have struggled with the definition of adequacy. Against what target should we measure these two divisions? How should we measure ourselves against our competitors?

At AEtna we are currently using a target which we call the 90/10 economic reserve level. How do we determine this 90/10 economic reserve level? First we start by estimating the 50/50 reserve level. This is the full-pay reserve or the sum of all future reserve payments at a given point in time. If the full-pay reserve has been estimated in an objective manner (using realistic tail factors), then half of the time the real payments should be higher than the estimate and half of the time the payments should be lower. Second we compute a 90/10 full-pay reserve. This is accomplished by looking at how accurate or variable our estimates of the 50/50 reserves have been in the past. We wish to choose a full-pay reserve level that will only be exceeded one time in ten. Slide 2 shows the relative degree of uncertainty in predicting the full pay reserve for different lines of business in Schedule P and all of Schedule O in the annual statement. If we use Auto Liability as our measure of one, then one additional block of dollars would need to be added to the 50/50 reserve in order to get to the 90/10 level. Other Liability is 3 1/2 times more risky to predict than Auto; Workers' Compensation is 1 1/2 times more risky and so on. From this measure of risk and the 50/50 full-pay reserves, we develop a 90/10 full-pay reserve. Third we need to estimate how the reserve will pay out over the next thirty to forty years. Given an appropriate interest rate we can find the present value (or economic value) of the 90/10 reserve. The result is what we call the 90/10 economic reserve.

The reserve payout stream varies from line to line. The payout stream can be collapsed into one payment at a given future point in time whose present value equals the present value of the payout stream. Slide 1 shows this future point in time for the Schedule O and P lines. It is no surprise that Auto Liability (1.7 years) pays out much quicker than lines like Other Liability (6 years) or Workers' Compensation (5 years). In order to discount, an interest rate must be chosen. We use what we call the portfolio yield rate. We chose this rate because we could compute it for any company including ourselves using annual statement data. The numerator is net investment income. The denominator is the average invested assets. For the industry group that we follow, the portfolio yield rate is about 8% in 1986. Thus to get the 90/10 economic reserve level we estimate the full-pay reserve, build it up to a 90/10 level, and then discount it at 8%. This economic reserve plus the assets backing it up are sufficient to meet the reserve obligations 9 times out of 10. Stated slightly differently, 9 times out of 10 this reserve will be sufficient. Only 1 time out of 10 might we require additional capital to pay the reserve obligation. We are going to define this 90/10 reserve level as adequate.

Corporate Actuarial's objective is to try to maintain or encourage AEtna to hold reserves that are above the 90/10 economic level. The second objective is to have AEtna's reserve stronger than the industry average. Should there be a major catastrophic event, we want to be one of the companies which will last the longest. When we compare ourselves against the industry we are referring to a composite of 43 major property/casualty groups including

AEtna. This industry composite represents about 2/3 of the reserves in the entire industry. We carefully collect the Schedule P's and Schedule O's of these 43 companies and do an extensive reserve analysis on them both as a group and individually. Slide 3 shows the results of this analysis for the composite. The vertical scale on the graph goes from minus 40 to positive 20. The level of zero is where the held reserve equals the 90/10 economic reserve. Minus 40 suggests that the held reserve is 40% below the 90/10 economic reserve and the plus 20 suggests that the held reserve is 20% above the 90/10 economic reserve. The graph shows the reserve adequacy grouped by line for 1985, 1986 and an estimate of where the industry will be at the end of 1987.

In our opinion, the industry was adequate in 1985 for Auto Liability. When looking at 1986, I prefer not to use the word overreserved but to say that the industry was conservatively reserved by about 8%. The industry will maintain that level in 1987. Other Liability was about 25% underreserved in 1985, improved some in 1986, and by 1987 will be underreserved by only 10%. Looking at a longer history for this line, we have found that it has never been close to adequate so by 1987 we will have made significant progress. Workers' Compensation has been in a slightly conservative position over this period. Multi-peril is a sleeper and Schedule O has had some deterioration in the last few years but remains in a good position. In our opinion based on the 90/10 reserve level as our measure of adequate, the industry was about 2-3% underreserved in 1985, is just about right in 1986, and by 1987 will be in a conservative position of about 2-3%.

Slide 4 shows a 12 year history for all lines combined. At the end of 1976 the industry was about 15% underreserved. It steadily improved through 1981 when it went above the adequate level. During the next three years the industry lost ground, and in 1985 it began to improve again and has been improving ever since. If my forecasts are correct for 1987, the industry will be a little better off than they were in 1981, the last best year in the 12 year history.

The 90/10 economic reserve level is interest sensitive and over the last 12 years the portfolio yield rate which we use has varied. Slide 5 illustrates the difference in reserve adequacy if we use the rate which varies or if we use a fixed rate (in this case the 1986 rate of 7.81%). Although the exact level changes, the trend remains the same. Note that using a fixed interest rate, the underreserving of 1976 and 1984 are about the same and the conservatism of 1980 and 1987 are about the same. It begins to look like a cycle but not like the underwriting cycle.

Slide 6 shows the picture for Auto Liability. This line, a boring line of business for someone worried about reserve adequacy, has been at or above adequacy for the entire 12 year period. If you start to get bored, we can look at Other Liability (Slide 7) which has been as much as 40% short. The good news is that in the last 3 years, the industry has begun to wake up and correct the problem. Workers' Compensation (Slide 8) has had its ups and downs. I have my theories as to why but we don't have time to discuss them now. Multi-peril interestingly enough has been fairly consistently underreserved by 8-10% until the last few years (Slide 9). Schedule O (Slide 10) is another boring line. It hovers around adequate.

Slide 11 shows all 43 companies in our industry composite separately. Remember that these 43 companies comprise 2/3 of the industry. The stars represent our opinion of the reserve adequacy of Schedule P at the end of 1986. The worst company in the group is about 40% short or underreserved. The best company is about 30% conservative. The boxes represent our opinion of the 1985 reserves. In 1985 the boxes of 17 of the companies were above the magic line of adequacy. In 1986, 26 of the companies were above this magic line. That is an improvement of 9 companies. More interesting is that, of the 43 companies, 38 of them improved their reserve adequacy in 1986, 2 of them remained the same, and only 3 of them actually got worse. One of those that deteriorated could afford to weaken their reserve position because they were already above the magic line. Two of them obviously were in a position where they should not have weakened their reserves. One other item may be worth mentioning. I ran this same scatter diagram with the scale at the bottom being from smallest to largest company based on earned premium. I was hoping that I would find some sort of a trend that had to do with the size of the company . Statistically there was no correlation between reserve adequacy and the size of the company. Of course the 43 companies which we analyzed are some of the largest companies in the industry so very small companies have not been included in this analysis.

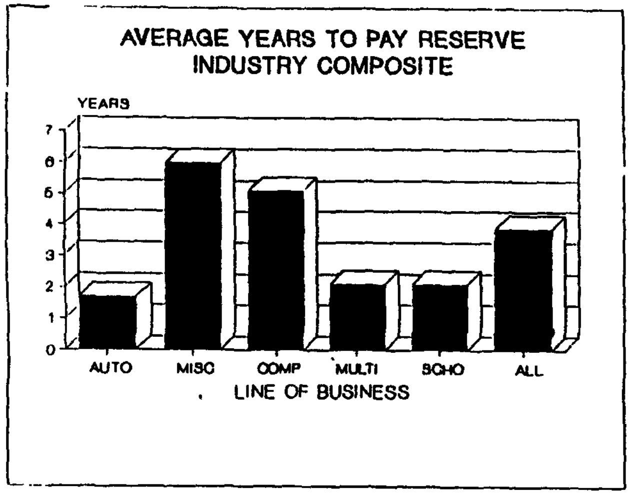
1987 CASUALTY LOSS RESERVE SEMINAR

(4F) CONSEQUENCES OF UNDERRESERVING

WILLIAM F. RICHARDS - AVP - AETNA LIFE & CASUALTY

SEPTEMBER 10, 1987

(1)



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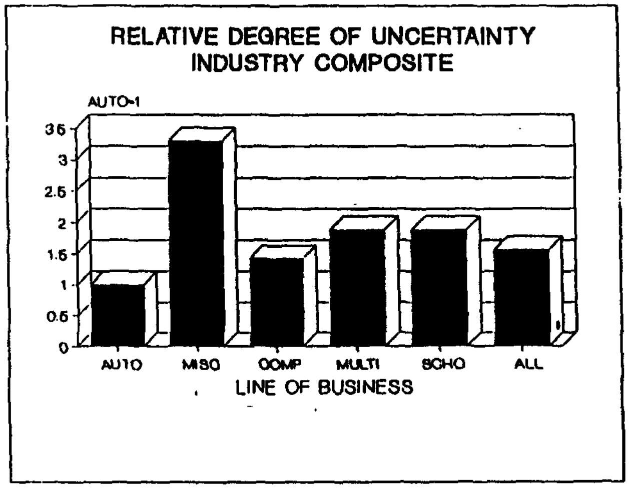

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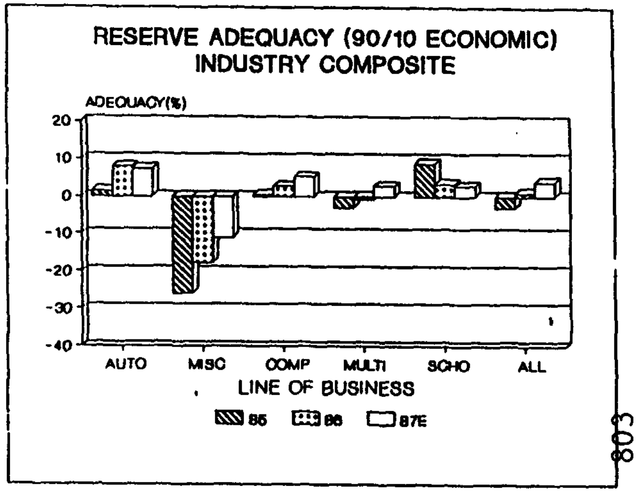

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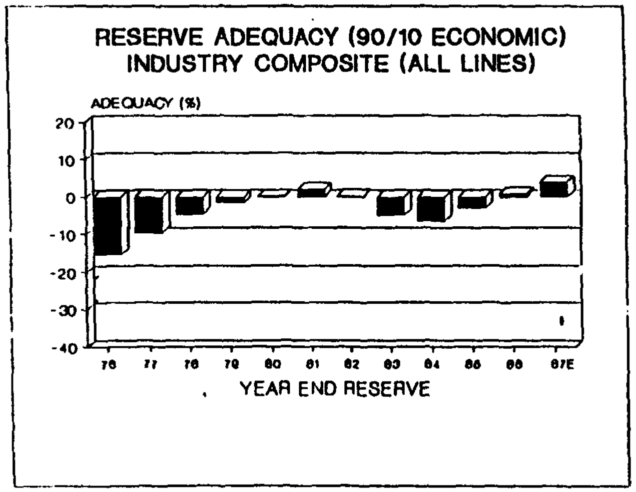

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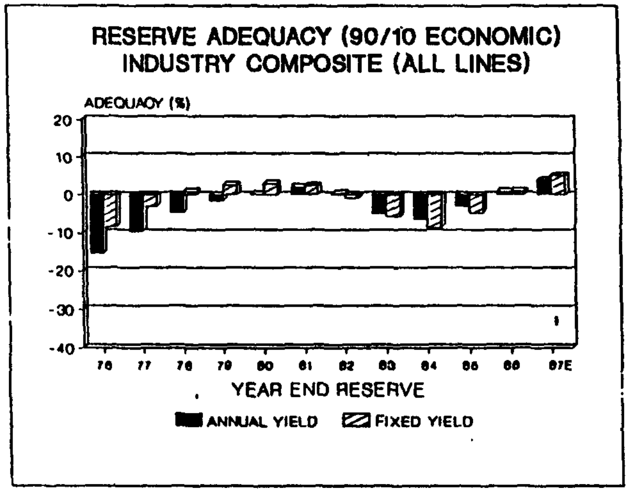
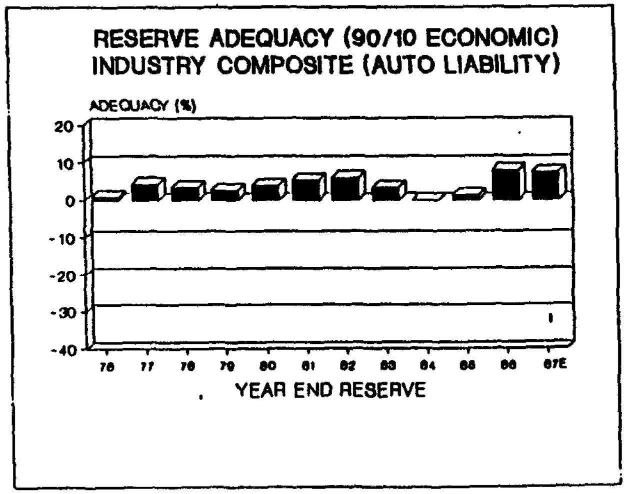
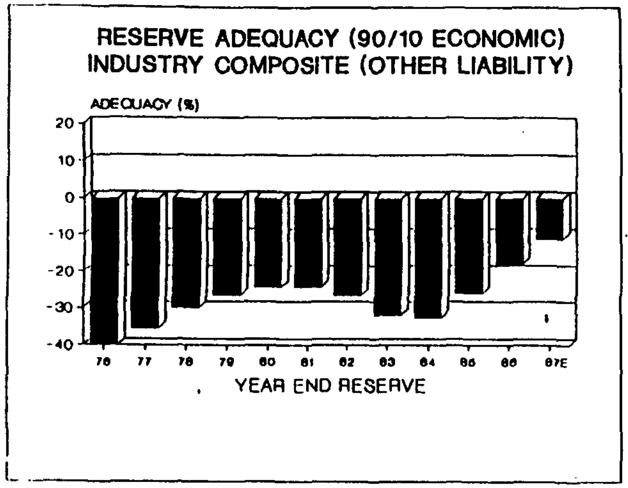


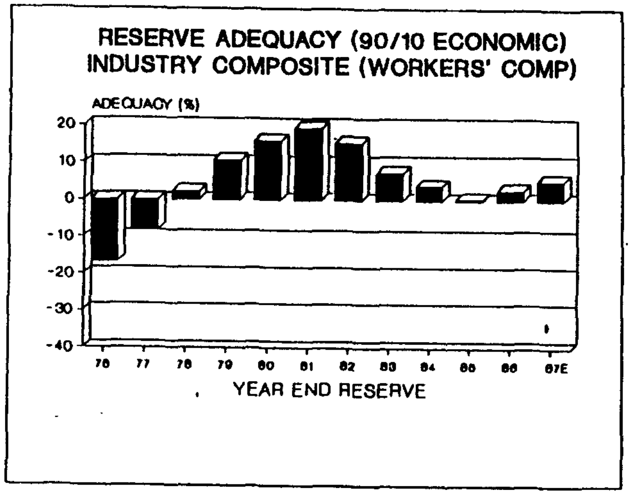
(6)



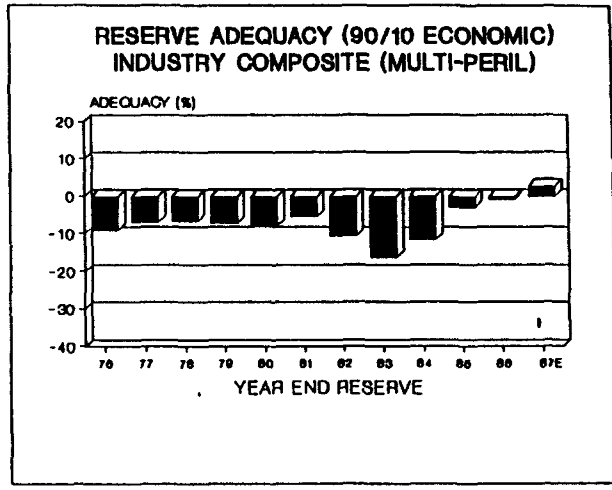
(7)


RESERVE ADEQUACY (90/10 ECONOMIC)
INDUSTRY COMPOSITE (OTHER LIABILITY)
ADEQUACY (%)
20
10
0
-10
-20
-30
-40
76 77 78 79 80 81 82 83 84 85 86 87E
YEAR END RESERVE

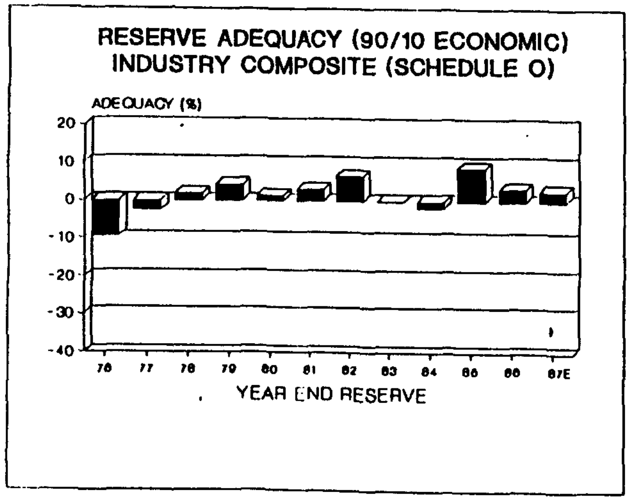
(8)


RESERVE ADEQUACY (90/10 ECONOMIC)
INDUSTRY COMPOSITE (WORKERS' COMP)
ADEQUACY (%)
20
10
0
-10
-20
-30
-40
76 77 78 79 80 81 82 83 84 85 86 87E
YEAR END RESERVE

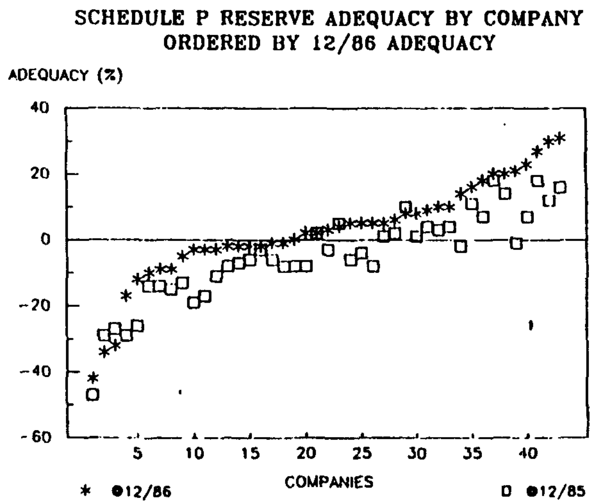
(9)


RESERVE ADEQUACY (90/10 ECONOMIC)
INDUSTRY COMPOSITE (MULTI-PERIL)
ADEQUACY (%)
20
10
0
-10
-20
-30
-40
76 77 78 79 80 81 82 83 84 85 86 87E
YEAR END RESERVE

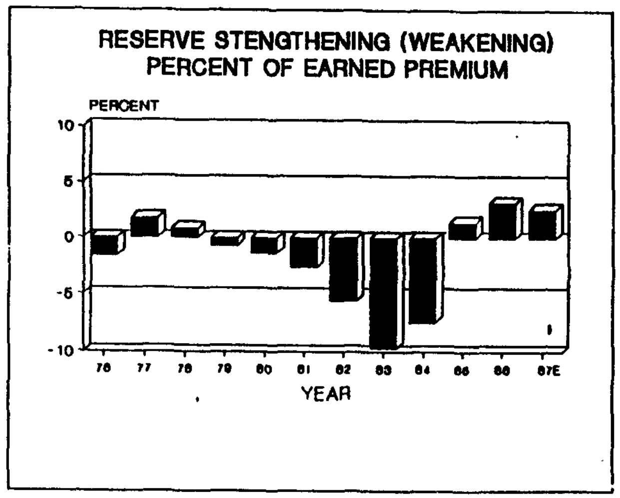
(10)


RESERVE ADEQUACY (90/10 ECONOMIC)
INDUSTRY COMPOSITE (SCHEDULE O)
ADEQUACY (%)
20
10
0
-10
-20
-30
-40
76 77 78 79 80 81 82 83 84 85 86 87E
YEAR END RESERVE

(11)


SCHEDULE P RESERVE ADEQUACY BY COMPANY
ORDERED BY 12/86 ADEQUACY
ADEQUACY (%)
40
20
0
-20
-40
-60
5 10 15 20 25 30 35 40
COMPANIES
* @12/86
□ @12/85

(12)


RESERVE STENGTHENING (WEAKENING)
PERCENT OF EARNED PREMIUM
PERCENT
10
5
0
-5
-10
76 77 78 79 80 81 82 83 84 85 86 87E
YEAR

ALAN ZIMMERMAN: I want to talk about two subjects today - the property/casualty industry, and how it is inter-related with the stock market. I've been told that we analysts (we meaning people that work for insurance companies) in many ways live in two different business worlds. The property/casualty industry is dominated by the stock market, and the stock market is dominated by a broad range of industries and what they are all doing. I'd like to present some broad overviews of where the property and casualty industry has been, try to show you where it fits in with corporate America, and give you a little flavor on how the stock market values the property and casualty industry. I hope this gives you some perspective as you think about the industry.

In the back I have put two separate handouts. The first one is called "Industry Overview." If I had to characterize the industry, which is really hard to do, I think I would say that the industry has a risk record. This is sort of a wishy-washy term -- some things are good and some things are bad. But I think that you'll find, as you go through some of the charts, that this is the way to think about it. The earnings graph is comparable to that of corporate America. The returns on equity also use to be but they're getting better, and the volatility is just horrendous. Let me take you through some things and you can see what I'm getting at, keeping in mind that I think the key word to use is mix.

Chart 1 shows you return on equity over the last 35 years for the property/casualty industry, as well as the S&P 400. The S&P 400 is the measure of corporations generally in the United States. You can see a couple of American trends here. First of all, in the mid-1960's the returns were generally below that of corporations overall. If you think back to the property and casualty industry in the old cartel days, it was a fairly mediocre industry. There was no particular reason anybody would want to invest in it. The initial trend is that on a secular basis the firms were getting a lot better. You could see a general upward pattern, sort of like the trough to be siphoned tends to get a little bit higher. That has broken the last cycle which was an extreme case. Two things have happened to the industry. One, the industry starting in the mid-1970's began to get a lot more leverage. The longer tail lines started to dominate and the leverage went a lot higher. Once the leverage went up in the industry, two things happened. One, returns went higher creating this upward drift in the chart. Two, volatility accelerated causing extreme volatility in the returns. The other thing to read on this chart, if you look through my projections out to 1990 and try and forget the fact that you can't figure out next quarter's earnings, is that you can leave yourself enough hedges. It looks like the return in 1988, which I think is going to be the peak, is below that of 1979; but, I think that the real key here is nominal terms versus real terms. All returns have been driven extremely high by inflation. If you put this chart in real terms, the industry returns this cycle will probably be higher than that in the last cycle. I think the first thing to realize is that it really is mixed. It went from a curve to being a poor return, to one where the returns are very aligned with corporations overall. The industry seems to be getting better relative to corporations generally.

If you look at Chart 2, you can understand the profit dynamics of the business and the way things are changing. I put this on the margin basis, and stated it was a percentage of earned premiums. You can see a little bit of where the volatility in earnings is coming from, so you would have the industry that investment income as the industry got more leveraged and as interest rates went higher, it started to drift upward. We can see that in the top part of that chart there is the point where it becomes the critical determinant of overall earnings. The problem is that, every time the opportunity comes up to get more investment income, people decide to cut prices and give it back in the underwriting side of things. You can see what happened in the last cycle; the underwriting just got too horrendous. The thing that is intriguing about this chart is that even though the industry has never made a dime in underwriting in its entire history, and all the profits come from the investment income side, the bottom line of the industry really is the underwriting line. If you look at that bottom line, it runs parallel to what is going on in the underwriting side. Because, in broad terms, investment income is a constant. You don't see that in many industries. Investment income is the source of all the profits, but the bottom line is the volatility in the underwriting, and that's where you get these horrible results that the industry shows periodically. I think the most interesting part of all of this is Chart 3. What I've tried to show here is some perspective on where the industry fits in versus other industries. I set this up purposely with different industries. On the top part of the slide you've got the industry that I tend to think of as stable growth industries. I should have five charts on this chart, because I don't have extremely fast growth industries like computers or business equipment, which have grown at 20% per year for the last thirty years, which is almost incredible. I have used the moderate companies like drugs and tobacco. The bottom is called the moderate cyclicals. They are cyclical-based on the economy -- chemicals, paper. I had excluded from the list the heavy cyclicals, such as steel and aluminum. The reason I have done that is because it is impossible to grasp -- it goes all over the place. The companies on the top tend to have, on average over this period, grown at about 10% a year. It doesn't sound like much, but you can imagine that after 35 years it is an incredible record. The companies at the bottom have grown at about 4% on average. The companies at the bottom have all of the volatility. They are cyclicals based on the economy, and profits go up and down dramatically. Whereas the companies at the top - the moderate companies - have very stable earnings. Earnings per share estimates are simple. You just take a growth factor off of last year. The property/casualty industry really has a strange record on this chart because it has a growth similar to the moderate growth companies. The industry growth on the average has been about 10% over the 30 years. The growth overall resembles the top line, but the volatility resembles the bottom line. It is a strange industry in that regard. Very few industries can grow as fast as the property/casualty industry in terms of profits and yet be as volatile at the same time. And yet, it's a puzzle to me and there is no reason for it, it is just the curious economics of the business.

My business is stocks and I keep saying that, because I am dominated by it, how the stock market looks at property/casualty companies is critical to me and how I think. Let's look at two pieces of this. First, I have just taken a price earnings I show, which is probably the most super valuation you can use, and divide it twice by your earnings and look at this relative to the market. Let's assume the market is constant and calculate the relative price earning ratio. This is hard to work with because when you've got earnings jumping up and down you're going to have the inverse of that on the valuation side. First of all, the industry stocks are always valued below that of the market. People who buy property/casualty stocks are not worth as much as corporations, generally. The growth is fine, the returns are fine, the volatility is horrendous. We're not going to pay as much for the insurance stock as we would pay for the average of all other companies. Not only that, what this chart tells you is that the valuation has been drifting downward. The degree that this is worth to the industry has been getting worse over the last thirty years. You can see that by looking at the piece in earnings which we're conversed with the _______ in valuation. Each _____ over the last thirty-five years has been lower than the previous _____. The stock market overall is saying two things. First, the stocks are not worth the market overall; and second, we see less of it now than we did thirty-five years ago. If you think about that, there is an interesting message there. Because, in the last overall time the profitability has gotten much better, returns have gone up but the valuations have gone down. The interest rate has come back, and it keeps coming back to the volatility. Insurance stocks aren't going to stay at multiples above the market until people on the stock market are convinced that their volatility is less; and that should happen if it is leveraged where it is.

Chart 5 looks at it another way, and with the price on the "Y" axis and the return of equity on the "S" axis. Here you can run relative so the market at 100 is at the intersection of 100 on both lines. The simple version of this is that if you are above diagonal line, the stock market thinks more highly of you from a valuation point of view than the underlying returns suggest. If you're below the diagonal line, the stock market thinks less of you than your underlying returns would be. Let's assume the property/casualty, which has had a return higher than the industry of the period that I'm using here which is 12 years, but a much lower valuation. The market does not think highly of the property and casualty stock ________ cosmetic stocks _______. I think that is what the message is telling you. But, if you think about the stocks that are below the line, they all tend to be the slower growth companies. If the industry is going to be penalized because of its volatility, it's because it is being treated like a reciprocal even though _____ is better.

The Casualty Actuarial Society is talking about specific companies. I did the same analysis in Chart 5 for companies. You see an interesting pattern that you don't see in any other industry, from a valuation point of view, to a change to use property/casualty stocks. You can see if there are clusters. You use plots clustered around that diagonal line -- as your returns go up, your valuations would go up. But that's not true in the property/casualty industry. The only way to get a high valuation in the property/casualty industry is to be a specialty company, and there aren't very many of them in the marketplace. Everybody else is clustered down below that line.

Let me talk a little bit about reserves, which is the real topic here. I don't have any theoretical problems with understanding adequate reserves. An adequate reserve can mean simply that the reserves in a company are such that _____ isn't going to hurt the reserves. When I think about it in that regard, I find myself in what Steve calls the optimist position -- what I've always called the minority position -- and, I really don't think the industry has a reserve problem anymore. I think reserves are essentially adequate. When I specifically go through the analysis, I essentially say to myself that the industry reserves are probably underreserved by 2 to 3%. That really isn't anything. Two years ago I would have jumped on the bandwagon and said that the industry reserves are underreserved by 10 to 12%. Two things have happened. The industry has added an incredible amount to reserves in the last two years. What is not showing up in the test yet is what I believe the industry has greatly over reserved the accident year 1986. If you think about the context of what is going on in the industry, a lot of this makes sense because we went through a pricing war between 1980 and 1984. The industry then turned around and the industry started raising prices to a point where it was gauging people. It made sense to _____. My analysis says that the industry is burying earnings a lot and, in fact, is caught up on the reserve deficiencies. I don't get troubled by underreserving and I am impressed by all of that. I think it's going to go on for another year or two. I think that when we get out to the end of 1987 there is going to be even more overreserving.

Let me walk you through some totals and then I will stop. My methodology is to take the 10 page reserve data. It is by far the most ridiculous method of presenting reserve data that I have ever seen in my life. It is too limited in deficiencies and no one has ever been able to make me intuitively understand what a cumulative deficiency is. The good news is that if you manipulate the data long enough, you can put it back on an accident year basis. It actually goes to show how bureaucracies work. If you think about how a company puts together reserve data, it does everything. For 10K purposes, I have to aggregate these into cumulative reserve data, so we write the program and it accumulates all of the data. Then I take the 10K data and put it on my computer and I roll it back to accident year. Every year I send a letter to the SEC saying this is ridiculous - Can we get out the middle man? When you put the data on the accident year basis, such as I do on Page 1, what you can see from my perspective is truly slow patterns.

1987 Casualty Loss Reserve Seminar
Minneapolis, MN
September 10, 1987

Consequences of Underreserving
Industry Overview

G. Alan Zimmermann

Chart 1
Industry Return on Equity

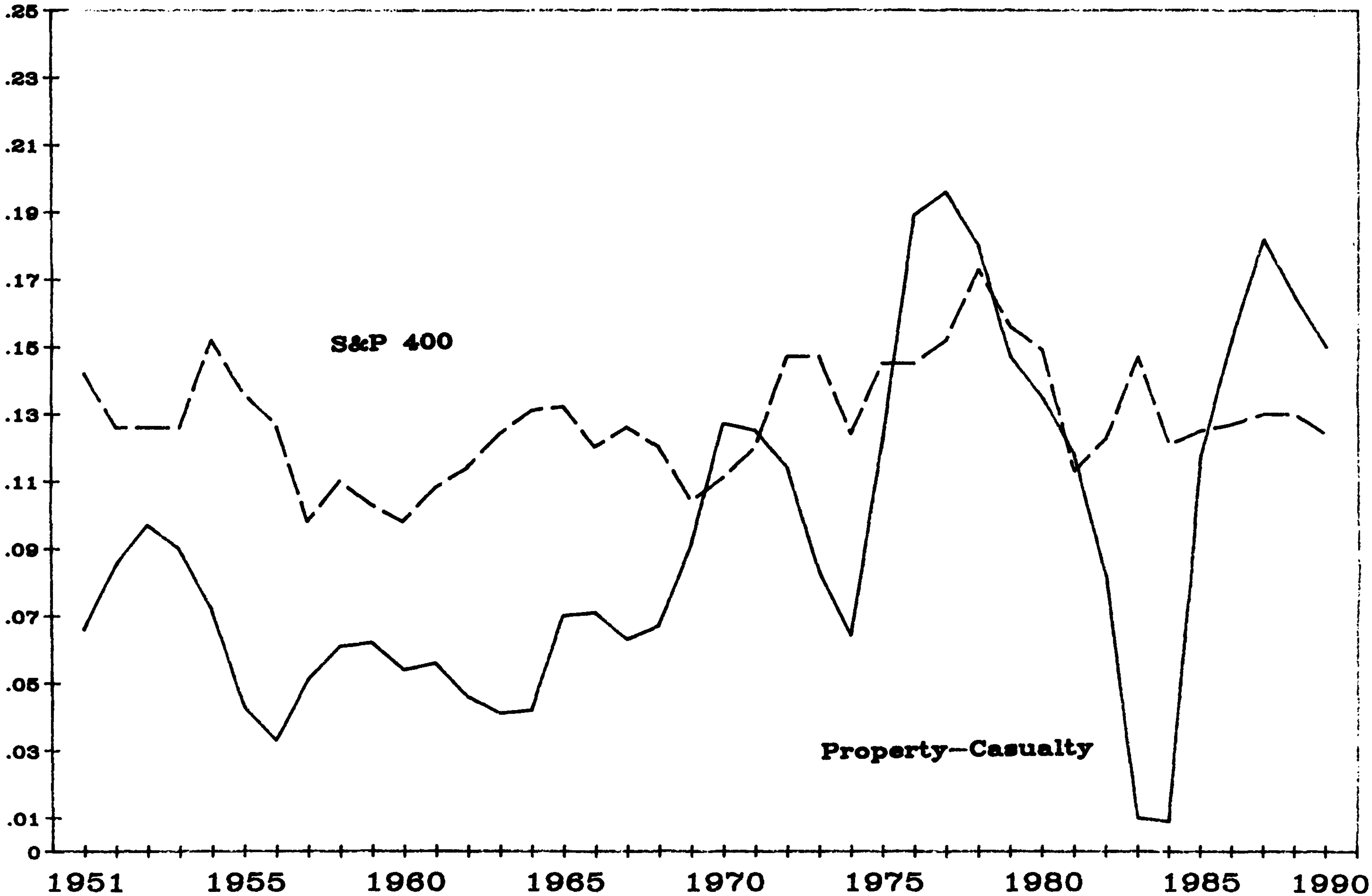
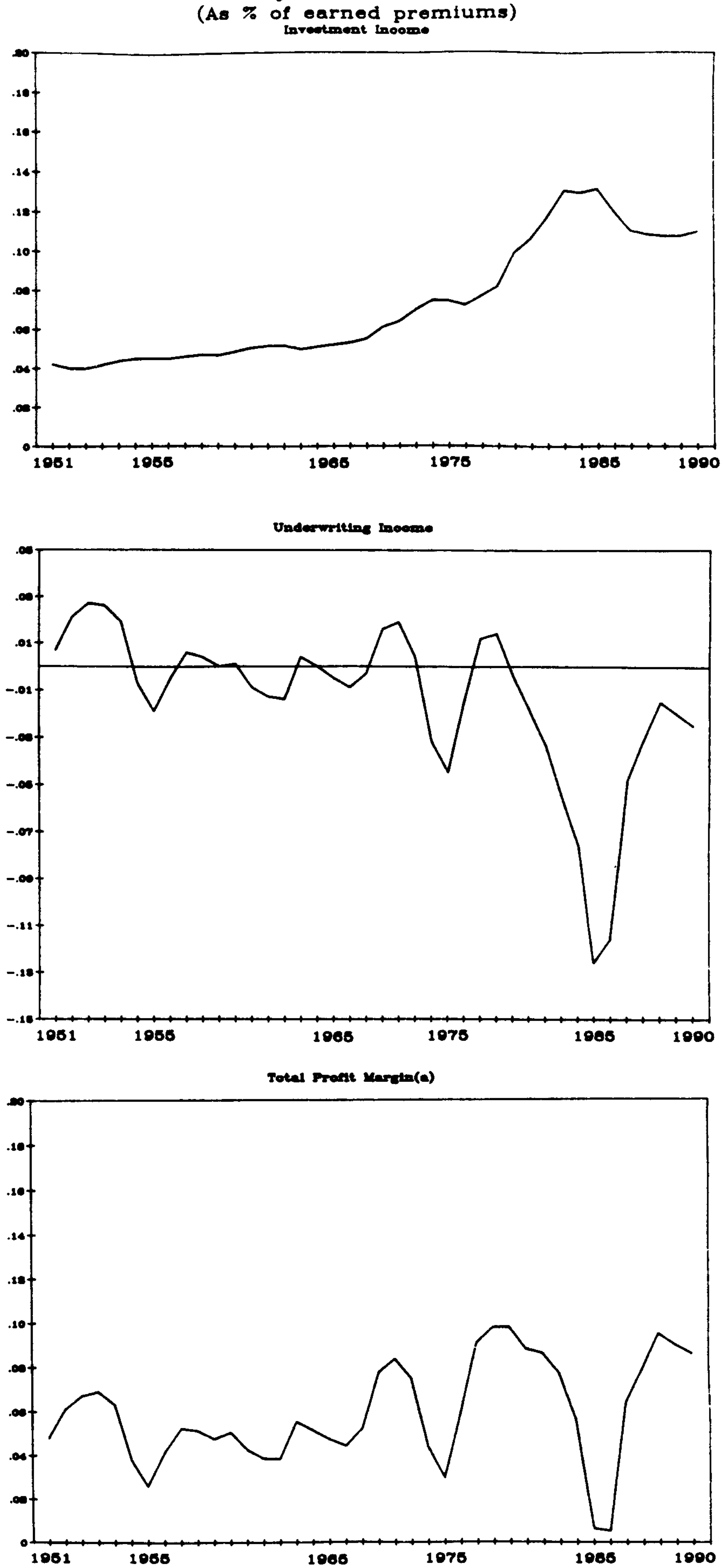


Chart 2

Industry Profit Sources

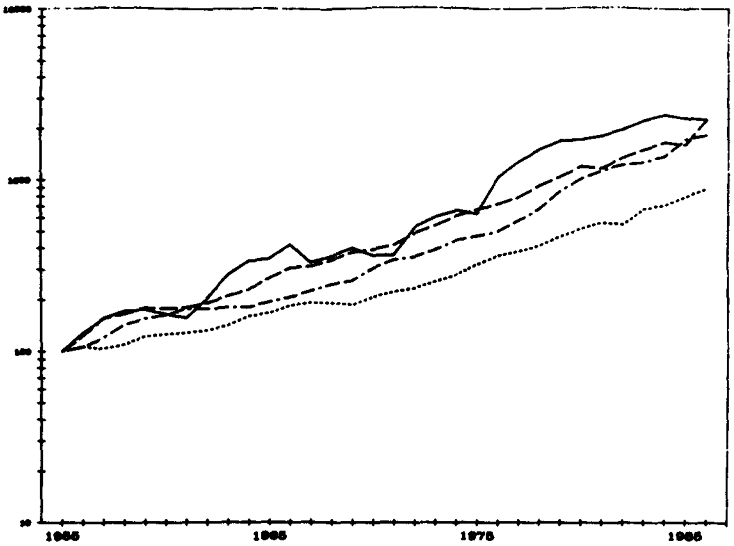
(As % of earned premiums)



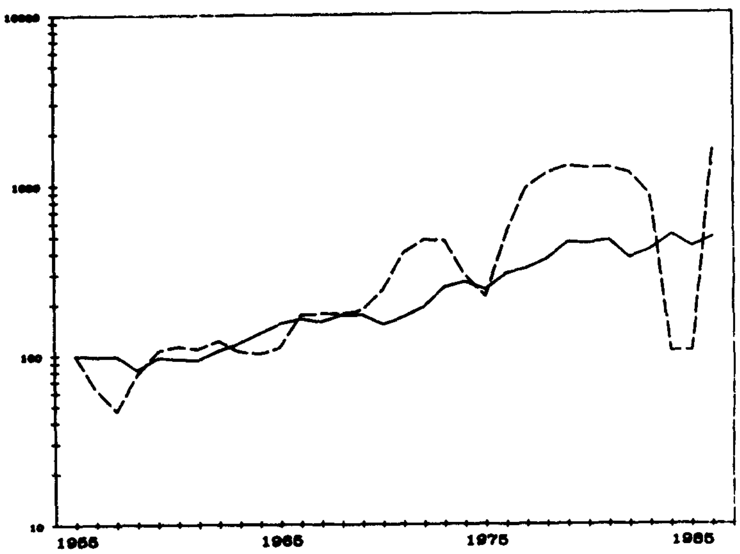
(a) Sum of investment income plus underwriting income.

Chart 3
Comparative Industry Earnings

Stable Growth

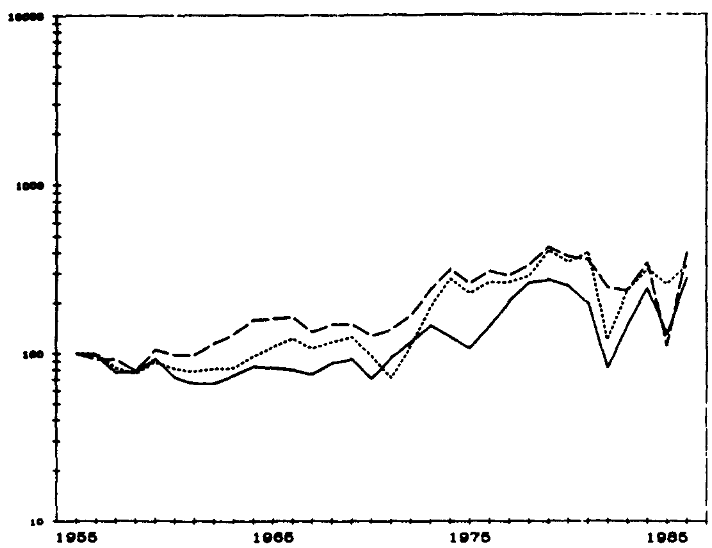


Broadcasting
Drugs
Food
Tobacco



S&P 400
Property-Casualty

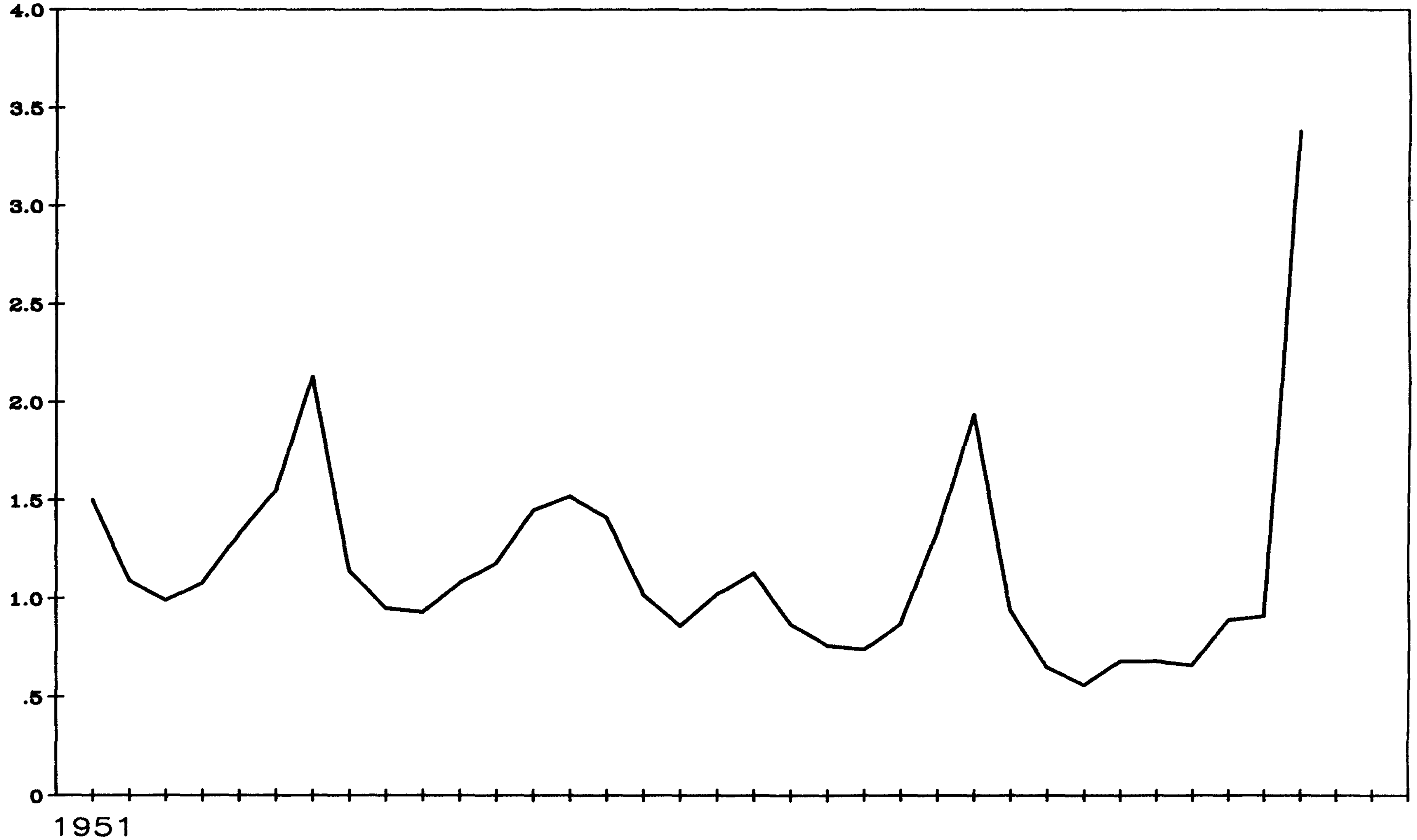
Moderate Cyclicals



Building Mat.
Chemicals
Paper

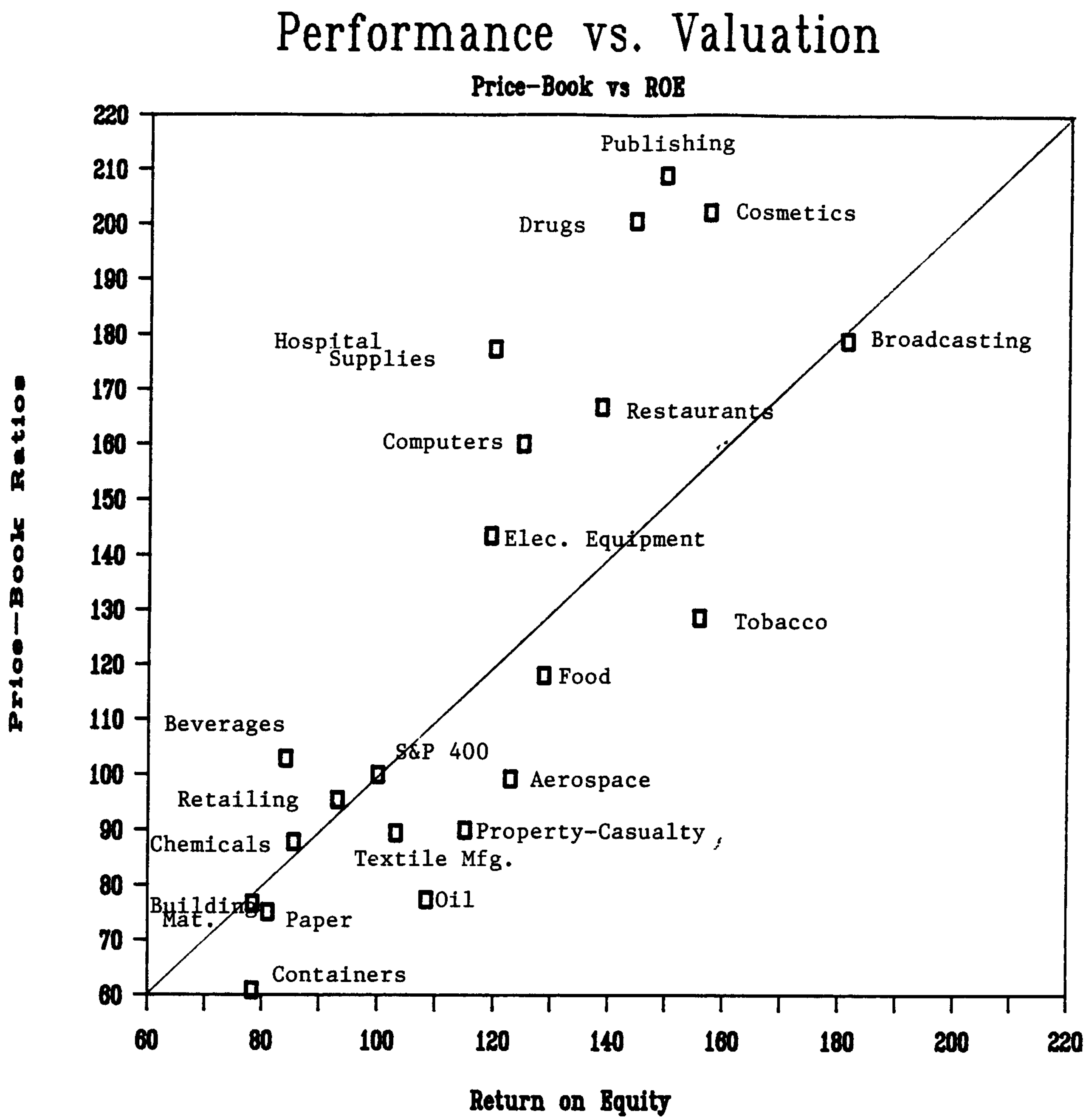
Chart 4

Relative Price-Earnings Ratios



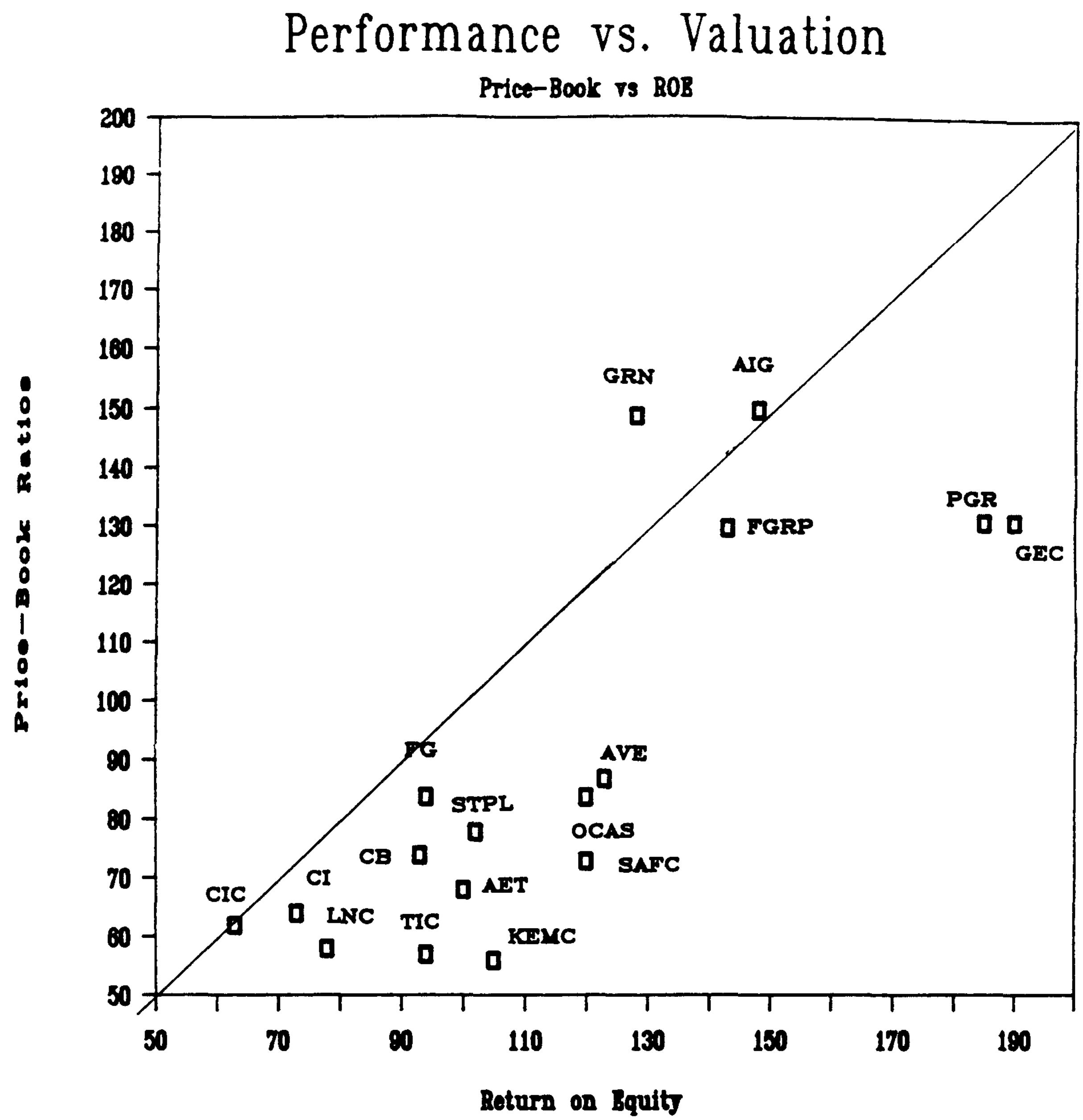
Note: 1985 Not Meaningful

Chart 5
Selected Industries



Note: Plots based on 12 years data, 1975-86, relative to S&P 400.

Chart 6



Note: Plots based on 12 years data, 1975-86, relative to S&P 400.
GEICO data 1980-86.

SYMBOLS:	AET	AETNA	FG	USF & G	OCAS	Ohio Casualty
	AIG	Amer. Int'l Group	FGRP	Farmers Group	PGR	Progressive Corp.
	AVE	AVEMCO	GEC	GEICO	SAFC	SAFECO
	CB	Chubb Corp.	GRN	General Re	STPL	St. Paul Cos.
	CI	CIGNA	KEMC	Kemper Corp.	TIC	Travelers Corp.
	CIC	Continental Corp.	LNC	Lincoln National		

1987 Casualty Loss Reserve Seminar
Minneapolis, MN
September 10, 1987

Consequences of Underreserving
Industry Reserve Analysis

G. Alan Zimmermann

Table 1

Aggregate Reserve Development Data
Accident-Year Basis
(Dollars in millions)

— — Reserve Development by Accident Year — —

	1976 & Before	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Balance at end of initial year	22359	11931	13207	14800	16424	17758	18320	20301	22792	26862	33820
Subsequent year:											
One	23102	11455	12782	14483	16138	17420	18376	20647	23880	27078	
Two	24228	11588	13010	14761	16253	17260	18689	21758	25070		
Three	24945	11579	12849	14518	15929	17202	19111	22435			
Four	25794	11618	12809	14412	15872	17416	19481				
Five	26252	11596	12697	14358	16002	17633					
Six	26694	11565	12685	14380	16179						
Seven	27287	11553	12727	14472							
Eight	27942	11602	12804								
Nine	28612	11663									
Ten	29239										
Cumulative change	6880	−268	−403	−329	−245	−125	1162	2134	2278	216	

— — As % of Initial Reserves — —

	1976 & Before	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Balance at end of initial year	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Subsequent year:											
One	103.3	96.0	96.8	97.9	98.3	98.1	100.3	101.7	104.8	100.8	
Two	108.4	97.1	98.5	99.7	99.0	97.2	102.0	107.2	110.0		
Three	111.6	97.1	97.3	98.1	97.0	96.9	104.3	110.5			
Four	115.4	97.4	97.0	97.4	96.6	98.1	106.3				
Five	117.4	97.2	96.1	97.0	97.4	99.3					
Six	119.4	96.9	96.0	97.2	98.5						
Seven	122.0	96.8	96.4	97.8							
Eight	125.0	97.2	96.9								
Nine	128.0	97.8									
Ten	130.8										
Cumulative change	30.8	−2.2	−3.1	−2.2	−1.5	−0.7	6.3	10.5	10.0	0.8	

Note: Aggregate includes following companies: Aetna Life & Casualty; American General Corp.; American International Group†; CIGNA Corp.; CNA Financial Corp.; Chubb Corp.; Continental Corp.; Fireman's Fund Corp.; GEICO Corp.; General Re Corp.; Home Group, Inc.; ITT Corp.; Kemper Corp.; Ohio Casualty Corp.; SAFECO Corp.; Sears, Roebuck & Co.; St. Paul Companies, Inc§.; Travelers Corp.†; USF&G Corp; and Xerox Corp.†.

Table 2

Aggregate Reserve Development Data
Calendar-Year Basis
(Dollars in millions)

	1976 & Before	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	Total
Calendar year												
1977	744	—	—	—	—	—	—	—	—	—	—	744
1978	1126	-476	—	—	—	—	—	—	—	—	—	650
1979	716	133	-425	—	—	—	—	—	—	—	—	424
1980	849	-9	228	-317	—	—	—	—	—	—	—	751
1981	458	39	-161	278	-286	—	—	—	—	—	—	328
1982	442	-22	-40	-244	115	-338	—	—	—	—	—	-86
1983	594	-31	-113	-106	-324	-160	56	—	—	—	—	-84
1984	655	-13	-12	-54	-56	-58	314	346	—	—	—	1123
1985	670	49	42	22	130	214	422	1110	1088	—	—	3746
1986	627	61	77	92	177	217	370	677	1190	216	—	3703
Cumulative	6880	-268	-403	-329	-245	-125	1162	2134	2278	216	—	—

Table 3

Paid-to-Incurred-Loss Analysis
(Dollars in millions)

	1986	1985	1984
Premiums earned	67891	52148	45106
% change	30	16	—
Initial year paid losses	16644	17132	15831
Initial reserves(a)	33869	26438	22516
Subsequent reserve development			
1985	—	—	1088
1986	—	216	1190
Incurred losses	50513	43786	40625
Developed			
Loss Ratios(%)	74.4	84.0	90.1
Paid-to-incurred ratios(%)			
Current	32.9	39.1	39.0
Projected(b)	34.3	38.2	38.0

(a) Does not completely agree with data in Table 3 due to differences in presentation.
(b) Paid losses + projected ultimate losses.

Table 4

Reserve and Estimates of Reserve Deficiencies
Year-end 1984 Through Year-end 1986
(Dollars in millions)

	1976 & Before	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	Total
— — Reserves — —												
Year-end 1984	4004	1146	1532	2196	3099	4863	7276	11235	22792	—	—	58143
1985												
Reserve development	670	49	42	22	130	214	422	1110	1088	—	—	3746
Losses paid	-904	-216	-375	-540	-951	-1643	-2299	-3926	-9819	—	—	-20673
Year-end 1985	3770	979	1199	1678	2278	3434	5399	8419	14061	26862	—	68079
1986												
Reserve development	627	61	77	92	177	217	370	677	1190	216	—	3703
Losses paid	-714	-180	-250	-372	-639	-965	-1722	-2826	-5227	-10566	—	-23461
Year-end 1986	3684	860	1026	1398	1816	2686	4047	6270	10024	16512	33820	82143
— — Estimated Deficiencies(+) or Redundancies(–) — —												
Year-end 1984	2000	0	0	0	-200	-150	800	1500	2450	—	—	6400
1985												
Reserve development	-670	-49	-42	-22	-130	-214	-422	-1110	-1088	—	—	-3746
Estimate changes	270	49	42	22	280	264	122	210	238	—	—	1497
Year-end 1985	1600	0	0	0	-50	-100	500	600	1600	1300	—	5450
1986												
Reserve development	-627	-61	-77	-92	-177	-217	-370	-677	-1190	-216	—	-3703
Estimate changes	427	61	77	92	227	317	70	477	590	16	—	2354
Year-end 1986	1400	0	0	0	0	0	200	400	1000	1100	-2000	2100

Note: Columns and rows may not add to totals due to rounding.

ROBERT BAILEY: Well I'm happy to be able to attend this conference in my home town for a change. I'm happy to be able to present the viewpoint of a reinsurance broker about the consequences of under reserving. A reinsurance broker is concerned about under reserving because it affects our analysis of the reinsurers that we do business with. An insolvent reinsurer has several disastrous affects. First, it increases our expenses, because when the reinsurer disappears there is no one there to back us up and help us in the claims administration, the bookkeeping, the recordkeeping, the runoff of that claims book, so our expenses go up. Plus, it of course, hurts our image with our clients --the reinsurer is no longer there. To top it all off, reinsurance is not covered by any of the state guaranty funds. Consequently, a reinsurance broker and reinsureds are more concerned about solvency than primary companies and primary policyholders and agents.

Loss reserve adequacy is a vital part of our analysis of reinsurers. Underreserving affects our analysis of profit, leverage, liquidity, all of which are measures of financial strength and stability. What do I mean by underreserving? Most companies carry a reserve which is less than the amount they will ultimately pay on outstanding claims, but more than the present value of the amounts they will ultimately pay.

Consequently, we are concerned about reserve adequacy from three aspects. First, an absolute basis -- if a company is insolvent or might be insolvent or might soon be insolvent on a present value basis, then obviously we want to avoid that company completely.

The second way we look at loss reserve adequacy is on a relative basis. As Bill Richards mentioned, he's concerned about how does Aetna compare with everybody else. We're concerned from the same point of view. As long as we feel the company is solvent, the next thing we are concerned about is how does each company compare with its peers. We want to evaluate their relative strength and stability. Of course, we prefer to do business with the strongest and most stable companies.

The third way we look at reserve adequacy is from an indicator basis. Loss reserve adequacy is an indicator of other strengths or weaknesses in the company. A material underreserving indicates that there may be other hidden weaknesses. Likewise, other weaknesses may indicate that the reserves are understated. It's like you can tell a lot about a person's work habits and character by the way he walks. If he is slow and slovenly in the way he walks, that tells you something about his work habits, his character. If he walks with a swagger, that tells you something else. Likewise, you can tell something about an insurance company's reserve adequacy by the way the insurance company walks. An important part of our analysis of a reinsurer is a review of some of these other indicators.

Of course, the way an insurance company sets its loss reserves is a part of the way it walks. If it sets adequate reserves then that's an indicator that there probably are other hidden strengths in the company. Another indicator is the relationship of the market value of its assets to statement value. Many of the assets are not carried at market value -- bonds, real estate, preferred stocks. If a company has a substantial positive difference, the market value is substantially greater than statement value, that is a hidden strength. In those cases the company is more likely to have adequate reserves. If you see a company realizing gains on its bonds and real estate, that doesn't have any affect on the real value of its assets. It only has an affect on its statement value. If you see a company taking the realized gains on its bonds and real estate, that is an indicator that possibly it is scraping the bottom of the barrel for profits and surplus. And that is an indicator that the reserve adequacy may be less adequate than average. Another indicator is gains on ceded reinsurance. If you see a company placing a lot of reinsurance and especially showing a lot of gains on it, that's perhaps an indication of surplus aid reinsurance such as loss portfolio transfers which discount loss reserves, which accelerates income into the present. That's an indicator that possibly loss reserves may be weaker than you might otherwise suspect. Another indicator is the excessive use of outgoing reinsurance. That's an indication that the company may not feel able to keep all of its business, or may be concerned about the profitability of it.

These are just five of what we call indicators of hidden strengths or weaknesses in a company. If all of the normal tests of reserve adequacy appear to be okay, but we see some of these other indicators pointing the wrong way, then we get more concerned about the adequacy of the loss reserves.

Indicators are important because the data that we're using in our reserve analysis has some problems in it. The first problem I'm going to mention is ceded reinsurance with retro-adjustments. This is a technique which tends to translate adverse reserve development into adjustments in ceded commission, or adjustments in ceded premium. If the reserves develop adversely and they've been ceded off, the company still bears the consequences of that adverse development, but it doesn't show up in Schedule O and P. It shows up in the operating statement as an expense item or a premium adjustment.

Ceded reinsurance offshore is a data problem because it often indicates that the company has discounted its loss reserves, but there's no way to cross check the amounts between the ceded and assuming companies since the offshore companies don't file a Schedule F.

Another problem is loss transfers booked as paid losses. A company will transfer $100 of loss reserves and pay $50 to the reinsurer to take that off its hands. It's long tail and the assuming companies will use the $50 plus interest on it to pay the $100 claim five or ten years later. This is, in affect, discounting reserves to present value, which makes the loss reserve run off schedules show a smaller deficiency.

You can also have a loss transfer and book it as premium, now you take $100 of reserves, you pay $50 for it, but the $50 doesn't go through Schedule O and P. It goes through the premium schedule, you book it as premium. So $100 of reserves disappears and there are never any payments. You can take a company's situation which has seriously deficient reserves and overnight transform it into adequate reserves or redundant reserves as far as the runoff schedules indicate.

Then we have mergers -- everybody handles a merger a different way. Sometimes they restate the prior years, sometimes they don't. Sometimes they just pick up the outstanding claims -- it often distorts the analysis of the Schedule P, because this year's data is often not comparable to prior years.

Then we have problems with companies that book net instead of gross. They wrote a lot of business in their excess and surplus lines operation, and reinsured most of it, but they only booked the net business so that many people -- the regulators and even some of the investors, didn't realize until too late that the real exposure was much bigger than what it appeared, because only the net had been booked.

Then we have miscoding. I can recall a company that wrote workers' compensation but didn't have any loss reserves. But Schedule P indicated that those reserves were adequate. What was going on was they were coding all of the payments to the latest accident year. That's a case of miscoding. A company that wants to can completely destroy the usefulness of Schedules O and P for evaluating reserve adequacy.

Because of data problems these other indicators assume more importance -- does the company take the realized gains -- are their assets overvalued -- are they using more reinsurance that you think they need -- those are indicators that there may be problems and you should look a little deeper.

Everybody has commented so far about where they think the industry is, as to reserve adequacy. I must confess that I don't know where the industry is. The data that we have is distorted, but it's distorted to an unknown degree. A.M. Best publishes the industry aggregates for Schedules O and P, and in the last publication of that it indicated that the reserves reported by the industry had been deficient each of the prior five years-- 1980 to 1984 -- by an amount ranging from 3% to 8% of the reserves. That's on an undiscounted basis. On a present value basis, obviously the industry was adequate if those developments are accurate and final. The data that we have has been distorted by loss portfolio transfers to Bermuda and various other places.

There are other problems in the data that I've discussed. So we know what data we have but we're not sure how complete or accurate it is.

For example, a couple of years ago Chubb portfolioed a couple of hundred million dollars of its med mal reserve to Europe. In affect, discounted that reserve by a substantial amount, and that, of course is reflected in the industry's totals, and many other transactions like that. I'm aware of a number of U.S. subsidiaries of European companies and Japanese companies who have had very adverse developments in the U.S. and have cured it by reinsuring the adverse development with their parent. I can think of one company that has shown a profit on reinsurance with parent of over $300,000,000 over the last couple of years. That also is reflected in this data.

From our point of view the average really doesn't matter all that much. We think the average is, hopefully, reasonably good and probably better now than it was. What we're concerned with much more is how does each company stand in relation to its peers. In other words, we're much more interested in the differences than we are in the averages, because our job is to pick the strongest and most reliable companies. We know one thing -- that using reported data is not an adequate basis to evaluate that relative strength.

UNDERRESERVING

- ABSOLUTE
- RELATIVE
- INDICATOR

INDICATORS

- LOSS RESERVE ADEQUACY
- MARKET VERSUS STATEMENT VALUE OF ASSETS
- REALIZED GAINS ON BONDS AND REAL ESTATE
- GAINS ON CEDED REINSURANCE
- EXCESSIVE USE OF OUTGOING REINSURANCE

DATA PROBLEMS

- CEDED REINSURANCE WITH RETRO ADJUSTMENTS
- CEDED REINSURANCE OFF SHORE
- LOSS TRANSFERS BOOKED AS PAID LOSSES
- MERGERS
- BOOKING NET INSTEAD OF GROSS
- MISCODING

STEPHEN LOWE: We have about ten minutes for questions, and as I understand the reception doesn't start until 6:00, there is really plenty of time. Three of the four of us came a long distance to be here, so I hope you'll have some questions for us.

JIM: I'd like to ask Mr. Richards to explain again what the 90/10 standard meant, because I was puzzled about what it was trying to do, and how, if it were met, would affect the appearance of statements over time.

BILL RICHARDS: The second part of that I'm going to have to think about. The 90/10 concept was simply to raise the level of the reserve to the point at which it will be above the actual payments that are merged in that reserve 9 times out of 10 full pay. The object being what that reserve -- the 90/10 economic reserve and the assets that back up that reserve will mature the obligations will itself, without any additional capital, 9 times out of 10. That's the concept.

JIM: For each individual risk, or both?

RICHARDS: We measure it on with all reserves in mind. That's what our target is to be above 100. Where we're not above 100, and I don't think many people are, in every single segment.

JIM: So, if you're not exactly right to the penny, the odds are 19% and somebody looking at the statements and saying they were overreserved rather than underreserved.

RICHARDS: I don't understand your point.

JIM: Assuming there's no such thing as being exactly reserves ... to the penny, you're saying that if you meet that standard, the odds at any one time are 90%, that when it's fully developed it will turn out to be overreserved at that point. Therefore, on a respective basis over time is always overreserved on a probabilistic basis.

RICHARDS: You would expect that there would be equity that would be released as the reserves actually mature. I think that's what you're saying -- that's right.

JIM: That's what I'm saying. I wonder if you have a measure of how much and whether that constitutes the problems with SEC reporting or the IRS.

(QUESTION INAUDIBLE)

BOB BAILEY: That question would be better directed to A.M. Best, and we do have a couple of representatives from them here. Dan, do you want to say something?

DAN KELLOGG: I'm Daniel Kellogg and I'm Vice President of the Property/Casualty Division of the A. M. Best Company. We do meet frequently with the top management of insurance companies. As a simple example, I personally have scheduled between now and the end of the year, meetings with management of at least thirty companies. During the past year we have met with numerous managements, at times accompanied by the like's of ______ and others. We do not make a point as Standard & Poors does of physically going out to each of the companies and interviewing the management of every case. There are companies that visit us on an annual basis, sometimes even more than an annual basis. There are other managements that we have never met with, and see no need to meet with. We find sufficient information from the annual statements for the evaluation.

STEPHEN LOWE: Thank you, Dan. Bob, let me rephrase a question and direct it to your current position because I think I'd be interested in a slightly different tack on the same question. In your current capacity as which I think includes looking at the strength of the balance sheets of reinsurers for Blanch, among other responsibilities. In that capacity, maybe you could address Bob Ramoff's question. In terms of determining how those reinsurers walk, you mentioned a list of elements that all had to do with the way that things were handled, I'd be curious -- does that list include quality management and do you try and meet with the managers of those reinsurers and get a feel for them?

BOB BAILEY: Yes. Management is very important and Best recognizes that. We spend a great deal of time meeting with management, both in our offices and in theirs -- and, of course, our brokers with their underwriters. That gives us an inside knowledge of how they are doing business, how they are pricing it, what they're accepting. That's very important.

STEPHEN LOWE: In summary, I guess I would say that in terms of the adequacy of the industry's reserves, we have one individual who is concerned, but only cares about 43 companies; we have one individual who is concerned, but only about reinsurance companies; and, we have one individual who doesn't care at all. I'd like to thank our panelists for doing an excellent job. Thank you.

1987 CASUALTY LOSS RESERVE SEMINAR

6E - STATUTORY EXAMINATION OF INSURANCE COMPANIES

Moderator: Richard J. Roth, Jr., Asst. Insurance Commissioner
California Department of Insurance

Panel: Robert C. Hallstrom, Senior Actuary
California Department of Insurance

Bertram A. Horowitz, President
Bertram Horowitz, Inc.

Recorder: Elise C. Liebers, Supervising Casualty Actuary
New York Insurance Department

RICHARD ROTH: I'd like to start this session. This is the session dealing with the statutory examination of insurance companies. The focus will be in terms of what insurance departments look for when they examine an insurance company; the type of data they ask for; the methods they use; and the problems they encounter. The first speaker today will be Bert Horowitz. Bert is a former Special Deputy Superintendent, and Financial Actuary for the New York Insurance Department. He is now in private consulting practice. He worked for five years with the Royal Globe Insurance Company, and has a Bachelor of Science degree from the State University of New York at Stony Brook in Applied Mathematics, and a Masters Degree in Mathematics from Brown University.

BERT HOROWITZ: Thank you, Dick. I would like to review some of the actuarial tests that regulators perform in the preliminary review of insurance companies. The major regulatory framework for solvency regulation is the statutory financial examination system. Under law, each insurer is generally subject to a statutory financial examination once every 3 or 5 years. The examination is usually directed by the insurer's domiciliary state and sometimes accompanied by other states where the insurer is licensed. Under certain circumstances, for example, when the insurance department has serious doubts concerning an insurer's solvency, it may call for a special examination.

The starting point for the financial examination is, of course, the filed annual statement. The balance sheet contained therein represents a year end snapshot of the insurer's assessment of its financial condition on a statutory accounting basis. The immediate purpose of the statutory examination is for the insurance department to independently reassess each asset and each liability as o the examination date. The process restates the statutory surplus (statutory assets minus the statutory liabilities) as of the examination date. The result is documented in a formal report on examination which is filed with the insurer's domiciliary state insurance department and each licensing state insurance department. The formal report remains on file and open or public inspection. Some or all of these insurance departments might deem it appropriate to take regulatory action based on the results of the examination. For example, of course, the finding of a deep uncorrected insolvency might cause the domiciliary superintended or insurance commissioner to seek a court order to rehabilitate or to liquidate the distressed insurer.

It is important to recognize that statutory accounting has adopted certain practical rules to value many of the assets and liabilities. For example, typical asset items are stocks and bonds. The statutory value for stocks is generally taken as the market value. On the other hand, the statutory value for bonds is generally taken as the amortized value. Typical liability items are the unearned premium reserves and the loss and loss adjustment expense reserves. The statutory value for the unearned premium reserve is generally determined by a relatively standardized pro rata formulas. On the other hand, in property and casualty insurance, there are three characteristics of loss and loss adjustment expense reserves which differentiate them from other balance sheet items. First, these liabilities are generally the most difficult balance sheet items to value. In contrast, to most other balance sheet items, there are few guidelines in the state insurance codes as to the appropriate statutory value or loss and loss adjustment expense reserves. The New York law is fairly typical in this regard. For example, Section 1303 of the New York Insurance Law provides that "every insurer shall maintain reserves to provide or the payment of all losses and loss adjustment expenses incurred on or prior to the date of statement, whether reported or unreported, which are unpaid as of the statement date". Section 4117 of the New York Insurance Law, which is also fairly typical prescribes certain minimum statutory reserves what are called excess of statement reserves. However, perhaps more importantly, within that Section, it also grants discretionary powers to the Superintendent or Commissioner in providing that he may modify the formulas for calculating such reserves, or prescribe any other basis which will produce adequate and reasonable reserves. The final report on examination put out by the insurance department ultimately rests on this authority.

The second characteristic is that loss and loss adjustment expense liabilities are generally the largest liabilities. This is especially true for insurers concentrated in the long-tailed lines of business such as workers' compensation, medical malpractice, excess of loss liability and other liability coverages. Since these liabilities are so large, a relatively small percentage change in their valuation may mean the difference between a solvent and an insolvent insurer. This is also known as leverage.

The third characteristic is that the statutory value selected for loss and loss adjustment expense liabilities by the insurer in its filed annual statement, and by the insurance department examiners are necessarily estimates. This means is impossible to eliminate all of the uncertainty in the value of these liabilities. As a by-product of this uncertainty, if a company wishes to hide its financial troubles, the easiest way to accomplish it is by understating its loss and loss adjustment expense liabilities and thereby overstating its statutory surplus. Related to this kind of purposeful understatement is the "wishful thinking" of a management which is unduly optimistic in its estimate of loss and loss adjustment expense liabilities. The task facing insurance department solvency regulators is to try to choose the most reasonable estimate of these liabilities without undue optimism or undue pessimism.

As a result of these three characteristics, Schedule P has been required by insurance departments to be included in each insurer's filed annual statement. Prior to 1969, Schedule P was constructed solely on a policy year basis, but it currently is stated on an accident year basis. While it has evolved through several other changes and refinements, it has been and continues to be a useful starting point for regulators to evaluate loss and loss adjustment expense liabilities. You have been handed a packet which contains extracts o 1974 through 1979 Schedule P's and other related exhibits from an illustrative company. I intend to refer to these exhibits throughout the remainder of my discussion. Some of the schedules and exhibits that appear in your handouts will also be presented on the slides. Hereafter, we'll assume that the examination date of this illustrative company is 12/31/79.

Schedule P is currently divided into 4 parts. Each part is further subdivided into other subdivisions. The lines of business subdivisions are a) auto liability; b) other liability; c) medical malpractice; d) workers' compensation, and; e) which includes the following 6 sublines; farmowners' multi-peril, homeowners multi-peril, commercial multi-peril, ocean marine, aircraft, and boiler and machinery. Parts 1 through 1E, which are the first three pages of your annual statement handouts, present the premium, loss and loss adjustment expense experience -- that is, cumulative payments and all reserves by accident year. The second to last column, column 11, displays the total loss and loss adjustment expenses incurred by accident year as of the statement date. The first 3 pages of the handout show other liability. The incurred value is defined as the cumulative payment through the statement date plus the reserves at the statement date. It is important to realize that these incurred values are the company's estimate of accident year ultimate loss and loss adjustment expense reserves. If the reserves for each accident year were perfectly correct at each statement date, then the Part 1, Column 11 incurred value of any particular accident year would be identical at every statement date. Any increase from the initial incurred value at subsequent statement dates is called upward development and represents an insurer's acknowledgement of underreserving of that initial value. A decrease from the initial incurred value at subsequent statement dates is called downward development. And represents the insurer's acknowledgement of overreserving of that initial value, resulting in a savings in those reserves.

The top portion of the 4th page of the handout displays extracts of Schedule P, Part 1F which gives the insurers accident year distribution of incurred but not reported losses included in the insurer's total loss and loss adjustment expense reserve at statement dates 1975 through 1979 for other liability. A one year development of IBNR by accident year appears on the bottom half of your page. Footnote (a) of the instructions to Part 1, which has not been provided in your handout, provides instructions for calculating the so-called excess of statutory reserves over the statement reserves.

The top part of the 5th page of this handout displays the 1979 Part-2 Summary. Parts 2 through 2E are simply a summary of Part 1 accident year incurred values for the current statement date and the prior 5 statement dates. The right hand side of Parts 2 through 2E similarly recap the loss and loss adjustment expense ratios. The top portion of the last page of the handout displays 1979 Part 2 other liability. The prior page is a summary of the entire company including all lines. The bottom portion of these final 2 pages displays the 1979-Part 3 and Part 3B respectively. Parts 3 through 3E show the cumulative payments and their relation to earned premium or the current and six prior accident years. Payments and reserves to earned premium ratios are also calculated from the incurred loss and loss adjustment expenses as of the statement date for each accident year at annual intervals.

Now, I would like to turn to some specific uses and limitations of Schedule P using figures of our illustrative company. Turning our attention to Schedule P, Part 2 Summary (the second to the last exhibit sheet in your exhibit handout) will give us a retrospective test of the adequacy of prior loss and loss adjustment expense reserves. For example, on Row 4 of Part 2 in the 1979 annual statement, the company shows an incurred loss and loss adjustment expense figure for accident year 1975 at the 1975 statement date and each subsequent statement date through 1979. It is the 4th row of figures. In this example the company originally estimated the ultimate incurred loss and loss adjustment expenses for accident year 1975 at $21,729,000. At the end of each subsequent year the company totaled its cumulative payments for accident year 1975 and re-estimated its remaining outstanding liabilities. In general, an ever increasing portion o the total incurred is comprised of actual payments rather than reserve estimates. At the end of 1979, the company estimate of the ultimate incurred loss and loss adjustment expense for accident year 1975 developed upward to $26,736,000. The $5,007,000 increase over the original $21,729,000 represents a deficiency in the original reserve established at year end 1975. Therefore, if there were no more developments beyond 1975, the company should have shown $26,736,000 as of its 12/31/79 accident year incurred loss adjustment expenses at every valuation. This is a retrospective acknowledgement that they were $5,007,000 underreserved as of 12/31/79.

Similarly, the total loss and loss adjustment expense reserves--that is, of all accident years -- as of the statement date can be retrospectively tested using the cumulative total row of Schedule P, Part 2. For example, on Row 5 of the Part 2-Summary in the 1979 annual statement, the company showed incurred loss and loss adjustment expenses for accident year 1975 and prior at the 1975 statement date and each subsequent statement date through 12/31/79. In this example, the company originally estimated the ultimate incurred loss and loss adjustment for accident years 1975 and prior at $378,881,000. At the end of each subsequent year, the company totaled its payments or accident years 1975 and prior and re-estimated its remaining outstanding liabilities. In general, each subsequent incurred evaluation should similarly become more and accurate because a higher proportion is comprised of payments rather than estimated reserves. At the end of 1979, the company estimate of ultimate incurred loss and loss adjustment expense or accident year 1975 and prior developed upward to $401,852,000. The $22,971,000 increase from the original figure to the final figure represents the company's, acknowledged deficiency in its original reserve established at year end 1975 for accident year 1975 and prior. Therefore, if there were no further developments beyond 1979, the company, by its own admission, should have shown $401,852,000 as the ultimate accident years 1975 and prior loss and loss adjustment expenses at every statement date. In addition, we can say that the loss and loss adjustment expense liabilities reported in the 1975 annual statement balance sheet should have been $22,971,000 higher than was actually reported. Going down on the Schedule to the 1978 reserves, we can see that a one year development of approximately $14 million has occurred. That is, the $475,075,000 as compared to the $489,277,000. On your handouts, as well as on the slide, the right hand side of Schedule P, Part 2 recast the dollars shown on the left hand side by accident year in terms of loss and loss adjustment expense ratios to calendar year earned premium.

Paralleling our earlier analysis, if we focus again on 1975 (and assuming the reserves at year end 1979 are correct), then the company should have established reserves for accident year 1975 such that an 86.1 loss ratio would have resulted. Therefore, the 1975 accident year reserves as of year end 1975 were deficient in loss ratio terms by 86.1% minus 70.0%, or 16.1%, of the calendar year 1975 earned premium. Similar deficiencies are evident in all accident years. These trends might suggest, subject to some limitations, that the most recent years reserves may be inadequate. In this case, most recent refers to 12/31/79.

A secondary regulatory concern is the absolute level of these loss ratios. It's apparent from the Schedule that the developed loss and loss adjustment expense ratios are in excess of 85%. It would be very difficult for many companies to survive this state of affairs for very long.

Another area for review is the accident year loss ratios at their first evaluation. A review of the loss ratios might indicate that the company might have strengthened or boosted its reserves in recent years, and that possible past trends may not apply. For example, assuming the same relative adequacy of earned premium, if accident year 1979 had a loss ratio of 90, instead of 67.5% (the lower right hand figure), a comparison to other years at their first evaluation would show 1979 to be much higher, and the company had possibly more accurately estimated its reserves for that year. A lost of this is also a function of the adequacy of the earned premium.

A sharp general decline in accident year incurred loss and loss adjustment expense ratios at the current statement date may also signal reserve deficiencies. For example, the Schedule shows a fairly consistent fall from a 98.5 high down to 67.5% or accident year 1974 to 1979 respectively. Of course, consideration should be given to rate adequacy and distorting influences, such as change in mix, reinsurance agreements, and other potential mitigating or aggravating factors.

Another variation of the retrospective test can be directly obtained from Schedule P, Part 2. This is illustrated in the first exhibit of your legal sized handouts, and is titled "Retrospective Solvency Testing." The purpose of this test is to retrospectively restate prior year end surplus in view of the company's subsequent loss and loss adjustment expense reserve developments. Since the statutory surplus equals the statutory assets minus the statutory liabilities, a dollar increase in the estimate of the liability for loss and loss adjustment expense should correspond to a dollar decrease in surplus. Of course, there are possible exceptions to this, such as the excess of statement reserves over statutory reserves, federal income tax offsets, unauthorized penalties, etc. This exhibit bypasses the excess of a statutory reserve problem by considering the statutory reserve as part of the surplus, but ignores any tax or other consequences, such as the unauthorized. In reviewing our retrospective analysis of the statement date reserves, consider the 1975 surplus. The company reported a statutory surplus

$6,163,000 at year end 1975. The incurred loss and loss adjustment expenses for accident year 1975 and prior were valued at $378,881,000 at year end 1975. You'll recall that this is as similar to what we just did on Schedule P, Part 2. The incurred loss and loss adjustment expense for accident year 1975 and prior evaluated 1 year later -- that is in 1976 -- developed to $381,759,000. The increase of $2,787,000 -- the difference between the two figures -- represents the company's acknowledged deficiency through 1976 in the original reserve as of 1975 on accident years 1975 and prior. Therefore, in view of the company's own development through 1976, the company, by its own admission, should have stated its reserve $2,878,000 higher. Therefore, its surplus should be $2,878,000, that is, $6,163,000 of the original, minus the upward development of $2,878,000. Continuing this process for another year reveals that this company has retrospectively declared itself insolvent by $3,004,000 as of 1975 in view of developments through 1977. Skipping to developments through 1979, the last statement available, this company has retrospectively declared itself insolvent by $16,808,000. Exhibit 1 shows that even though a company has reported itself in a solvent condition in every statement and in every balance sheet, subsequent developments of their reserves have caused the company to, in effect, retrospectively declare itself statutorily insolvent each year. It is also significant to note that the insolvency and the reserving problem appear to be worsening because, the 1974 developed a retrospective insolvency after 3 years, 1975 through 1977 after 2 years, while 1978 actually developed a retrospective insolvency by the company's own admission after only 1 year. Actually, this exhibit represents adaptation and expansion of one of the most widely disseminated regulatory tests. The final 3 ratios consider 1 and 2 year reserve developments divided by surplus. Any upward development in excess of 25% of surplus is considered failure of the test and cause for regulatory concern. I probably should mention at this point that IRIS' forerunner was called the NAIC Early Warning Test. It is clear from Exhibit 1 that the company was unable to pass any of the tests for any year displayed.

Up to this point, we have been looking at Schedule P, Part 2 Summary only. That is, all the Schedule P lines ("A" through "E") combined. The "A" through "E" subdivisions of Schedule P, Part 2 allow for a similar analysis by line. The by line analysis is very important because shifts in business for one line to another affect the ability to conclude that prior trends apply to recent years. Of course, subline shifts within a line can also have this effect.

As an example, I will briefly discuss other liability for the by line analysis. Note, we just did the summary of all Schedule P lines combined. The top half of the last page of your Exhibits shows a generally consistent upward development by accident year and by statement year on the left-hand side. As a consequence of this, the right hand side, those left hand side figures divided by a fixed earned premium within each accident year, shows the expected generally upward trend in the accident year loss and loss adjustment expense ratios.

We now move to Schedule P, Part 3 on the bottom of your final exhibit, as well as on the slide. The left-hand side is a compilation of the calendar year earned premium, accident year cumulative loss and loss adjustment expenses paid, and the company's current accident year incurred loss value. Cumulative loss and loss adjustment expenses are displayed at 1, 2, 3, 4, and 5 years from the inception of the accident year. These payments do not change at subsequent statement dates once included in Part 3. The reserve figures displayed on the Schedule are the loss and loss adjustment expense reserves that "should have been" established at year end 1, 2, 3, 4, and 5 years from inception of each accident year under the assumption that the company's current incurred values are correct. For example, the loss and loss adjustment expense reserve for a particular accident year that "should have been" established at the end of 2 years is computed a the current incurred value minus the cumulative payment through those two years. Of course, these should have been reserve values will change at subsequent statement dates by the same amount as the subsequent re-estimated incurred values, unless, the company perfectly estimated its ultimate incurred values at each statement date.

Parts 3 through 3E provide a prospective test of loss and loss expense reserves. I will focus on Part 3B, other liability, in more detail. The prospective attempt to determine the adequacy of the reserves set at the current evaluation rather than set at prior evaluations as done in the retrospective tests in Parts 2 through 2E.

Current reserves are tested by reviewing and comparing several ratios which are made available by the organization of Parts 3 through 3E. One such ratio which is directly available to us is the "should have been" reserve to earned premium ratio given in the right hand side in Columns (8) through (14). If the last reserve ratio in each row is significantly lower than other ratios within a row, this might suggest that current reserves are inadequate. This is somewhat analogous to what we did in Schedule P, Part 2. For example, in Row 4, the last ratio corresponding to accident year 1979 is 52.6% whereas the average of all the other ratios in the Row is 72.2%. In Row 6, the last ratio corresponding to accident year 1979 is 54.0%, whereas the average of the other ratios in the row is 56.2%. In Row 8, the last ratio corresponding to accident year 1977 is 37.1%. The average of the other ratios in the row is 41.8%. In Row 10, the last ratio is 12.5% corresponding to accident year 1976, versus an average o 31.3%. Finally, in the last Row 12, the ratio corresponding to accident year 1975 is 8.5% versus an average of 21.5% in every case, the last ratio is lower than the average of its predecessor evaluated at a common point in time. This certainly suggests that the current reserves, that is, the reserves held in the 12/31/79 statement are inadequate. Some of the important implicit assumptions in this test are that the payment pattern, the adequacy of earned premium and the ratio of the required reserves to earned premium are relatively constant for all years. Limitations which apply to Part 2 through 2E also apply to Parts 3 through 3E, such as reinsurance. Their impact will be reflected in both the incurred loss and loss adjustment expense ratios and the payment pattern for each accident year.

I want to mention a relatively new discounting Schedule which I know has been discussed in several other sessions. Schedule P, Part 4, which was a new schedule to be included beginning with the 1985 annual statement, provides information on the amounts of discount of the gross loss and loss adjustment expenses unpaid. This does not in any way mean that the insurance department of any state is sanctioning or approving discounting. This is merely for disclosure purposes. Parts 4A through 4E display the interest rate, loss and loss adjustment discount amounts adjusted or in the process of adjustment, as well as the incurred but not reported amounts of discount for each line.

The New York Insurance Department's position on discounting is based on a long tradition of statutory accounting and relies on Section 4117(g) of the Insurance Law, which adopts the NAIC Accounting Procedures and Practices and Procedures Manual rule which states:

"Generally, a company is required to determine what the value of its claims will be when they are ultimately set. Excluding certain types of losses in which the settlement consists of periodic payments of specified amounts and which may properly be discounted with conservative interest assumptions, statutory accounting practice require that for every dollar of unpaid losses the company reserve a whole dollar for future payment of those losses."

Under Section 4117(d) of the Insurance Law, Workers' Compensation determinable and estimable future loss and loss adjustment expense payments are computed on an individual basis shall be scounted at the very conservative interest rate of 3.5% per annum. This discounting is applicable to Workers' Compensation tabular reserves, which, following that general NAIC rule, are reserved for periodic payments of specified amounts. In addition, the Superintendent of New York has made one exception. Using his discretionary power that I referred to earlier, he has made exception to the general NAIC rule in the area of Medical Malpractice reserves at an interest rate that is appropriate for the particular company under consideration.

Note that Portfolio Transfer Regulation 108, which New York promulgated about 3 years ago, implicitly permits discounting of reserves, although they are not explicitly shown as discounting in the new Part 4 schedule.

The most useful part of Schedule P or loss reserve specialists is Part 1. Part 1 provides the data base or every subsequent part of Schedule P -- Parts 2 and 3. You can construct Schedule P, Parts 2 and 3 rom having successive Schedule P, Parts 1 of historic annual statement dates. Some specific applications of Schedule P include payment development triangles, incurred development triangles (excluding IBNR), and expense reserve analyses. The New York Insurance Department includes these methods as part of their preliminary analysis. Prior seminars have reviewed that material. Exhibit 6, the payment development through 12/31/79, indicates a $12,352,000 deficiency. Exhibit 8 indicates an $8,381,000 deficiency as per the incurred development method. The loss reserve specialists attempt to narrow the difference between the payment development indication, the incurred developments indication, as well as any other methods. Often, an extensive actuarial analysis of several methods are performed for purposes of comparison to arrive at what we consider the appropriate report on examination figure.

Up to this point I have described certain tests based on Schedule P that can be done in a kind of cookbook fashion. I cannot over emphasize the fact that these are really just early warning or preliminary tests. There is no sure fire recipe that always cook up the correct reserves. Understanding the trends and changes that affect the database is a prerequisite to the application of sound reserving methods. Data contained in Schedule P is generally only sufficient to gain preliminary insight into what is going on. Knowledge of changes in underwriting, claims handling, data processing, and accounting, as well as changes in the legal and social environment, can affect the experience and are essential to an accurate interpretation and evaluation of the observed data and the choice of reserving methods.

RICHARD ROTH: That was a detailed description of Schedule P. The next speaker is Robert Hallstrom, who is a colleague of mine at the California Insurance Department. Bob is also a fellow of the Casualty Actuarial Society. He has worked for four years for Trans-America Insurance Co.; four years for the Cal-Farm Insurance Company; and has now worked two years for the California Insurance Department as a Senior Casualty Actuary. He has a Bachelor's and Masters degree in Mathematics from the California State University in Sacramento. When Bob finishes I will give a presentation on some of the areas that we show needing improvement in the Schedules O and P.

BOB HALLSTROM: I thought I would just elaborate a little more on the process that I go through when we actually conduct a financial exam of an insurance company. I aid the insurance examiners in evaluating the loss and loss adjustment expense reserves. One of the first things that we do is to take the Schedule O and Schedule P data and input it into the computer. We have a computer program that does a rather thorough analysis of that data. This gives us an initial look at the reserve situation of an insurance company, and it takes the analysis of that data as far as possible. There are many limitations in using annual statement data, and when I actually participate in an exam we try to overcome any of the limitations that might exist. One of the other things that I do when we first start an exam is send the company a questionnaire about the loss and loss adjustment expense reserves. The questionnaire tries to determine if there have been any changes in mix of business, underwriting standards, settlement patterns, or anything like that, which would have some bearing on the adequacy of loss and loss adjustment expense reserves or adverse affects on some of the methodologies that we might apply. Based on that I might then try to adjust the techniques or data so that I can make a more accurate determination of the reserve level. Another thing that the questionnaire focuses on are the methods and data that are used by the companies in setting their loss and loss adjustment expense reserves, so that I have an idea before I even visit the company, what will be available when I arrive. Another thing I do is request a copy of the actuarial report that was prepared to justify the reserve levels that have been selected. In California we require that a loss reserve specialist render an opinion on the reserves; and this is simply a request to see the documentation that is available to support that statement of opinion. That's often on a very good starting point because it provides some analysis that have been prepared by a qualified person. It usually mentions some of the unusual circumstances that may exist, and I usually refer to that report many times in the process of judging the reserves. It is also often a good source of data that might not be available in the annual statement but would be useful in analyzing the reserves. Another thing that I do is ask for data on a different basis than is available in the annual statement. Frequently the exam will not begin until many months after the effective date of the examination. We will therefore have some additional development available, so I'll ask for updated development triangles that incorporate this additional data. For instance, if June data is available I'll ask for a development triangle with June evaluation dates rather than the traditional December evaluation dates that are used in the annual statement. By using this additional development it just it possible for me to develop a much more accurate estimate of the reserve level. Also, I will often ask for accident quarter data if I feel that would be of some value. In particular, in the case of a small new company that has grown rapidly, accident quarter data is helpful in correcting for the change in the size of the company. Another consideration is whether the reinsurance retention has changed significantly over time. I'll frequently ask for data on a direct basis rather than a net basis, so that I can avoid the distortions that might result from using net data. When I finish analyzing the direct data I'll have to develop an estimate of the ceded reserves so that I can convert my results to a net basis. As or the methods that I use when I look at a company -- one is the paid loss development method. That's a fairly traditional method. The data is usually readily available at most companies, which is one of the reasons it is a favored method with me. The necessary data is available in the annual statement if the line of business definitions there are appropriate for the analysis. Commonly, for lines such as automobile physical damage or workers' compensation, I find that a paid loss development approach provides useful estimates. Another method is the incurred loss development method which is based on the development factors for case incurred losses.

Another approach I use for short-term lines of business when sufficient development is available is to simply calculate a runoff estimate. In the six or nine months which may have elapsed since year end, there will be sufficient development to produce a reasonable estimate. I will use that for some of the very short tailed lines of business. Another approach I have used is the reserve development method. It is an approach commonly used for claims made data of medical malpractice companies. Occasionally I will use frequency and severity approaches or counts and averages techniques as they are sometimes called. I often find the data required for these approaches is not available at the smaller companies, so frequently I am unable to apply them because.

Now, on to loss adjustment expense reserves. I actually find this is frequently where a company is having problems with their reserving. Usually between losses and loss adjustment expenses, loss adjustment expense is the more common source of problems.

For allocated loss adjustment expenses some of the methods I've used are simply to apply a paid development method to the allocated loss adjustment expense payments. These are readily available in the annual statement. Another approach, and one that has many variations, is to look at the ratio of paid allocated loss adjustment expenses to paid losses displayed in the form of a development triangle. The ratios are developed to their ultimate values. Then you may apply the estimated ultimate ratio to the estimated ultimate losses, and that provides you with the estimated ultimate loss adjustment expenses. Finally, a third method that I sometimes have to use is to apply the incurred development technique to case incurred losses and loss adjustment expenses on a combined basis. The reason I have had to do that is that some companies establish case reserves which cover both losses and allocated loss adjustment expenses, without segregating the two. Thus, in order to use case reserves in any sort of methodology you have to calculate the estimate on a combined basis.

Finally, for unallocated loss adjustment expenses, I use a fairly standard approach. I look at the ratio of calendar year paid unallocated loss adjustment expenses to paid losses. I apply fifty percent of that ratio to the total loss reserves, and then I also apply fifty percent to the IBNR reserve. An alternative method, and one which I have been using more frequently in recent years, is to apply fifty percent of that ratio to the total reserves, but instead of using the IBNR reserve, I simply add five percent of the estimated unallocated loss adjustment expense to be paid during the upcoming year. The reason I do this is because it tracks more closely with the way that unallocated loss adjustment expense payments will ultimately be allocated by accident year in the annual statement according to the formulas for that allocation. I think this provides a reserve that is a better measure of the ultimate payments.

Next, I'd like to just mention a few things relative to certain specific lines of business that I think might be interesting. The first is workers' compensation, especially that in California. There are a number of small companies in California that specialize in writing workers' compensation. I have reviewed a number of them and found various problems that exist. One of the things that happened was a sizeable benefit increase in 1983 which had a significant impact in the incurred loss development factors for several years. We found that the factors from prior years no longer applied, and that the development factors from the most recent years were the most appropriate. Something else that had an affect on reserves in workers' compensation was the increased cost and utilization of vocational rehabilitation in California. This increased the overall cost of workers' compensation. Also, the adequacy of the rate level has changed. That has had an impact on the loss ratios, and I think it has also had an impact on the level of loss reserves that companies have been willing to establish. Another place that I have found a problem is in the allocated loss adjustment expense reserve. I've found inadequacies in many cases. It resulted because the attorney costs were actually increasing faster than the loss costs. What I've discovered at many companies is that they have recognized this fact and they're trying to take measures to correct for it. One way was to try to internalize as many of the procedures that they could. For instance, if a lawyer had to send a simple letter or get copies of files or something like that, they would have their own personnel do it and save a considerable amount of money. Another area that I've looked into is reinsurance. In the case of a professional reinsurer, we require them to establish an asset for the earned but not booked premiums, and also to establish corresponding loss and expense liabilities for those premiums. There are various other ways of doing this, but this is the one that we have selected as giving the most accurate picture of the financial condition of a reinsurer at a given point in time. Basically what you need to do to develop the earned but not booked premium is to obtain underwriting year experience and project the written premium using a development factor approach. From there you calculate the portion that has been earned as of a given point in time using the distribution of the premium writings. Then you project ultimate loss ratios by line of business and apply those to the earned premium as of a given point in time to derive the corresponding incurred losses. Another interesting line of business is mortgage guarantee insurance. It is rather interesting because it is a long-term line of business, since the policy has a guaranteed renewable feature to it. That is, the mortgage guarantee company is committed to renewing the contract every year at a stated premium. The problem that results is if a company has poor underwriting for a period of time or inadequate rates, they can ultimately become insolvent because of the commitment to renew those contracts. I think because of that a loss reserve analysis itself doesn't provide the total picture for a mortgage guarantee insurance company. You really have to look at the projected future premium income and the projected future losses because of the guaranteed renewable feature.

The California Insurance Code does provide for a contingency reserve based on the earned premium of a mortgage guarantee insurance company, and to some extent that contingency reserve does guard against the problems that can arise because of the long-term nature of the commitment. To talk more specifically about the loss reserves for a mortgage guarantee insurance company, basically these are divided into several categories: delinquencies, forecloses, and claims. These categories correspond to the status particular loans may have at any point in time. Delinquency simply means that the borrower is delinquent on the payments. Foreclosure means that the lender has actually proceeded with foreclosure. Claim means that they've gone through foreclosure and they are presenting the mortgage guarantee insurance company with a claim for a specific amount. Reserves are established for all three of these categories. An interesting feature arises in the delinquency and foreclosure categories. In many cases borrowers that are in those categories will not ultimately produce a claim, because they will eventually catch up on their payments or some other financing will be arranged. A so-called "cure" occurs in those cases. What you do is look at the inventory of delinquencies and foreclosures and build in an estimate of how many of those will ultimately be cured and not produce a claim. Then you establish an average reserve for those that will ultimately produce a claim. I see I'm running out of time so I will stop there. Thank you.

R. ROTH: I'm the Assistant Commissioner of Insurance in the California Department of Insurance, and also the Chief Property Casualty Actuary. What you've heard already today is a review of Schedule P and an overview of some of the special considerations we have to make when we as regulators look at an insurance company. What I'd like to do is go over some of the areas where financial reporting could be improved and where we happen to have some difficulties with the current financial reporting. I'd like to cover some of the actuarial problems with Schedules O and P. Prior to 1985, losses incurred did not include IBNR for fidelity and surety. Therefore, companies writing heavily in fidelity and surety always showed an adverse development on Schedule O. This affected the NAIC Early Warning Test. However, in 1985 this was corrected and now we're getting accurate reporting on fidelity and surety. The reinsurance line is included in Schedule O. It is a long-tail line and it is difficult to test the IBNR. What happens in reinsurance often buries what happens in the other lines in Schedule O. For this reason, we often remove manually the reinsurance line from Schedule O in making an actuarial projection in the combined lines of Schedule O. In the current annual statement there is a separate table showing the development on reinsurance. However, this could be improved further by taking reinsurance and breaking it down by line. In other words, automobile, workers' compensation, commercial and so forth. This is being proposed. Another problem is the international line. Development on international lines can be greatly affected by changes in foreign exchange rates. There may appear to be serious adverse development in the losses. Actually what is happening is that the foreign currency is strengthening against the U.S. dollar. There is simply no way to solve this problem, and it can affect the NAIC Early Warning Test. The true loss development can only be obtained by examining the loss statistics in their original currency. Schedule P is intended to enable a more detailed analysis of the liability or long tailed lines. However, Schedule P can be distorted by reinsurance contract. In fact, any reinsurance contract other than a quota share contract can distort Schedule P. Particularly damaging are loss portfolio transfers and contracts where retentions change from year to year significantly. In a loss portfolio transfer a block of outstanding losses is ceded out. This means that a section of the loss development projection triangle will be missing and the losses cannot be projected. The reverse problem occurs when a block of outstanding losses is assumed. The loss development factors cannot be determined because the old losses cannot be separated from the new losses to see the trends. A more subtle problem occurs when the retention provisions of the reinsurance change or when the provisions of the surplus contract change. The loss development factors would be directly affected by such changes and adjustments may be necessary in using these factors to project the ultimate losses. Very large insurers commonly report on a pooling basis. Thus, one member of the group would be allocated a percentage of the group's losses and expenses and the results reported accordingly in the annual statement. If the percentage allocation changes from year-to-year, the member company's annual statement will become worthless. In such a case, only the groups consolidated annual statement can be used. For this reason, I almost entirely rely on consolidated annual statements for large groups, and we very rarely look at the individual so-called pup company annual statements.

Another problem is that of fronting. In a fronting situation almost all the risks are ceded to another insurance entity--quite often an offshore insurance company. The problem is that the fronting company receives only a small portion of the premium but can be liable for all of the risk if the offshore insurance company becomes insolvent. Schedule P, of course, will not show this potential liability at all. I've been pushing the NAIC Blanks Committee to add additional schedules which would give us basic data in Schedules O and P on a direct basis. This would remove the problems with reinsurance, and particularly give the profitability of the fronting business. However, the NAIC Blank Committee has been reluctant to add any more schedules to the blank. Also, while reporting on a direct basis will solve many problems, it will not solve all of the problems. At the California Department, when we do an examination of a company, we almost always ask for data on a direct basis from the company, as Bob described. One good advantage of reporting on a direct basis is this will give the profitability of the whole book of business and by implication the profitability of the reinsurance business being ceded. This is important because if the ceded business is not profitable, then there will eventually be problems with the reinsurers. Thus, if you take and analyze a company on a direct basis then you know the total profitability. By removing the ceded business, you can see the profitability of the net retained and the profitability of the business being ceded. If the business being ceded is unprofitable, you know the company is going to have problems with the reinsurers in the not too distant future.

Some other problems with Schedules O and P are among the following. A shift from occurrence policies to claims made policies will invalidate the analysis of Schedule P. In such a case an actuarial analysis will have to be based on historical report year information. Although Schedule P asks for accident year data, most companies writing claims made policies ignore the heading and present report year data. The problem is that occurrence losses will have IBNR in their development, whereas claims made losses do not have IBNR. Thus, if a shift has occurred, the projected losses will be greatly over stated.

Another problem occurs when any of the losses are reported on a discounted basis -- then there will be adverse development by the amount of the discount. This happens sometimes in workers' compensation and sometimes in medical malpractice. To deal with this problem a supplemental Schedule P - Part 4 is required, which shows the amount of the discount of the losses and expenses unpaid. Schedule P should give the number of claims reported. This would enable average incurred losses to be determined. The present annual statement gives only the number of claims outstanding, which is of limited use from an actuarial analysis point of view. Also, the loss expense reserves should be split into allocated and unallocated. The methods used to calculate each of these reserves are quite different. Also, this will make sure that the insurer has put up an was allocated loss expense reserve, which unfortunately some companies don't. In Part 1E, homeowners and commercial multi-peril should be split out separately. These two important lines are different from each other. Also, more and more losses are being incurred under the liability coverage of the homeowners' policy than ever before. As mentioned, the mortgage guarantee insurance industry has been having many problems lately. However, due to the nature of the claim reporting and loss settlement procedures, the Schedule O data is of limited value for analyzing this line. There is often a mismatch between the losses and premiums which will distort the loss ratios. This mismatch arises when retrospectively rated policies are used, or sometimes when there is an audit involved. It also will occur in reinsurance when there is a delay in reporting the premiums. Because of these problems we rely primarily on historical development. If Schedule O and P are used, particularly for a line such as workers' compensation, you can have problems which I have listed. In California when an insurer comes under financial examination, we ask for the loss and expense reserve information on a direct basis to avoid the reinsurance problems. We have the claims and underwriting departments answer a detailed questionnaire, so we can learn about the shifts in the claims and underwriting activities. What we do is we go in and talk to the claims and underwriting people to see what problems there are with Schedules O and P. We can take these problems into consideration when we do our loss reserve analysis.

That concludes my section and also concludes our speeches. I'd like to thank Elise Lieber, for being our recorder today. On behalf of the American Academy of Actuaries, and the Casualty Actuarial Society, I'd like to thank you for attending this meeting. I certainly hope you come back in the future. We are now available for questions. If you have any questions, I would welcome them right now.

QUESTION: Is it appropriate to use Schedule P to analyze the loss reserves of a reinsurer?

B. HOROWITZ: From my experience with New York insurance companies, we do handle reinsurers differently in that less credibility is given to Schedule P. We may collect data separately or property versus casualty, separately by treaty and, of course, over a much longer period of time on excess of loss reinsurance. Also, we often look at the direct data underlying the reinsurance.

QUESTION: Don't the IRIS loss reserve development tests inappropriately penalize companies that have strengthened their reserves and are now in a much stronger position (e.g., CIGNA added $1.2 billion to their reserves)?

B. HOROWITZ: We're certainly aware of the two-edged sword of strengthening where strengthening in and of itself then triggers all sorts of early warning tests. Bear in mind, however, that the early warning tests are just red flags and we delve way beyond this.

R. ROTH: In regulation the early warning tests are just one of the tools that we use. We are familiar with the situation in most companies and often know the people involved. While the early warning test would be the score, the Department's worksheets will have an explanation on what is going on. If we're not familiar with the company, we write them and ask for an explanation. They send us voluminous letters, closely typed, explaining that they really are in great shape and there is no problem. In the case of CIGNA, which was well publicized, the

IRIS test did present a problem. We did, however, remove one of the problems with the IRIS tests by putting fidelity and surety IBNR back into Schedule O. That solved one major distortion problem or many companies.

B. HOROWITZ: Of course, there is no way out o the fact that the strengthening that now appears is an acknowledgement that was reported in the past was an underestimate. The financial community takes note of that and acts accordingly. As ar as the ripple effects, you've seen some interesting paradoxes. Some may interpret it as the financial condition was bad and continues to be bad. Others may have the opposite reaction i.e., the problem is fixed and now behind them.

QUESTION: Is there any movement toward changing the Annual Statement lines of business? For example, splitting the Multi Peril line into its property and casualty pieces?

R. ROTH: I think that the Schedule P lines should be broken out. I also think some of the Schedule O lines should show development.

QUESTION: Does Schedule P, Part 2 Summary include IBNR?

B. HOROWITZ: Yes. That is why it represents the company's ultimate losses. At each point in time, it was the company's best estimate of ultimate.

R. ROTH: Thank you very much for coming.

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EXHIBIT 1

ALL SCHEDULE P LINES

RETROSPECTIVE SOLVENCY TESTING ($000 OMITTED)

(PART 2 -- SUMMARY)

ANNUAL STATEMENT/ EVALUATION DATE	SURPLUS AS REGARDS POLICYHOLDERS PLUS STATUTORY RESERVES AS REPORTED BY COMPANY	INITIAL INCURRED LOSSES		AFTER 1 YEAR	AFTER 2 YEARS	AFTER 3 YEARS	AFTER 4 YEARS	AFTER 5 YEARS
1974		354113	Incurred Losses	357152	359277	365147	370347	375116
			Savings	- 3039	- 5164	- 11034	- 16234	- 21003
	8548		Rev. Surp.	5509	3384	- 2486	- 7686	- 12455
1975		378881	Incurred Losses	381759	388048	395270	401852	
			Savings	- 2878	- 9167	- 16389	- 22971	
	6163		Rev. Surp.	3285	- 3004	- 10226	- 16808	
1976		405608	Incurred Losses	411386	419212	427648		
			Savings	- 5778	- 13604	- 22040		
	7927		Rev. Surp.	2149	- 5677	- 14113		
1977		437499	Incurred Losses	445410	457614			
			Savings	- 7911	- 20115			
	9363		Rev. Surp.	1452	- 10752			
1978		475075	Incurred Losses	489277				
			Savings	- 14202				
	11003		Rev. Surp.	- 3199				

EXHIBIT 2

OTHER LIABILITY

HISTORIC RECORD OF LOSS AND LOSS ADJUSTMENT EXPENSE RESERVE ADEQUACY ($000 OMITTED)

(PARTS 1B, COLUMNS 3, 4, 5, 9 AND 10)

ANNUAL STATEMENT/ EVALUATION DATE	INITIAL RESERVE		AFTER 1 YEAR	AFTER 2 YEARS	AFTER 3 YEARS	AFTER 4 YEARS	AFTER 5 YEARS	CALENDAR YEAR PREMIUMS EARNED	INDEX 1: INITIAL RESERVE ÷ PREMIUMS EARNED	RES. ÷ PAID AFTER 1 YEAR
		Cum. Pd.	4618	8768	12643	15387	17976			
		Rem. Res.	9224	5365	3432	2230	1771			
1974	13528	Devel. Res.	14042	14133	16275	17617	19747	6685	2.024	2.808
		Savings	-514	-605	-2747	-4089	-6219			
		%	-3.8%	-4.5%	-20.3%	-30.2%	-46.0%			
		Cum. Pd.	5019	9949	13424	16886				
		Rem. Res.	7656	4304	2894	2319				
1975	12573	Devel. Res.	12675	14253	16318	19205		6449	1.950	2.505
		Savings	-102	-1680	-3745	-6632				
		%	-0.8%	-13.4%	-29.8%	-52.8%				
		Cum. Pd.	5998	10811	15806					
		Rem. Res.	6970	4835	3361					
1976	11705	Devel. Res.	12968	15646	19167			8323	1.406	1.951
		Savings	-1263	-3941	-7462					
		%	-10.8%	-33.7%	-63.8%					
		Cum. Pd.	6350	13226						
		Rem. Res.	7989	6550						
1977	11181	Devel. Res.	14339	19776				8602	1.300	1.761
		Savings	-3158	-8595						
		%	-28.2%	-76.9%						
		Cum. Pd.	8272							
		Rem. Res.	9723							
1978	11679	Devel. Res.	17995					5877	1.987	1.412
		Savings	-6316							
		%	-54.1%							

EXHIBIT 3

OTHER LIABILITY

HISTORIC RECORD OF LOSS RESERVE ADEQUACY ($000 OMITTED)
(PARTS 1B, COLUMN 3 AND COLUMN 9)

ANNUAL STATEMENT/ VALUATION DATE	INTIAL RESERVE		AFTER 1 YEAR	AFTER 2 YEARS	AFTER 3 YEARS	AFTER 4 YEARS	AFTER 5 YEARS	CALENDAR YEAR PREMIUMS EARNED	INDEX 1: INITIAL RESERVE ÷ PREMIUMS EARNED	INDEX 2: INITIAL RES. ÷ PAID AFTER 1 YEAR
		Cum. Pd.	3900	7046	10435	12485	14604			
		Rem. Res.	8151	4847	3083	2026	1609			
1974	11767	Devel. Res.	12051	11893	13518	14511	16213	6685	1.760	3.017
		Savings	-284	-126	-1751	-2744	-4446			
		%	-2.4%	-1.1%	-14.9%	-23.3%	-37.8%			
		Cum. Pd.	4044	8140	10956	13795				
		Rem. Res.	6664	3827	2630	2107				
1975	10993	Devel. Res.	10708	11967	13586	15902		6449	1.705	2.718
		Savings	+285	-974	-2593	-4909				
		%	+2.6%	-8.9%	-23.6%	-44.7%				
		Cum. Pd	4961	8907	13047					
		Rem. Res.	6057	4325	3054					
1976	10293	Devel. Res.	11018	13232	16101			8323	1.237	2.075
		Savings	-725	-2939	-5808					
		%	-7.0%	-28.6%	-56.4%					
		Cum. Pd.	5193	10945						
		Rem. Res.	6740	5741						
1977	9882	Devel. Res.	11933	16686				8602	1.149	1.903
		Savings	-2051	-6804						
		%	-20.8%	-68.9%						
		Cum. Pd.	6911							
		Rem. Res.	8127							
1978	9773	Devel. Res.	15038					5877	1.663	1.414
		Savings	-5265							
		%	-53.9%							

OTHER LIABILITY | EXHIBIT 4

HISTORIC RECORD OF LOSS ADJUSTMENT EXPENSE RESERVE ADEQUACY ($000 OMITTED)

(PARTS 1B, COLUMN 4, COLUMN 5 AND COLUMN 10)

ANNUAL STATEMENT/ EVALUATION DATE	INITIAL RESERVE		AFTER 1 YEAR	AFTER 2 YEARS	AFTER 3 YEARS	AFTER 4 YEARS	AFTER 5 YEARS	CALENDAR YEAR PREMIUMS EARNED	INDEX 1: INITIAL RESERVE ÷ PREMIUMS EARNED	INDEX 2: INITIAL RES. ÷ PAID AFTER 1 YEAR
		Cum. Pd.	918	1722	2408	2902	3372			
		Rem. Res.	1073	518	349	204	162			
1974	1761	Devel. Res.	1991	2240	2757	3106	3534	6685	.263	1.918
		Savings	- 230	- 479	- 996	-1345	- 1773			
		%	-13.1%	-27.2%	-56.6%	-76.4%	-100.7%			
		Cum. Pd.	975	1809	2468	3091				
		Rem. Res.	992	477	264	212				
1975	1580	Devel. Res.	1967	2286	2732	3303		6449	.245	1.621
		Savings	- 387	- 706	-1152	- 1723				
		%	-24.5%	-44.7%	-72.9%	-109.1%				
		Cum. Pd.	1037	1904	2759					
		Rem. Res.	913	510	307					
1976	1412	Devel. Res.	1950	2414	3066			8323	.170	1.362
		Savings	- 538	-1002	- 1654					
		%	-38.1%	-71.0%	-117.1%					
		Cum. Pd.	1157	2281						
		Rem. Res.	1249	809						
1977	1299	Devel. Res.	2406	3090				8602	.151	1.123
		Savings	-1107	- 1791						
		%	-85.2%	-137.9%						
		Cum. Pd.	1361							
		Rem. Res.	1596							
1978	1906	Devel. Res.	2957					5877	.324	1.400
		Savings	-1051							
		%	-55.1%							

EXHIBIT 5

OTHER LIABILITY -- PAYMENT DEVELOPMENT METHOD

HISTORIC CUMULATIVE LOSS PAYMENTS BY ACCIDENT YEAR (\$000 OMITTED)

(PART 1B, COLUMN 3)

CCIDENT YEAR	1st		2nd		3rd		4th		5th		6th		7th		8th		8th+8th O/S
1969											2753	1.088	2995	1.059	3173	1.038	3294
1970									2815	1.175	3308	1.103	3648	1.022	3730	1.068	3982
1971							2632	1.212	3190	1.094	3489	1.181	4120	1.023	4216	1.040	4384
1972					1724	1.308	2255	1.281	2888	1.216	3512	1.077	3782	1.085	4104	1.081	4438
1973			1313	1.718	2256	1.394	3145	1.300	4088	1.149	4697	1.092	5129				
1974	346	3.081	1066	1.517	1617	1.471	2378	1.329	3161	1.281	4048						
1975	223	5.027	1121	1.631	1828	1.419	2594	1.278	3314								
1976	527	2.641	1392	1.812	2522	1.516	3823										
1977	483	3.582	1730	1.932	3342												
1978	699	2.658	1858														
1979	266																
		1st-2nd		2nd-3rd		3rd-4th		4th-5th		5th-6th		6th-7th		7th-8th		8th-Ult.	
LECTED FACTOR:5 YR.AVG., [illegible] HI, 1 LOW (*4 YR. VG.)		3.107		1.720		1.428		1.286		1.180		1.094		1.047*		1.057*	
MULATIVE FACTOR		14.020		4.513		2.624		1.837		1.429		1.211		1.107		1.057	

EXHIBIT 6

OTHER LIABILITY -- PAYMENT DEVELOPMENT METHOD

ANALYSIS OF PROJECTED ULTIMATE SAVINGS ON 12/31/79 LOSS RESERVES ($000 OMITTED)

ACCIDENT YEAR	(1) CUMULATIVE LOSS PAYMENTS AS OF 12/31/79	(2) FACTOR TO ULTIMATE	(3)=(1)x(2) PROJECTED ULTIMATE LOSSES INCURRED	(4) ACTUAL LOSSES INCURRED @ 12/31/79	(5)=(4)-(3) PROJECTED ULTIMATE SAVINGS ON 12/31/79 LOSS RESERVES
1971 & PRIOR			48823	48823	0
1972	4104	1.057	4338	4438	+ 100
1973	5129	1.107	5678	5440	- 238
1974	4048	1.211	4902	4395	- 507
1975	3314	1.429	4736	3812	- 924
1976	3823	1.837	7023	4770	- 2253
1977	3342	2.624	8769	6029	- 2740
1978	1858	4.513	8385	4244	- 4141
1979	266	14.020	3729	2080	- 1649
TOTAL			96383	84031	-12352

EXHIBIT 7

OTHER LIABILITY -- INCURRED DEVELOPMENT METHOD

HISTORIC INCURRED LOSSES EXCLUDING IBNR BY ACCIDENT YEAR ($000 OMITTED)

(PART 1B, COLUMN 3)+(PART 1B, COLUMN 9)-(PART 1F, COLUMN 3)

ACCIDENT YEAR	1st		2nd		3rd		4th		5th		6th		7th		8th	
1969													3385	.973	3294	
1970											3974	.993	3946	1.009	3982	
1971									4375	.949	4150	1.061	4405	.995	4384	
1972							3443	1.099	3784	1.057	3999	1.026	4102	1.082	4438	
1973					3961	1.093	4330	1.121	4855	1.071	5202	1.046	5440			
1974			2223	1.358	3019	1.120	3381	1.128	3815	1.152	4395					
1975	3065	.861	2638	.975	2572	1.243	3198	1.192	3812							
1976	2977	1.091	3247	1.299	4217	1.131	4770									
1977	3146	1.230	3870	1.558	6029											
1978	2808	1.413	3969													
1979	1255															
		1st-2nd		2nd-3rd		3rd-4th		4th-5th		5th-6th		6th-7th		7th-8th		8th-Ult.
SELECTED FACTOR : 4 YEAR AVERAGE		1.149		1.298		1.147		1.135		1.057		1.032		1.015		1.000
CUMULATIVE FACTOR		2.150		1.871		1.441		1.257		1.107		1.047		1.015		1.000

OTHER LIABILITY -- INCURRED DEVELOPMENT METHOD

ANALYSIS OF PROJECTED ULTIMATE SAVINGS ON 12/31/79 LOSS RESERVES ($000 OMITTED)

ACCIDENT YEAR	(1) INCURRED LOSSES EX. IBNR AS OF 12/31/79	(2) FACTOR TO ULTIMATE	(3)=(1)x(2) PROJECTED ULTIMATE LOSSES INCURRED	(4) ACTUAL LOSSES INCURRED @ 12/31/79	(5)=(4)-(3) PROJECTED ULTIMATE SAVINGS ON 12/31/79 LOSS RESERVES
1971 & PRIOR			48823	48823	0
1972	4437	1.000	4437	4438	+ 1
1973	5440	1.015	5522	5440	- 82
1974	4395	1.047	4602	4395	- 207
1975	3812	1.107	4220	3812	- 408
1976	4770	1.257	5996	4770	-1226
1977	6029	1.441	8688	6029	-2659
1978	3969	1.871	7426	4244	-3182
1979	1255	2.150	2698	2080	- 618
TOTAL			92412	84031	-8381

SCHEDULE P--PART 1B--LIABILITY OTHER THAN AUTO

Reserve for Unpaid LIABILITY OTHER THAN AUTO LOSSES December 31 of Current Year*

SCHEDULE OF EXPERIENCE

	Year in Which Policies Were Issued	(1) Years in Which Premiums Were Earned and Losses Were Incurred	(2) Premiums Earned (See Notes (a) and (b))	(3) (c) Liability Loss Payments	(d) LIABILITY LOSS EXPENSE PAYMENTS (4) Allocated	(4a) Ratio (d) ÷ (3) %	(5) (g) Unallocated	(5a) Ratio (5) ÷ (3) %	(6) Total (Col. 4 Plus Col. (5))	(7) Liability Loss and Loss Expense Payments (Col. 3 Plus Col. 6)	(8) Ratio (7) ÷ (2) %	(9) Number of Suits	(10) (e) Total Estimated Reserve for Liability Losses Case-basis	(10-1/2) (d) (e) Total Estimated Reserve for Loss Expense Pertaining to Case-basis Loss Estimates	(11) Total Liability Losses (Sum of Items in Cols. 7, 10 and 10-1/2)	(12) Ratio (11) ÷ (2) %
1	Prior to 1967	Prior to 1969	73,155,438	30,188,951	4,699,514	15.6	4,327,845	14.3	9,027,359	39,216,310	53.6	193	408,804	40,880	39,669,994	54.2
2	1967	Prior to 1969	7,785,085	3,384,431	471,401	13.9	654,974	19.3	1,126,375	4,510,806	57.9	131	330,239	33,023	4,874,064	62.6
3	1968	Prior to 1969	3,761,624	1,726,585	300,793	17.4	549,165	31.8	849,958	2,576,533	68.5	102	327,385	32,738	2,936,656	78.1
4		1969	7,773,172	2,752,811	501,141	18.2	570,920	20.7	1,072,061	3,824,872	49.2	266	726,787	72,678	4,624,337	59.5
5		1970	7,408,177	2,815,138	392,037	13.9	411,021	14.6	803,058	3,618,196	48.8	323	1,132,974	113,297	4,864,467	65.7
6		1971	8,896,986	2,632,265	405,026	15.4	509,334	19.3	914,360	3,546,625	39.9	427	1,745,849	206,621	5,499,095	61.8
7		Total first period	108,780,482	43,500,171	6,769,912	15.6	7,023,259	16.1	13,793,171	57,293,342	52.7	1,442	4,672,034	499,237	62,464,613	57.4
8		1972	7,921,915	1,723,896	303,601	17.6	554,401	32.2	858,002	2,581,898	32.6	475	2,001,507	174,081	4,757,486	60.1
9		1973	7,765,704	1,312,949	234,364	17.9	588,283	44.8	822,647	2,135,596	27.5	590	2,589,193	511,234	5,236,023	67.4
10		1974	6,684,873	346,002	117,572	34.0	472,018	136.4	589,590	935,592	14.0	187	2,503,494	576,494	4,015,995	60.1
11		Total second period	22,372,492	3,382,847	655,537	19.4	1,614,702	47.7	2,270,239	5,653,086	25.2	1,252	7,094,609	1,261,809	14,009,504	62.6
12		Grand Totals	131,152,974	46,883,018	7,425,449	15.8	8,637,961	18.4	16,063,410	62,946,428	48.0	2,694	11,766,643	1,761,046	76,474,117	58.3

COMPUTATION OF RESERVE FOR UNPAID LIABILITY OTHER THAN AUTO LOSSES

	Years in Which Premiums Were Earned and Losses Were Incurred	(13) 60% of Earned Premiums Stated in Col. 2	(14) Deduct Loss Payments and Expense Stated in Column 7	(15) Remainder (Col. 13 Less Col. 14) If Negative Enter "0"	(16) Estimated Reserve for Liability Losses and Loss Expense; Case-basis (Cols. 10 and 10-1/2)	(17) Carry Out For Each Year Amount Stated in Col. 15 or 16 Whichever is Greater	(18) Total Incurred Liability Losses (Col. 14 Plus Col. 17)	(19) Incurred Loss Rati (Col. 18 Divided by Co %
8	1972	4,753,149	2,581,898	2,171,251	2,175,588	2,175,588	4,757,486	60.1
9	1973	4,659,422	2,135,597	2,523,825	3,100,428	3,100,428	5,236,025	67.4
10	1974	4,010,923	935,593	3,075,330	3,080,404	3,080,404	4,015,997	60.1
11	Totals	13,423,494	5,653,088	7,770,406	8,356,420	8,356,420	14,009,508	62.6

(20) Reserve for unpaid liability losses and loss expenses, first period (sum of Cols. 10 and 10-1/2, first period)	5,171,271
(21) Reserve for unpaid liability losses and loss expenses, second period (total of Col. 17)	8,356,420
(22) Total reserve for unpaid liability losses and loss expense	13,527,691

ANNUAL STATEMENT FOR THE YEAR 1975 OF THE ______________________________

Write or Stamp Name

SCHEDULE P--PART 1B--OTHER LIABILITY*

Year in Which Policies Were Issued	(1) Years in Which Premiums Were Earned and Losses Were Incurred	(2) Premiums Earned	(3) Loss Payments	(d) LOSS EXPENSE PAYMENTS (4) Allocated	(4a) Ratio (4) + (3) %	(5) (g) Unallocated	(5a) Ratio (5) + (3) %	(6) Loss and Loss Expense Payments (3 + 4 + 5)	(7) Ratio (6) + (2) %	(8) Number of Claims Outstanding	(9) (e) Losses Unpaid	(10) (d) (e) Loss Expense Unpaid	(11) Total Losses and Loss Expense Incurred (4 + 9 + 10)	(12) Ratio (11) - (%
1 Prior to 1968	Prior to 1969	80,940,524	33,898,724	5,250,309	15.5	4,999,888	14.7	44,148,922	54.5	203	504,700	50,470	44,704,092	55.2
2 1968	Prior to 1969	3,761,624	1,813,915	317,634	17.5	553,751	30.5	2,685,301	71.4	64	200,885	20,088	2,906,275	77.3
3	1969	7,773,172	2,995,166	564,713	18.9	583,640	19.5	4,143,520	53.3	170	391,292	39,129	4,573,941	58.8
4	1970	7,408,177	3,308,437	460,038	13.9	436,894	13.2	4,205,370	56.8	214	667,492	66,749	4,939,612	66.7
5	1971	8,896,577	3,189,577	521,808	16.4	538,581	16.9	4,249,967	47.8	389	1,229,045	134,563	5,613,576	63.1
6	1972	7,921,915	2,255,053	405,072	18.0	582,264	25.8	3,242,389	40.9	594	1,253,350	136,994	4,632,733	58.5
7	1973	7,765,704	2,256,272	378,170	16.8	637,779	28.3	3,272,222	42.1	1,188	1,874,028	153,544	5,299,793	68.3
8	1974	6,684,873	1,065,996	215,324	20.2	534,414	50.1	1,815,735	27.2	1,514	2,029,993	471,633	4,317,361	64.6
9	1975	6,449,256	222,856	97,593	43.8	233,326	104.7	553,775	8.6	2,121	2,842,423	507,269	3,903,468	60.5
10	Totals	137,602,234	51,006,000	8,210,664	16.1	9,100,541	17.8	68,317,206	49.6	6,457	10,993,209	1,580,441	80,890,858	58.8

COMPUTATION OF EXCESS OF STATUTORY RESERVE OVER STATEMENT RESERVES--OTHER LIABILITY

1975 $..........0.......... 1974 $..........0.......... 1973 $..........0.......... Total $..........0..........

Calculation Method--..........0..........% of Column % less Column 11, if negative enter zero. See Note a.

See Schedule P--Part 1F for footnotes.

FAILURE OF THE ITEMS TO ADD TO THE TOTALS IS DUE TO THE DROPPING OF CENTS

ANNUAL STATEMENT FOR THE YEAR 1976 OF THE ______________________________

Write or Stamp Name

SCHEDULE P--PART 1B--OTHER LIABILITY*

1	Prior to 1969	84,702,148	35,968,879	5,610,698	15.6	5,572,768	15.5	47,152,346	55.7	106	245,394	28,539	47,466,279	56.0
2	1969	7,773,172	3,173,212	593,573	18.7	596,904	18.8	4,363,690	56.1	67	120,652	12,065	4,496,407	57.8
3	1970	7,408,177	3,647,741	514,097	14.1	462,194	12.7	4,624,033	62.4	90	297,580	29,758	4,951,371	66.8
4	1971	8,896,986	3,489,420	598,744	17.2	560,949	16.1	4,649,114	52.3	192	660,640	77,518	5,387,269	60.5
5	1972	7,921,915	2,887,508	493,262	17.1	629,454	21.8	4,010,224	50.6	293	895,575	101,009	5,006,808	63.2
6	1973	7,765,704	3,144,566	513,999	16.3	704,029	22.4	4,362,595	56.2	606	1,185,200	129,971	5,677,766	73.1
7	1974	6,684,573	1,617,469	336,833	20.8	598,448	37.0	2,552,750	38.2	618	1,401,530	138,885	4,093,166	61.2
8	1975	6,449,256	1,120,832	189,761	16.9	311,510	27.8	1,622,104	25.2	942	1,817,199	473,915	3,913,218	60.6
9	1976	8,322,894	527,393	141,583	26.8	346,218	65.6	1,015,195	12.2	2,301	3,629,261	419,985	5,064,442	60.8
10	Totals	145,925,128	55,577,022	8,992,555	16.2	9,782,477	17.6	74,352,055	51.0	5,215	10,293,031	1,411,645	86,056,732	58.9

COMPUTATION OF EXCESS OF STATUTORY RESERVE OVER STATEMENT RESERVES--OTHER LIABILITY

1976 $..........0.......... 1975 $..........0.......... 1974 $..........0.......... Total $..........0.......... Calculation Method 0..........% of Column 2, less Column 11, if negative enter zero. See Note a.

See Schedule P--Part 1F for footnotes

ANNUAL STATEMENT FOR THE YEAR 1978 OF THE ______________________

Write or Stamp Name

SCHEDULE P--PART 1B--OT HER LIABILITY*

1	Prior to 1971	99,883,498	43,512,730	6,803,219	15.6	6,691,848	15.4	57,007,797	57.1	154	379,717	37,972	57,425,486	57.5
2	1971	8,896,986	4,215,888	683,820	16.2	617,102	14.6	5,516,811	62.0	74	168,196	16,820	5,701,827	64.1
3	1972	7,921,915	3,781,634	633,084	16.7	701,228	18.5	5,115,947	64.6	139	319,934	31,993	5,467,874	69.0
4	1973	7,765,704	4,696,809	742,737	15.8	831,784	17.7	6,271,331	80.7	254	504,675	50,467	6,826,473	87.9
5	1974	6,684,783	3,161,461	529,033	16.7	729,128	23.1	4,419,623	66.1	302	653,610	65,361	5,138,594	76.9
6	1975	6,449,256	2,594,080	379,366	14.6	436,483	16.8	3,409,931	52.9	436	603,736	60,374	4,074,041	63.2
7	1976	8,322,894	2,521,920	341,329	13.5	558,169	22.1	3,421,420	41.1	702	1,695,103	246,37	5,362,901	64.4
8	1977	8,602,360	1,730,662	228,912	13.2	576,773	33.3	2,535,949	29.5	777	2,414,928	739,130	5,690,007	66.1
9	1978	5,876,848	698,594	154,361	22.1	563,261	80.6	1,416,216	24.1	899	3,033,430	657,005	5,106,652	86.9
10	Totals	160,404,337	66,913,382	10,495,866	15.7	11,705,780	17.5	89,115,030	55.6	3,737	9,773,329	1,905,500	100,793,859	62.8

COMPUTATION OF EXCESS OF STATUTORY RESERVE OVER STATEMENT RESERVES--OTHER LIABILITY

1974: ....0..... 1975: ...0.... 1977:5 ...0... Total $..0 Calculation Method....0.... % of Column 2, less Column 11, if negative enter zero. See Note a.

See Schedule P--Part 1F for footnotes

ANNUAL STATEMENT FOR THE YEAR 1977 OF THE ______________________

Write or Stamp Name

SCHEDULE P--PART 1B--OTHER LIABILITY*

(1)		(2)	(3)	(d) LOSS EXPENSE PAYMENTS				(6)	(7)	(8)	(9)	(10)	(11)	(12)
				(4)	(4a)	(5)	(5a)							
Years in Which Premiums Were Earned and Losses Were Incurred		Premiums Earned	Loss Payments	Allocated	Ratio (4) + (3) %	(g) Unallocated	Ratio (5) + (3) %	Loss and Loss Expense Payments (3 + 4 + 5)	Ratio (6) + (2) %	Number of Claims Outstanding	Losses Unpaid	(d) Loss Expense Unpaid	Total Losses and Loss Expense Incurred (6 + 9 + 10)	Ratio (11) - (2) %
1	Prior to 1970	92,475,320	39,490,675	6,234,121	15.7	6,195,841	15.6	51,920,638	56.1	114	289,441	28,944	52,239,023	56.4
2	1970	7,408,177	3,730,242	551,117	14.7	468,368	12.5	4,749,728	64.1	60	252,016	25,201	5,026,956	67.8
3	1971	8,896,986	4,119,509	663,334	16.1	608,258	14.7	5,391,101	60.5	107	285,380	38,734	5,715,216	64.2
4	1972	7,921,915	3,512,014	561,947	16.0	676,354	19.2	4,750,315	59.9	205	486,548	58,851	5,295,715	66.8
5	1973	7,765,704	4,087,621	646,842	15.8	774,850	18.9	5,509,313	70.9	381	766,755	86,872	6,362,940	81.9
6	1974	6,684,873	2,378,389	434,922	18.2	655,611	27.5	3,468,923	51.8	445	1,002,960	110,492	4,582,376	68.5
7	1975	6,449,256	1,827,929	284,993	15.5	364,625	19.9	2,477,548	38.4	636	744,423	128,201	3,350,172	51.9
8	1976	8,322,894	1,391,853	238,880	17.1	452,040	32.4	2,082,774	25.0	1,069	2,229,585	435,587	4,747,947	57.0
9	1977	8,602,360	483,161	112,095	23.2	404,313	83.6	999,569	11.6	1,582	3,824,965	386,056	5,210,591	60.5
10	Totals	154,527,489	61,021,397	9,728,253	15.9	10,600,263	17.36	81,349,914	52.6	4,599	9,882,073	1,298,941	92,530,929	59.8

COMPUTATION OF EXCESS OF STATUTORY RESERVE OVER STATEMENT RESERVES--OTHER LIABILITY

1977 $..318,287 .... 1976 $..599,248 1975 $..793,258 Total $..1,710,794 Calculation Method 64.2% of Column 2, less Column 11, if negative enter zero. See Note a.

See Schedule P--Part 1F for footnotes

SCHEDULE P--PART 1B--OTHER LIABILITY*

(1) Years in Which Premiums Were Earned and Losses Were Incurred	(2) Premiums Earned	(3) Loss Payments	(d) LOSS EXPENSE PAYMENTS (4) Allocated	(4a) Ratio (4) ÷ (3) %	(5) (g) Unallocated	(5a) Ratio (5) ÷ (3) %	(6) Loss and Loss Expense Payments (3 + 4 + 5)	(7) Ratio (6) ÷ (2) %	(8) Number of Claims Outstanding	(9) Losses Unpaid	(10) (d) Loss Expense Unpaid	(11) Total Losses and Loss Expense Incurred (6 + 9 + 10)	(12) Ratio (11) - (2) %
1 Prior to 1972	108,780,485	48,206,325	7,535,691	15.6	7,354,909	15.3	63,096,925	58.0	86	617,345	61,734	63,776,005	58.6
2 1972	7,921,915	4,103,521	679,466	16.5	732,563	17.8	5,515,550	69.6	69	333,743	33,374	5,882,667	74.3
3 1973	7,765,704	5,129,442	818,695	15.9	873,564	17.0	6,821,702	87.8	122	311,068	31,106	7,163,877	92.3
4 1974	6,684,873	4,047,714	625,348	15.4	814,776	20.1	5,487,839	82.1	172	347,416	34,741	5,869,997	87.8
5 1975	6,449,256	3,314,445	461,542	13.9	506,117	15.3	4,282,104	66.4	265	497,944	49,794	4,829,843	74.9
6 1976	8,322,894	3,822,582	446,510	11.7	684,206	17.9	4,953,298	59.5	373	946,944	94,694	5,994,936	72.0
7 1977	8,602,360	3,342,172	342,175	10.2	733,449	21.9	4,417,796	51.3	446	2,686,587	502,461	7,606,845	88.4
8 1978	5,875,848	1,657,695	253,624	13.6	700,490	37.7	2,811,809	47.8	346	2,385,510	787,385	5,984,705	101.8
9 1979	4,501,001	265,720	130,195	49.0	476,562	179.6	872,477	19.4	307	1,814,070	553,231	3,239,778	72.0
10 Totals	164,905,339	74,089,618	11,293,248	15.2	12,876,636	17.4	98,259,503	59.6	2,186	9,940,628	1,148,524	110,348,657	x x x

COMPUTATION OF EXCESS OF STATUTORY RESERVE OVER STATEMENT RESERVES--OTHER LIABILITY

1979 $........0......... 1978 $......0...... 1977 $.....0...... Total $....0..... Calculation Method-- 0 % of Column 2, less Column 11, if negative enter zero. See Note a.

See Schedule P--Part 1F for footnotes

SCHEDULE P--PART 1F--INCURRED BUT NOT REPORTED LOSSES

ANNUAL STATEMENT FOR THE YEAR

(b) INCURRED BUT NOT REPORTED LOSSES UNPAID INCLUDED IN COLUMN 9 OF:

1975		1976		1977		1978		1979	
(1) Years in Which Losses Were Incurred	(2) Part 1B	(3) Years in Which Losses Were Incurred	(4) Part 1B	(5) Years in Which Losses Were Incurred	(6) Part 1B	(7) Years in Which Losses Were Incurred	(8) Part 1B	(9) Years in Which Losses Were Incurred	(10) Part 1B
		1 Prior to 1969	0	1 Prior to 1970	0	1 Prior to 1971	0	1 Prior to 1972	98,792
1 Prior to 1969	9,500	2 1969	0	2 1970	0	2 1971	0	2 1972	0
2 1969	1,000	3 1970	0	3 1971	0	3 1972	0	3 1973	0
3 1970	1,380	4 1971	0	4 1972	0	4 1973	0	4 1974	0
4 1971	44,480	5 1972	0	5 1973	0	5 1974	0	5 1975	0
5 1972	64,774	6 1973	0	6 1974	0	6 1975	0	6 1976	0
6 1973	169,364	7 1974	0	7 1975	0	7 1976	0	7 1977	0
7 1974	872,628	8 1975	300,000	8 1976	375,000	8 1978	275,000	8 1978	275,000
8 1975	0	9 1976	1,178,601	9 1977	1,162,072	9 1979	923,940	9 1979	825,000
9 Totals	1,163,126	10 Totals	1,478,601	10 Totals	1,537,072	10 Totals	1,198,940	10 Totals	1,198,792

SCHEDULE P--PART 1F--INCURRED BUT NOT REPORTED LOSSES

ANNUAL STATEMENT FOR THE YEAR

(1) ONE YEAR DEVELOPMENT OF IBNR LOSSES INCLUDED IN COLUMNS 3 AND 9 OF:

1975		1976		1977		1978		1979	
(1) Years in Which Losses Were Incurred	(2) Part 1B	(3) Years in Which Losses Were Incurred	(4) Part 1B	(5) Years in Which Losses Were Incurred	(6) Part 1B	(7) Years in Which Losses Were Incurred	(8) Part 1B	(9) Years in Which Losses Were Incurred	(10) Part 1B
		1 Prior to 1969	0	1 Prior to 1970	0	1 Prior to 1971	0	1 Prior to 1972	62,750
1 Prior to 1969	3,025	2 1969	0	2 1970	0	2 1971	0	2 1972	11,846
2 1969	3,250	3 1970	0	3 1971	0	3 1972	0	3 1973	22,831
3 1970	5,102	4 1971	0	4 1972	0	4 1973	0	4 1974	14,179
4 1971	7,069	5 1972	0	5 1973	0	5 1974	0	5 1975	64,119
5 1972	37,992	6 1973	78,279	6 1974	0	6 1975	0	6 1976	75,118
6 1973	18,714	7 1974	92,530	7 1975	66,561	7 1976	157,926	7 1977	333,584
7 1974	130,095	8 1975	1,051,584	8 1976	925,286	8 1978	1,596,813	8 1978	532,395
8 1975	0	9 1976	0	9 1977	x x x x	9 1979	x x x x	9 1979	x x x x
9 Totals	205,247	10 Totals	1,222,393	10 Totals	991,847	10 Totals	1,754,739	10 Totals	1,116,822

Form 2 ANNUAL STATEMENT FOR THE YEAR 1979 OF THE ____________

SCHEDULE P--PART 2B-OTHER LIABILITY

(1)	INCURRED LOSSES AND LOSS EXPENSE REPORTED AT END OF YEAR (000) OMITTED)						INCURRED LOSS AND LOSS EXPENSE RATIO REPORTED					
Years in Which Premiums Were Incurred	(2) 1974	(3) 1975	(4) 1976	(5) 1977	(6) 1978	(7) 1979	(8) 1974	(9) 1975	(10) 1976	(11) 1977	(12) 1978	(13) 1979
Prior to 1974	72,457	72,667	72,984	74,638	75,421	76,822	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x
1974	4,015	4,317	4,093	4,582	5,138	5,870	60.0	64.6	61.2	68.5	76.9	87.8
Cumulative Total	76,472	76,984	77,077	79,220	80,559	82,692	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x
1975	x x x x	3,903	3,913	3,350	4,074	4,829	x x x x	60.5	60.6	51.9	63.2	74.9
Cumulative Total	x x x x	80,887	80,990	82,570	84,633	87,521	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x
1976	x x x x	x x x x	5,064	4,747	5,362	5,994	x x x x	x x x x	60.8	57.0	64.4	72.0
Cumulative Total	x x x x	x x x x	86,054	87,317	89,995	93,515	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x
1977	x x x x	x x x x	x x x x	5,210	5,690	7,606	x x x x	x x x x	x x x x	60.5	66.1	88.4
Cumulative Total	x x x x	x x x x	x x x x	92,527	95,685	101,121	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x
1978	x x x x	x x x x	x x x x	x x x x	5,106	5,984	x x x x	x x x x	x x x x	x x x x	86.9	101.8
Cumulative Total	x x x x	x x x x	x x x x	x x x x	100,791	107,105	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x
1979	x x x x	x x x x	x x x x	x x x x	x x x x	3,239	x x x x	x x x x	x x x x	x x x x	x x x x	72.0

Form 2 ANNUAL STATEMENT FOR THE YEAR 1979 OF THE ____________

SCHEDULE P--PART 2--SUMMARY

(1)	INCURRED LOSSES AND LOSS EXPENSE REPORTED AT END OF YEAR (000) OMITTED)						INCURRED LOSS AND LOSS EXPENSE RATIO REPORTED					
Years in Which Premiums Were Incurred	(2) 1974	(3) 1975	(4) 1976	(5) 1977	(6) 1978	(7) 1979	(8) 1974	(9) 1975	(10) 1976	(11) 1977	(12) 1978	(13) 1979
Prior to 1974	(a) -	331,224	333,340	336,992	339,944	342,778	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x
1974	(b) -	25,928	25,937	28,155	30,403	32,338	-	79.1	79.1	85.9	92.7	98.6
Cumulative Total	(c) -	357,152	259,277	365,147	370,347	375,116	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x
1975	x x x x	21,729	22,482	22,901	24,923	26,736	x x x x	70.0	72.4	73.7	80.2	86.1
Cumulative Total	x x x x	378,881	381,759	388,048	395,270	401,852	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x
1976	x x x x	x x x x	23,849	23,338	23,942	25,796	x x x x	x x x x	63.2	61.9	63.5	68.4
Cumulative Total	x x x x	x x x x	405,608	411,386	419,212	427,648	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x
1977	x x x x	x x x x	x x x x	26,113	26,198	29,966	x x x x	x x x x	x x x x	63.7	63.9	73.1
Cumulative Total	x x x x	x x x x	x x x x	437,499	445,410	457,614	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x
1978	x x x x	x x x x	x x x x	x x x x	29,664	31,663	x x x x	x x x x	x x x x	x x x x	65.9	70.3
Cumulative Total	x x x x	x x x x	x x x x	x x x x	475,075	489,277	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x
1979	x x x x	x x x x	x x x x	x x x x	x x x x	29,199	x x x x	x x x x	x x x x	x x x x	x x x x	67.5

Form 2 ANNUAL STATEMENT FOR THE YEAR 1979 OF THE ____________________

SCHEDULE P--PART 3--SUMMARY

Calendar Year Premiums Earned, Accident Year Loss and Loss Expense Incurred

	DOLLARS (000 omitted)							PERCENTAGES						
	(1) 1973 (a)	(2) 1974 (a)	(3) 1975	(4) 1976	(5) 1977	(6) 1978	(7) 1979	(8) 1973	(9) 1974	(10) 1975	(11) 1976	(12) 1977	(13) 1978	(14) 1979
Summary Data From Schedule P--Part 1--Summary														
Premiums Earned	26,993	29,116	31,059	37,711	41,000	45,000	43,263	100.0	100.0	100.0	100.0	100.0	100.0	100.0
& Loss Exp. Inc'd	25,442	29,332	26,735	25,794	29,965	31,661	29,198	94.3	100.7	86.1	68.4	73.1	70.3	67.5
Loss & Loss Expense through 1 Year														
	5,213	6,681	6,962	7,561	8,310	10,472	8,199	19.3	22.9	22.4	20.0	20.3	23.3	19.0
see (2) - (3)	20,229	22,651	19,773	18,233	21,655	21,189	20,999	75.0	77.8	63.7	48.4	52.8	47.0	48.5
Loss & Loss Expense through 2 Years														
	11,826	14,445	15,425	15,285	16,697	18,939	x x	43.8	49.6	49.7	40.5	40.7	42.1	x x
see (2) - (5)	13,616	14,887	11,310	10,509	13,268	12,722	x x	50.5	51.1	36.4	27.9	32.4	28.4	x x
Loss & Loss Expense through 3 Years														
	16,138	19,064	19,898	19,875	21,927	x x	x x	59.8	65.5	64.1	52.7	53.5	x x	x x
see (2) - (7)	9,304	10,268	6,837	5,919	8,038	x x	x x	34.5	35.2	22.0	15.7	19.6	x x	x x
Loss & Loss Expense through 4 Years														
	19,314	22,091	22,837	23,758	x x	x x	x x	71.6	78.6	73.5	63.0	x x	x x	x x
see (2) - (9)	6,128	6,441	3,898	2,036	x x	x x	x x	22.7	22.1	12.6	5.4	x x	x x	x x
Loss & Loss Expense through 5 Years														
	31,661	26,171	25,375	x x	x x	x x	x x	81.1	89.9	81.7	x x	x x	x x	x x
see (2) - (11)	3,961	3,161	1,360	x x	x x	x x	x x	13.2	10.0	4.4	x x	x x	x x	x x

Form 2 ANNUAL STATEMENT FOR THE YEAR 1979 OF THE ____________________

SCHEDULE P--PART 3B-OTHER LIABILITY

Calendar Year Premiums Earned, Accident Year Loss and Loss Expense Incurred

	DOLLARS (000 omitted)							PERCENTAGES						
	(1) 1973 (a)	(2) 1974 (a)	(3) 1975	(4) 1976	(5) 1977	(6) 1978	(7) 1979	(8) 1973	(9) 1974	(10) 1975	(11) 1976	(12) 1977	(13) 1978	(14) 1979
Summary Data From Schedule P--Part 1B														
Premiums Earned	7,765	6,684	6,449	8,322	8,602	5,876	4,501	100.0	100.0	100.0	100.0	100.0	100.0	100.0
& Loss Exp. Inc'd	7,163	5,869	4,829	5,994	7,606	5,984	3,239	92.2	87.8	74.9	72.0	88.4	101.8	92.0
Loss & Loss Expense through 1 Year														
	1,057	939	553	1,015	999	1,416	872	13.6	14.0	8.6	12.2	11.6	24.1	19.4
see (2) - (3)	6,106	4,934	4,276	4,979	6,607	4,568	2,367	78.6	73.8	66.3	59.8	76.8	77.7	52.6
Loss & Loss Expense through 2 Years														
	2,135	1,815	1,622	2,082	2,335	2,811	x x	27.5	27.1	25.1	25.0	29.5	47.8	x x
see (2) - (5)	5,038	4,054	3,207	3,912	5,071	3,173	x x	64.7	60.7	49.8	47.0	58.9	54.0	x x
Loss & Loss Expense through 3 Years														
	3,272	2,552	2,477	3,421	4,417	x x	x x	42.1	38.2	38.4	41.1	51.3	x x	x x
see (2) - (7)	3,891	3,317	2,352	2,573	3,189	x x	x x	50.1	49.6	36.5	30.9	37.1	x x	x x
Loss & Loss Expense through 4 Years														
	4,362	3,468	3,409	4,953	x x	x x	x x	56.2	51.9	52.9	59.5	x x	x x	x x
see (2) - (9)	2,801	2,401	1,420	1,041	x x	x x	x x	36.0	35.9	22.0	12.5	x x	x x	x x
Loss & Loss Expense through 5 Years														
	5,509	4,419	4,282	x x	x x	x x	x x	70.9	66.1	66.4	x x	x x	x x	x x
see (2) - (11)	1,654	1,450	547	x x	x x	x x	x x	21.3	21.7	8.5	x x	x x	x x	x x

Schedule P--Part 3B (a)

1987 CASUALTY LOSS RESERVE SEMINAR

6F - LOSS RESERVE REPORTS AND DATABASES

Moderator: Howard L. Cohen, Vice President & Actuary
Geico Indemnity

Panel: Jeanne H. Eddy, Sr. Vice President
Data Processing
United States Fidelity & Guaranty Co.

Richard H. Snader, Vice President-Corporate Actuary
United States Fidelity & Guaranty Co.

Recorder: Thomas A. Wallace, Asst. Vice President
Maryland Casualty Company

HOWARD COHEN: Good morning! Welcome to the session on Loss Reserve Reports and Databases. My name is Howard Cohen, and I'm the Vice President and Actuary at GEICO Indemnity Company, which is a subsidiary of GEICO. If you've attended this session at other seminars, you'll notice a difference in this one. This year we're planning to take a different approach to the topic. Instead of just talking about which kind of data should be included in a reserving database, we're going to concentrate on the process of actually building one. To do this you have to work hand in hand with your data processing department. Consequently, we have two data processing representatives to discuss the process from their perspectives. I personally eel that the most important ingredient in successfully building a good system is to have excellent communication with your programmers. They are the individuals that are actually going to build the system for you. As you go through the process of working with them, you'll find that there are very important decisions and tradeofs that must be made jointly. The purpose of this session is to discuss these issues and to improve the communication process. Only through a mutual understanding of the issues involved can you hope to be successful. Before we begin, I would like to survey the audience. How many of you are actuaries? How many of you work in data processing? [Very few of those attending worked in data processing]. One of the things that I'm going to advocate is that if your company is in the process or is considering building a reserve database, that you send some of your key data processing people to the Loss Reserve Seminar. I think they'll get an excellent introduction into what reserving is all about.

I'd like to introduce the other members of the panel. To my right is the other actuary on the panel, Dick Snader. Dick is Vice President and Corporate Actuary at USF&G. He is very active in the Casualty Actuarial Society. Dick is currently the Vice President of Administration and is also a member of the board. To Dick's right are two members of data processing. Jeanne Eddy is Sr. Vice President of Data Processing ast USF&G. Before moving into that position, Jeanne was Vice President and Actuary of Pricing at USF&G. Jeanne is also a Fellow of the Casualty Actuarial Society. Next to Jeanne is Lerry Fogle. Lerry is our Director of Actuarial Systems at GEICO. He is responsible for all of our actuarial and homeowners systems.

Basically, we're going to have each of the companies represented here discss the process that we went through in building our actuarial databases. I'll begin the discussion with GEICO's experiences, then Lerry will talk about his perspective. Dick and Jeanne will then talk about the process at USF&G.

I'll begin by explaining why we decided to build a reserving database. Before we had an actuarial database (a reserving database) at GEICO, we ran a series of programs to extract data from our various reporting systems. These programs were written in the late 1970's, and were not very well documented. GEICO is predominantly a personal lines company, and we had different claims systems for automobile and homeowners. One of the major problems that we had was that the programs were not up to current data processing standards. Our data histories were updated in a non-production environment. In other words, they were updated by actuaries or programmers running the programs. We thought that we were very vulnerable to distortions if there were any problems in the systems feeding our histories. Also, there was no automated way to diagnose a systems problem. We felt it was important to ensure that our data balanced to other systems. All of these concerns focused on the validity and quality of our data. Finally, every time we had to build a new history we essentially had to construct that history from scratch. As we increased the sophistication and complexity of our reserve analysis, we felt that our old methods were no longer meeting our needs. Consequently, we came to the decision to build a production reserving database. I fell there are a number of important advantages to this approach.

First of all, if you construct a database properly, it can be used as a single source for all of your histories. Obviously, your objective in building a database is to put all the data elements you need into initially so that you don't have to enhance it at a later time, which can be very expensive and time consuming. If you update your histories in a production environment, it brings with it all of the controls and data quality standards of your other important corporate data. Consequently, you can ensure that your data balances to other financial, claims and premium data. It also places the task of updating your histories where it belongs. It belongs in the data center supported by the professional programmers instead of being an actuarial function. I fell that all of these will improve the reliability, consistency and efficiency of your reserving analysis. Finally, if the database has all of the elements you feel you might want to analyze in the future, you can use the database to build your histories for any new analysis. I believe its fairly simple to come to the conclusion that it's desirable to build a reserving database. However, what is much more difficult and problematical is how to actually build one.

Basically, I'm going to describe the process in five stages. First, you have to research and specify what data you need; second, determine when you need your data; third, explain your needs to your programmers; fourth, ensure that you have a vehicle for continuous communication during the implementation phase; finally test and validate the database.

The first step is pretty obvious, you have to decide what you need in your database. In our situation, we already had an existing database that was used to support the NAIC triennial audits. What we had to determine is whether or not all the data that we needed was already in that existing database. As you do your analysis, keep in mind that you can build reserve histories by combining or deriving new elements from existing elements. This can greatly reduce the size of your database. For example, if you want to do a projection of loss and expense payments net of salvage and subrogration, all you need to have are the loss payments, the expense payments, and the salvage and subrogation recoveries. You can build a history by just adding or subtracting various elements. If you're going to do that then obviously you have to specify to data processing the calculations for deriving elements based on existing elements within the database. In our case, as I said before, we already had an existing database. We spent a considerable amount of time just trying to research exactly what was contained in various fields within the database. We were very careful to document the results of our research this time so that we could reconstruct the exact nature of the elements on the database.

Let me briefly describe the stucture of the database. We have a 15 year history of all coverages and claims that were ever opened with our companies. Every month a coverage is open, we update a monthly segment. Basically, we have a claim and coverage key with common information about the coverage and then the monthly segments associated with each coverage. In general, the fields on the database fall into four categories: dates; monetary data; counts; and general information. Some of the dates included on the database are the accident date; the date the coverage was reported to the company; the date the coverage was closed; and the date the coverage was reopened. We have the standard loss and expense data that I'm referring to as monetary data. It includes information on paid losses; paid expenses; the outstanding reserve for loss and expense; and salvage and subrogation recoveries. We also, and I think you'll find this is different from the approach that USF&G takes, have reported count, a reopened count, a closee count, and a pending count. Finally, there's general information. Basically, what you want to include is any general information about the policy and/or claim that you think you're going to use when you do your reserve analysis. For example, we have information about the state in which the accident occurred; the state in which the policy was written; the coverage itself; and then the status of the coverage -- isthe coverage still pending or has it been closed. That completes my description of the database itself.

By summarizing, extracting and combining data from the database, we can then update all of our development triangles. At GEICO we project counts and do payment and incurred projections. In addition, we divide different elements to project averages. For example, by extracting a history of loss and expense payments on closed coverages and then ratioing it to the number of coverages, you can project closed average payments. You can also do projections of ratios themselves. For example, you can project the ratio of loss adjustment expenses to losses.

The next stage is to make sure that you specify to data processing when your data needs to be available. It's a very important programming and design consideration. Can you wait a week for your data? Do you need it the next day? Can you wait three weeks? At GEICO, we analyze reserves each month. Consequently, we need a standard set of histories and projections updated each month and each quarter. In our case, we need projections 2-4 days after the end of the month. That requirement put quite a strain on Lerry Fogle's staff to update the database and our reserve histories in these time frames. It is extremely important to identify your needs to the programmers up front before they design a system that gives you your data too late to meet your financial schedules.

Once you've done all of your research the next step is to document and communicate your requirements. We've learned from experience that it was essential to explain our needs to the programmers in business terms. If you start to talk to your data processing department about the need for link ratios and development triangles of policy year incurred loss and expense data, their eyes will start to glaze over. Keep in mind, that most people view actuaries as wizards that magically come up with reserve projections. We found that if we took the time and efort to explain reserve analysis to our programmers, it greatly enhanced our chances of success and made everybody's involvement much more rewarding.

Explain why and how the data is to be used; why you need so many diverse elements; and also why you need data over such a long historical period. As I said before, one of the things that we found very helpful was to send members of our data processing staff to the loss reserve seminars. In our case, we also asked our programmers to write the projection programs. In other words, we asked them to program the standard link ratio development factor approach. This is a very non-standard applications programming project. Consequently, we felt it was essential to explain what those calculations were all about and how we used them in reserve analysis.

After you've finished documenting your requirements, you still have to go through the phase of implementing the project. We found it was extremely important durig this phase to ensure we had continuous communication with the programmers. Remember you're going to be working on a long and very complicated project. In many cases, your reserving databases may be fed by numerous systems. These systems themselves may have undergone a considerable number of changes in the 10, 15, or 20 year historical period from which you're trying to get your data. It's almost impossible, I think, to underestimate the amount of misunderstanding and misinterpretation that can take place in a project of this nature. So make sure your actuaries walk through their specifications with data processing. Have them explain actuarial terminology in concrete and simple terms. We also found that it was very useful to have regularly scheduled meetings with the programming staff to discuss progress and any outstanding items. All of these items may sound trite or unimportant, but we found the investment of time and effort really paid off. It took us an awful long time to get our project underway. Some of you may have had a similar experience. We spent a year or two just trying to get the project started. We found that only when members of the project team could talk intelligently to one another and really understood the concerns of the other members of the team, did we make any real progress.

I'd like to finish my presentation by talking briefly about testing. Testing is an area that is often overlooked or not well thought out. You should start thinking about how to test and validate your database even beore programming actually begins. The objective is to structure your testing to identify problems as soon as possible. First of all, you have to decide as actuaries what you eel should be tested. You also have to decide how you are going to test. Are you going to test with a limited amount of data, or are you going to test with voluminous amounts of data? I would recommend that you do both. First, you test with a limited amount of data to verify that the database is actually being updated properly. After any problems are corrected, then do volume testing. This is especially important if you are trying to balance your data to existing data histories. It's also necessary to mutually agree and define acceptable test results with the data processing staff. One example of this is how will rounding be handled. Finally, throughout the project make sure you maintain a test log, to both identify any problems that you found in updatng the database during the programming stages and also to make sure you track the resolution of those programs. Remember a carefully constructed test plan can avoid numerous future headaches and problems.

That concludes my presentation. We'd like you to hold your questions to the very end. Now Lerry will talk about the data processing perspecrive on building the actuarial database.

LERRY FOGLE: Thank you Howard. Howard has given you a history and user perspective of the DP projects that have been done at GEICO to create an established production reserve database and reporting facility. In my portion of the presentation I will present a data processing perspective of the things we found to be important, many of which will overlap things that Howard has already said. I will also talk about some of the pitfalls that we've encountered and that you may encounter if you're doing the same thing. To do this I'd like to cover three subjects--issues relative to developing the specifications; some of the concerns that you should have as the system is designed and built; and finally to spend a little time talking about accessing the data once it's available.

First of all, it might seem very obvious, but I'll say it anyway -- put the specifications in writing. Even though we, at GEICO, had a prototype reserve projection system, the actuary took the time to write out the specifications for each of the major phases of the project. We feel that the specs should be user initiated and, as Howard mentioned, should be defined in business terms. If you do not know the form in which your specifications should be written, ask your data processing department what they'd like to see. They should be very cooperative in telling you, what they would like to see. We have had occasions when we got specifications we didn't feel had enough detail. We sit down with them and did an analysis of the specifications to round them out,. We like to come to a clear agreement before we proceed.

The second thing we found useful in specifications is something called "cumulative user specs". I would strongly recommend that you consider using this format. It is a major project to put together a reserve database and many of the reporting facets that come off it. You will want to document it in written terms and then begin to add to it as the phases develop, so that when you've completed this major project which may take several years, you have a cumulative document that describes everything that happened to that project. You have a document that will represent a good functional view of the system from a user perspective. It will become a very valuable reference for the programming staff later on that has changed and which has to pick that system up and maintain it

Lastly, if you have a data dictionary in house, I strongly recommend that you use it. It provides a very meaningful way of documenting the system, particularly defining the data elements that are part of the database -- not only the ones that are carried in the database, but also the ones derived for reporting.

As we look at other issues on specifications, redundant data is something that I will briefly mention. To the greatest possible extent you should eliminate redundant data because it causes maintenance nightmares from a data processing perspective. However, as I'll talk about in a couple of minutes, there are instances where creating redundant data must be done for system performance reasons, which we have chosen to do.

When you're developing your specifications look at balancing as a very important issue. The balancing specifications and how you want to reconcile the data that are in your database, and the reports that are driven off of it should be done up front and not after the fact. You really ought to have a good handle on how you want that data to balance. We have put in internal balancing -- internal balancing of the inputs and the update process to ensure that, from month-to-month, the database balances, and secondly to make sure that the master file itself balances. Decide whether or not, up front, you want reports to balance to the penny or whether you want to have rounding done.

Lastly, at specification time, it is important to test the data. We had a prototype system of our reserve projection system already built in-house by an actuarial person at the time. That, for us, became a major prototype for what would ultimately become our projection facility. If you have the time, you should think about building a sample database and do some extractions off of it and generate some reports. We found it to be a time consuming process, but one that was worthwhile in avoiding extended test time later when you build the projection system. It can also help in avoiding project failure altogether -- by identifying some of the glitches and some of the flaws that may be in your data that you don't know about.

As we move on in talking about designing and building the system, one consideration that you'll want to make is performance. Let's look at database size. I've already identified some of the elements that we have in our database. You want to very carefully weigh just how many elements you want in the database as well as how much history you would like to carry. Our main reserving database that Howard described has years of history. It is really 10 years of active data and 5 years of inactive. Right now it is contained and housed on 23 reels of magnetic tape. However, we've chosen to isolate off and to create some redundancy. In fact, we have a set of model history files that are maintained on-line and those model history files are the actual files we use to create the triangles to do projections. They're also used to create and drive a lot of the reporting that is done.

The model history files, themselves, are contained on 600 cylinders of DASD which, in relative terms, is really not that much space on-line. We have also chosen a means of implementing multiple physical file structures to create our model history files to do the projections. We have what we call an elemental database where all of the fundamental elements are carried -- the ones that are updated every month. This file is contained on 140 of those 600 cylinders. Then we have a second file that has all of the elements that are calculated or derived, from the elemental database, carried separately. They occupy and house about 400 cylinders of on-line DASB space. Those, by the way, are recalculated and replaced every quarter.

In taking this approach we have also created multiple jobs to process our data, since we have multiple companies in our corporate structure. Some of you may have the same situation and may want to look at creating multiple jobs to update and create the reports out of your reserving system, so that if the processing of one of the companies gets held up, you're not holding up the other companies as well. We found that to be very useful. In taking the combined multiple/physical file job approach, we have come to a point where our run time, at this point, on a monthly basis takes 1 to 3 hours and, at the end of the quarter it takes those same 1 to 3 hours, plus an additional 1 to 2. We've found this approach to be very useful. It doesn't do you a whole lot of good if, at the end of the month or the end of the quarter it takes you 48 hours or 72 hours to update your database and create your reports.

In the verification and testing process, we have found that it is also extremely useful to have user involvement in the design, having design walk-throughs as the data processing people design the system; and throughout the other phases of the project. It is also extremely important to have a user test plan. The programmers can come up with unit test cases that are based on the specifications and based on the design, but the real system testing must be laid out by the people who are going to ultimately use the system, namely the actuary.

We found it to be important to ensure that you establish test cases -- some very basic test cases for processing the data and testing it in different ways. And as the project gets tested and moves along, the programmers may have to make modifications or changes before the final product is implemented. You have those test cases in place so that you can regression test and make sure nothing else has changed and that your earlier successful testing will continue to be successful at implementation.

Also, change control is important. As you go through and encounter problems or things you didn't expect as you do in testing sometimes, you need to resolve the major problems, the ones that are necessary for actually implementing the product. But you also want to make sure that the things that are determined to be enhancements or the things you think might be nice to have that you think of as the project goes along, put those on the back burner and put those on a list of enhancements for later development. Otherwise, you will find the project longer to develop and longer to implement then you would have liked.

Balancing is something that I talked about a while ago. You want to make sure that during the database builds itself, that the data are balanced very carefully. It is key to making sure that the data that are in place are valid so that when you get into production you're data are reliable. Also, in the regular update and reporting from your database, make sure the balancing is going on. Internally we balance to the penny as we bring our data up to date each month and each quarter, but when we get down to reporting we round to the whole dollar. In fact, we're looking in the future for some of the reports we're going to drive off of our system to be rounded to the nearest thousand dollars.

The last subject I want to talk about is accessing the data. There are different ways that you can make the data on your reserve database meaningful. You can, obviously, look at some of the things that were created in production, reports that come directly out of the production system. Believe it or not, we only have five main reports that are produced in our production system on a monthly and quarterly basis. However, we've constructed the reporting facilities of our system with enough flexibility that the actuaries can actually drive off of the history files up to 793 different user selected reports just by varying the keys or the different elements they would like to see and the different ways they would like to see the reports come out, by either company, line of business, or coverage, or state, or a lengthy list of other elements that are there, or a combinations thereof. They can get up to almost 800 reports. We also have production extracts that take place that allow the data to be manipulated beyond production in a personal computing mode.

In the personal computing mode itself, we have some extracts that our actuarial folks do off of the production data, and some reports they also do themselves with that data.

In accessing the data, you can get out, of course, information through the mainframe. A lot of tools are available. I'm sure some of the ones that you see here are available in your systems as well. We, of course, like many of you, use APL. We also have SAS available and both our programming staff as well as our actuarial staff use both of those products.

Fourth generation languages are also something you can use to access the data. If you're not familiar with that term it is really a very powerful kind of tool that you can have on your mainframe to develop data, house it in a certain way, and access it using english like commands rather than by accessing it by using programming type statements. It is a very powerful way to access and manipulate your data and get information you'd like to see. I would also caution that if you put up a 4GL, prepare to work very closely with your data processing department in looking at the amount of resources that will be consumed on your mainframe, because it takes up much, much more than APL and some of the other tools that you may have available. A fourth generation language is also powerful in that at the very center of each of them is generally some sort of date dictionary facility that allows you to define your database and the reports.

Spreadsheets are another thing you may use on mainframes. There are many, spreadsheets available that you can put on mainframes, including Lotus 1-2-3, which is now available in mainframe form. You may find that you'll be able to manipulate your reserving data using a mainframe spreadsheet, and possibly develop the summary exhibits that you'll take to your reserve committee meetings.

Finally, you can use a microcomputer to access and manipulate some of your data from the production reserve system. You may want to download portions of some of the data that you've extracted and work with it on a micro. The caution that I would make if you're going to download is to take a look at the amount of data that you want to bring down to your PC. If it is a large file, it could take quite a bit of time in order to transfer it from the mainframe to the PC. You want to know up front that you're working with a limited amount of data. One way to address this problem is to work with a concept called "virtual diskette", where the data itself is maintained in extracted form on the mainframe, but you actually manipulate it and access it at the PC, as if it were an actual micro diskette on the mainframe.

A third thing that you might want to think about is the microcomputer processor speed. If you have a PC you're going to use to manipulate your reserving data, I would recommend that it be an IBM/AT or a compatible or larger, because you'll find that the calculation times take quite a while with some of the spreadsheet packages or some of the other custom software that you may use. You'd want to take a look at that spreadsheet performance and make sure that as you use spreadsheets, you can calculate in a reasonable amount of time -- that the machine doesn't just sit there with a calculate sign up in the right hand corner whirling away for an hour.

Finally, there is a lot of custom software that you can get for PCs. I think some of them were talked about last year in this session -- things that will actually develop and manipulate the data in triangular form to produce the reports that you would like to see. That concludes the comments I'm going to make this morning. I tried to describe some of the things we found to be useful as we built our portion of the reserving system. At this time I would like to turn the presentation over to Dick Snader.

RICHARD SNADER: About ten years ago the CAS published a "Statement of Principles" on loss reserves, and that statement contains many references to data required for reserve analysis. In fact, the Statement contains a entire section entitled "Data Considerations". That section deals with organizing data by time units. The Statement contains many other considerations, and as you read them you can see that most of them have very important implications for the way data is to be organized and used by actuaries. Three of those considerations are homogeneity,; credibility, and data availability. Under data availability I would like to quote from the Statement of Principles. It says:

> "It is the actuary's responsibility to assure that the necessary data for establishment of proper reserves is available. Frequently this means working within the constraints of existing information systems while more suitable data are being developed." Quoting further:
>
> "It is also the actuary's responsibility to be sure that claim data used in analysis of reserve is reconcilable with company financial records."

These are very significant and important responsibilities for a company actuary. Not only is the company actuary responsible for the analysis performed with the data that is provided, but he is also responsible for the quality of the data itself. Obtaining homogeneous data groupings requires refinement and fragmentation of the database.

[SLIDE #1]

This entails grouping claims into categories such as line of business; class; geographic location; personal versus commercial coverage; umbrella versus primary coverage; and of course it is necessary to separate direct, assumed, and ceded business, and anything else you can think of that's important to your company or your way of doing business.

[SLIDE #2]

The usual organization of data is into two dimensional matrices which are defined by time units. Examples are accident period versus report period and report period versus development period. The matrix is further defined by the data groupings that were shown on the previous slide, such as line, class and so forth. And finally, it is defined by the statistics displayed. The statistics that are commonly displayed in a reserve matrix are the number of claims, paid losses, outstanding losses and so on.

[SLIDE A#3]

A typical approach that a company takes in compiling this data is to create a summary database. This is done in accordance with some predefined criteria. Then the database is periodically updated until a long history has been amassed. This causes a number of problems. Databases of this type are inflexible. They are inflexible because they typically don't contain all the data that is needed to do the job at hand. They lack responsiveness meaning that after you realize that you don't have the exact data that you need, it is hard to get the additional information. These problems come about because of our failure to foresee all future requirements. The result is that we must ask our data processing department to give us additional reports. New data files are created, and we wind up with a multiplicity of databases.

That's essentially the situation we had at USF&G. We had summary databases which are produced from detail data. The detail data is in the form of a sequential, transactional file. Reports are made up from the summary databases and either used as is or combined manually with other reports from other databases to meet company needs. We had images of the output from these reports written to disk files and these disk files are manipulated by actuarial personnel using APL.

Summary databases simply aren't adequately detailed to support a very complex analysis. The ever changing insurance environment results in ever increasing demands for different views of the data. Senior management expects information and analysis that cannot be captured by the existing databases. Attempts to meet these demands take the form of additional reports. In our company we use accident year data for analyzing IBNR and total reserve needs, we have report year data for analysis of case reserves and we have an IRS database to do the IRS closed claim test. We have large claim reports and we have structured settlement reports, and all kinds of other special purpose reports. All of these databases have different selection criteria and different specifications because they were invented at different times. As a result there is a lack integrity between databases. Development of new reports from a transactional data source is, as I mentioned previously, difficult and slow because transactional data organization is not conducive to report generation.

We decided to build a new database but felt that another summary database was not the answer. We concluded that a claim level detail database was needed, and that's what asked our data processing department and for. We felt that a claim level database would be no larger than a summary database that had all the information that we currently perceive as needed for corporate reserves. We felt also that basic actuarial needs could be addressed only through user access to the detail files but that the transactional structure of our existing details would not allow the flexibility needed for research or analysis. The practical approach to research and analysis of the type we wanted to do was possible only if data could be reorganized to maximize accessability and flexibility.

[SLIDE #4]

When we approached data processing with our proposal for a database, we told them that our objective was to reorganize our claim data in order to provide a common pool which would facilitate control and balancing, data integrity, accessability, flexibility, and the ability to develop future applications--any future application we could think of that would require multiple use of the loss structure.

[SLIDE #5]

Our expectations -- first and foremost we wanted to improve the quality of loss reserve projections. We thought this would be done because reserve projections would be based on more complete information. We wanted the facility to test more theories about the underlying causes of observed trends and phenomenon. We wanted to provide senior management with additional information to support their reserve decisions. We wanted to address any other variable needs for research and analysis and along the way we thought it would be nice if we also could respond to statutory reporting requirements. Finally, we wanted this database to be the primary data source or numerous existing applications, thereby replacing our summary data files.

[SLIDE #6]

We expected our database to have the following capabilities:

- We wanted on-line access to this database via APL;
- The ability to select data for analysis using any combination of criteria and to make that selection within 24 hours.
- We wanted to be able to develop new reports showing different views of the data within 1-2 weeks depending on the complexity of the report.
- We wanted to be able to download to PCs.
- We wanted the existing jobs to be able to access this database.

Our department worked with data processing to develop the following systems requirements.

- We wanted to be able to capture and maintain data on open claims for as long as they would be open.
- We wanted to capture and maintain 15 years of closed claim data on an individual claim level basis.
- We thought it would be nice to organize the data to reduce redundancy, because we knew we would have a big file.
- We wanted to enhance accessability.

- We wanted enough flexibility to change data definitions as new data requirements became known to us in the future.

- We wanted a system that could be updated monthly, and we wanted to be able to balance our database to the audit trails produced by the official company systems.

- And finally, we asked for an APL interface.

All of these functions that I've just mentioned will be controlled by the data processing department, but the reporting that is done from the database will be a shared responsibility between data processing and actuarial. Data processing is expected to do production reports, but our department expects to do a great deal of ad hoc reporting from this database.

[SLIDE #7]

I'd like to say a little something about the record layouts that we came up with. We devised 5 different files -- 3 of them are claim level files, and 2 of them are summary files. The claim level files are called the "current claim description file", the "amount changed history file", and the "combined history file." The summary file are the "special reserve file" and the "special paid file".

[SLIDE #8]

For each of these files we expect to able to monitor activity separately for direct, assumed, and ceded. At the present time we have a database for our direct business but not for our assumed and ceded business.

[SLIDE #9]

This slide is a schematic intended to represent our current claim description file. The current claim description file contains the most recent descriptive data about the claim and "as of: dollar amounts for each claim reported in the corporate system.

JEANNE EDDY: Thanks Dick. I guess I'll have to enlighten everyone about the combined history file.

Once Corporate Actuarial determined they wanted a new Loss Reserve History System, it was up to Data Processing to come up with a way to develop it. One of our first tasks was the project team organization. Traditionally, the programming units within the Data Processing Department have been organized to mirror the user departments in the company. So we already had an existing group that was responsible for working with the Corporate Actuarial user support group. The user support group is one consisting of analysts who are responsible for defining the business requirements, the test plan, doing the user acceptance testing; really a lot of the things Larry was talking about earlier that are so critical from a business standpoint to make a system work. In our organization, these people are located within the user department. Every major department with a lot of data processing activity has a user support group with these responsibilities. The result is they are the ones that ensure we build what the end user wants.

Because of the anticipated size of this project, and also the added complexity of migrating to a relational database management system, we were concerned about doing this project and, at the same time, maintaining the existing system. As much as we were dissatisfied with all of the summary files we had, we needed to keep them going while we were doing this new project. Therefore, Data Processing created a separate project team to work with user support to develop the Loss History System.

The most critical part, and I know you've heard this before, and I guess people who have anything to do with data processing can't resist saying it again -- the requirements are really the most critical part of the system. We feel we were very fortunate here in that, as I think you can tell from Dick's presentation, our users had a good idea of what they wanted. In addition, both the Data Processing staff and the Corporate Actuarial staff on the project team had good experience with structured analysis and structured design, and they really understood what they were trying to accomplish.

The critical part of our requirements, that I hope came through, was a need for flexibility in being able to access data and do things that you didn't know you were going to have to do when you created the project in the first place. I remember when I was in Actuarial, that's what I kept telling Data Processing. I don't know what I want to do, but I want to be able to do it when the time comes. We decided the best way to achieve this flexibility would be to use a relational database manager as opposed to flat files or tape systems. At the time we started, we didn't have a lot of experience with relational databases and, therefore, broke the project into two phases. The first phase was to develop the system on flat files or tape and then to convert it to a relational database.

Many of the issues you would address in building a phase one tape system are the same ones you would have to take care of for phase two. Availability of data -- we wanted to build a 15-year database. We started with 10 and we plan to grow to 15 over the next five years. The historical data we had to make available to do this consisted of 500 reels of tape. The organization of the data was in simple transaction format by transaction date, and we needed to evaluate how we would reorganize it to come up with a structured claim sequence. Data quality -- we knew we needed to investigate what the quality of the data on these 500 reels of tape was, so we wouldn't put anything on a new database and incur all of that effort without a good expectation it would really be usable. The size of the database is something Data Processing is always concerned about. How much storage is it going to take up? How fast is it going to be to access? How much CPU time is it going to require? Those are some of the major issues we had.

Some of the major problems were really in dealing with the historical data itself. Because our systems which generated the input had changed over the 10-year period, there were various record formats to deal with. We had to analyze various ways of bringing record formats into one combined claims sequence. Also we found, particularly in older data, what appeared to be gaps in the information. We had to find different ways of reconciling those gaps and filling them, or at least understanding that there were some pieces missing. Fortunately, this was in very old data we were not expecting to be using frequently.

The other problem was definition changes over time. Internally, we had changed the way we assigned claim numbers. We had changed the way we handled some date activity, and all of this had to be matched and merged so we could come up with the combined information in the database. All of the research was mainly to improve the data quality. We think we've been able to do quite a bit, and we were confident we had something that we could use for many years.

To complete the tape phase required about 15 months, a team of five Data Processing personnel, and one to three user people from the Actuarial Department. Half of this time was spent on collecting and constructing historical data, and the other half on building the updating system to maintain the database. When it was finally completed, we were able to go from the original 500 tape reels down to 16, so the hardware resources for storing the data were significantly reduced.

While magnetic tape is obviously the cheapest storing medium, there are a lot of constraints in using a tape system. Most of the analysis the loss reserver wants to do requires only a portion of this data. With a tape system, you have to access all of the data even if you want only a piece of it. We tried to minimize accessing all the data to some extent with our tape system by creating the multiple files. One of the reasons for Dick's combined history file is it is the biggest file and if the information he needs is on one of the other ones, he doesn't have to go through the whole combined history unless he absolutely needs to.

The other constraint is only one person can use the system at a time because you have to go through the sequential reading of the tapes. Anytime you're using large volumes of tapes, you need to have an operator find them, mount them, and get them in the right order.

The biggest problem is the limited reporting and analysis tools available for tape. What we normally do with our tape system is produce an extract, put it up under an APL file, and then let the actuaries access it using APL. Unfortunately, the APL file can't be accessed with COBOL or another language, so frequently you end up creating multiple extracts.

Because of these problems with the tape based system, we knew we were going to move to a relational database system that we felt would overcome most of these constraints. It is just about completed. It has taken us eight months to move the tape information to our relational database called DB2, and it required three to four Data Processing personnel. It really did not require much user intervention because we weren't changing any of the business requirements, just moving data to a different medium. By the time we started the database phase, the 16 tapes had grown to 22, and that's now residing on 11 volumes of direct access storage.

The other problem with DB2 was training, both for Data Processing and Actuarial personnel. We had some but not enough of experience with DB2, the tools and the user languages. We have spent time over the last six to eight months sending our staff and Dick's staff to classes on DB2.

We think we're going to see advantages by having our database under a relational manager. Primarily, we'll be able to retrieve only the data needed. The relational database has the ability to define certain elements of data as an index and, therefore, easily access that information. For example, we're defining things like line of business as an index and claim key as an index. Using the line of business index, we were doing some testing and we found we could run a workers' compensation 10-year triangle; it took us three hours, which normally would have taken three months. We can retrieve a history on a single claim using the claim key index in three to four seconds. Being able to research problems on individual claims and look at the history of the claim is going to be very efficient using the database.

Data Processing has the advantage of not needing any operators to mount tapes; the information will always be loaded on direct access storage devices. There are many access tools. Actuarial mentioned they required access with APL because that's their primary user tool. They can also access the database using user query languages provided by DB2.

We can access it using COBOL. We're investigating interfaces to the database for the other fourth generation language of FOCUS and MARK IV. We think we're going to have a wide variety of ways for individuals to get at the database and do the kinds of things they need to do.

The other advantage is it is easier to manage the files as they get larger. You can partition them into different segments, and a problem with one segment would not affect the other. And yet, at the same time, the users will not have to know what segment they are getting into; the database will manage that for them.

We're continuing at this point to maintain both databases. Each month when we process our monthly information, we update the monthly tape file and balance it, then we update the DB2 file and balance it. This takes us about five days elapsed time. That's something that we definitely want to cut down on.

We have several ongoing issues. Basically, we want to know whether or not we're meeting the expectations of the Corporate Actuarial Department. They've had access to the tape system for a while, and initial reaction seems to be very favorable. They've been able to do a lot of reports faster than they could before. They've been able to get access to information that they couldn't get before. Time will only tell as far as the DB2 portion is concerned. We plan to eliminate the tape system, mainly because of the duplicate data and the duplicate updating. If we're updating directly from our monthly losses to the database itself, we can do it a lot faster and not have the five-day time lag.

We know we want to add additional data. Dick mentioned that we only have direct and we want to add assumed and ceded. We have been discussing adding some additional statistical data. For example, there are some reports that we could do if we had territory information. In reporting areas, we plan to be doing additional standard system generated reports from data processing. Right now, most of the reports we generate are the balancing reports. We have a few others that we're working on that will be defined by Corporate Actuarial and developed by Data Processing to run in a production mode. But the primary reports will be user-generated. They will have the ability to get in and manipulate the data and produce their own reports. Basically, what Data Processing is providing is the data; we're not doing a lot of calculations or reporting.

Users have been able to do a fair amount of report generation with the tape system by building extract files. Some of the things that the Corporate Actuarial staff had told us that they like about the system -- they've been able to get in and quickly take a look at claim count triangles -- look at count triangles for closed versus open. They've liked the ability to review history on individual claim files for analyzing problems with large losses.

The majority of the need for the database and the incentive to build it came from Corporate Actuarial for reserving purposes. But now that we have pieces of it up, we're finding that the pricing actuaries are also using it, because the data is aggregated on an individual claim and you can see the total claim amounts at different points in time. It works very nicely for looking at basic limits pricing or capping losses for experience rating or loss limitation type functions. We think the database is going to be much more widely used than we originally planned.

Data Processing would like to use this database as a source of information to eliminate a lot of our other summary databases, like systems that produce agency experience results and branch office operating statements. We believe this claim database will allow us to eliminate a large number of our summary files.

Since we haven't much experience with the relational database, we're going to continue to monitor very carefully the performance and the resource utilization. It will be important to work very closely with Corporate Actuarial to monitor the types of inquiries they do, the time it takes, and to continue the education process so we can do things as quickly and efficiently as possible. We think we have a good foundation and a good system in place, but really we're going to still have a few more months of learning experience before we can do all the things we want -- but we think we're on the right track. I'd like to turn it back to Howard. Thank you.

EXAMPLE

AMOUNT CHANGE HISTORY FILE

	Activity			Derived History		
Qtr. End. Date	Paid	Δ Reserve	Status	Paid	Reserve	Incurred
9/83	0	10,000	Open	0	10,000	10,000
12/83	-	-	-	0	10,000	10,000
3/84	-	-	-	0	10,000	10,000
6/84	-	-	-	0	10,000	10,000
9/84	-	-	-	0	10,000	10,000
12/84	-	-	-	0	10,000	10,000
3/85	7,000	-7,000	Open	7,000	3,000	10,000
6/85	-	-	-	7,000	3,000	10,000
9/85	-	-	-	7,000	3,000	10,000
12/85	0	5,000	Open	7,000	8,000	15,000
3/86	6,000	-6,000	Open	13,000	2,000	15,000
6/86	0	-2,000	Closed	13,000	0	13,000
9/86	-	-	-	13,000	0	13,000
12/86	-	-	-	13,000	0	13,000

EXAMPLE

AMOUNT CHANGE HISTORY FILE

Qtr. End. Date	Activity Paid	Activity ΔReserve	Activity Status	Derived History Paid	Derived History Reserve	Derived History Incurred
9/83	0	10,000	Open	0	10,000	10,000
12/83	-	-	-	0	10,000	10,000
3/84	-	-	-	0	10,000	10,000
6/84	-	-	-	0	10,000	10,000
9/84	-	-	-	0	10,000	10,000
12/84	-	-	-	0	10,000	10,000
3/85	7,000	-7,000	Open	7,000	3,000	10,000
6/85	-	-	-	7,000	3,000	10,000
9/85	-	-	-	7,000	3,000	10,000
12/85	0	5,000	Open	7,000	8,000	15,000
3/86	6,000	-6,000	Open	13,000	2,000	15,000
6/86	0	-2,000	Closed	13,000	0	13,000
9/86	-	-	-	13,000	0	13,000
12/86	-	-	-	13,000	0	13,000

Richard H. Snader
Session: Loss Reserve Reports & Databases (6F)

#1

DATA CATEGORIES

- LINE OF BUSINESS
- CLASS
- GEOGRAPHIC LOCATION
- PERSONAL VS. COMMERCIAL
- UMBRELLA VS. PRIMARY
- DIRECT, ASSUMED OR CEDED
- ANYTHING ELSE YOU CAN THINK OF

#2

DATA ORGANIZATION

2 DIMENSIONAL MATRIX

- TIME UNITS
- DATA CATEGORIES
- STATISTICS

#3

SUMMARY DATA BASE PROBLEMS

- INFLEXIBILITY
- LACK OF RESPONSIVENESS
- FAILURE TO FORESEE FUTURE REQUIREMENTS
- MULTIPLE REPORTS
- DUPLICATION OF DATA BASES

#4

COMMON DATA POOL

OBJECTIVE

- CONTROL AND BALANCING
- DATA INTEGRITY
- ACCESSIBILITY
- FLEXIBILITY
- FUTURE APPLICATIONS

#5

EXPECTIONS

- IMPROVE QUALITY OF LOSS RESERVE PROJECTIONS
- TEST THEORIES AND ASSUMPTIONS
- MANAGEMENT INFORMATION
- RESERACH AND ANALYSIS
- STATUTORY REPORTING REQUIREMENTS
- REPLACE EXISTING SUMMARY DATA BASES

#6

CAPABILITIES

- On Line Access
- 24 Hour Turnaround
- Input for Existing Applications
- Develop New Reports
- Download to PC

#7

PRINCIPAL FILES

CLAIM LEVEL INFORMATION

- CURRENT CLAIM DESCRIPTION
- AMOUNT CHANGE HISTORY
- COMBINED HISTORY FILE

SUMMARY LEVEL INFORMATION

- SPECIAL RESERVE FILE
- SPECIAL PAID FILE

#8

PRINCIPAL COMPONENTS

- DIRECT
- ASSUMED
- CEDED

#9

CURRENT CLAIM DESCRIPTION

GENERAL CLAIM INFO (CLAIM KEY)	CURRENT DOLLAR VALUES (9 "BUCKETS")

#10

GENERAL CLAIM INFORMATION

COMMON TO ALL CLAIMS

- CLAIM KEY
- ACCIDENT DATE
- STATE CODE
- AND SO ON

#11

CLAIM KEY

COMBINATION OF

- CLAIM NUMBER
- CLAIM REGISTER
- CLAIM DATE
- DATE CLOSED

#12

MONETARY BUCKETS

- PAID LOSS
- PAID MEDICAL
- PAID EXPENSE
- O/S LOSS
- O/S MEDICAL
- O/S EXPENSE
- LOSS SALVAGE
- MEDICAL SALVAGE
- EXPENSE SALVAGE

#13

AMOUNT CHANGE HISTORY

CLAIM KEY	DATE OF CHANGE	CHANGE FROM PREVIOUS RECORD

#14

SUMMARY LEVEL INFORMATION

SPECIAL RESERVE QUARTERLY SUMMARY	SPECIAL PAID QUARTERLY SUMMARY

1987 CASUALTY LOSS RESERVE SEMINAR

6G - FINANCIAL GUARANTEE RESERVING

Moderator: Gail A. Mendelssohn, Consulting Actuary
Tillinghast/TPF&C

Mark A. Stuckart, Sr. Vice President
AMBAC Indemnity Corp.

Lou Turner Zellner, Sr. Vice President
Mortgage Guarantee Insurance Corp.

Recorder: John Buchanan
Tillinghast/TPF&C

GAIL MENDELSSOHN: We're talking about financial guarantee insurance today. I'd like to start off and just give a very brief overview of the financial guarantee insurance industry. I'll be talking about the types of risks that are addressed by financial guarantee insurance; the kinds of products that are written; who some of the key players are; what some of the broad based financial results have been for two of the lines of business -- mortgage guarantee insurance and municipal bond insurance. Finally, I'll give some of the key success factors for someone getting into the financial guarantee insurance industry. And after that I'm going to turn the table over to Mark Stuckart, who will be talking about municipal bond insurance. And then to Lou Zellner, who will be talking about mortgage guarantee insurance.

[Exhibit 1]

There are basically four types of risks that the financial guarantee insurance industry addresses. The first risk would be termed credit risk, and this is basically where the insurer is substituting its credit rating for that of the insured and basically involves analyzing the creditworthiness of the insurer that they're offering the credit rating to. Secondly, we look at timing risk. This is where the insurer may have to fulfil the obligation of the insured until the insurer can recoup via salvage. For example, if an insurer guarantees a portfolio of mortgages, and some of the mortgages default, then the insurer would have to pay upon the default of the mortgages but would have recourse to the properties that are supporting the mortgages and would ultimately be able to recoup some of their loss, hopefully, by being a secured creditor. The third type of risk would be value risk, and this is where we're guaranteeing the value of a selected asset at an agreed point in time. This would also include interest rate guarantee. Fourth, would be performance risk, which is basically what we know the surety business to be, and what sometimes considered the starting point for financial guarantee insurance. This is the guarantee that some future performance will take place.

[Exhibit 2]

The main types of financial guarantee products that address these risks are: mortgage guarantee insurance, where the insurer covers a percentage of the loan against default, and this would also include any guarantee of securities backed by pools of mortgages. Lou is going to get into that in great length. There are credit enhancement products which are municipal bonds, commercial paper, industrial revenue, and development bonds. This is where the insurer is insuring the timely payment of principal and interest, thereby rating the credit raising of the debt instrument, and possibly reducing the cost to the issuer. A couple of miscellaneous types of financial guarantee products would include: residual value insurance. Many equipment leases have residual value insurance which guarantees to cover a fixed percentage of the asset value for either a specific asset or a group of assets. And finally, limited partnership guarantees--suppose you have a limited partnership which invests in the purchase of real estate. You've got individuals who are investing in the limited partnership and they typically don't pay their investment into the limited partnership in full up front, however the cash is needed in order to buy the property that is being purchased by the limited partnership -- so banks lend the money to the limited partnership to buy the property and they're usually backed by promissory notes from the individuals that are part of the limited partnership. The banks typically ask for some other form of collateral other than the promissory note. One form of the collateral would be the limited partnership guarantee.

[Exhibit 3]

As I said we're going to focus in on mortgage guarantee insurance and municipal bond insurance. And some of the key suppliers of this kind of insurance for a mortgage guarantee would be: MGIC; Mortgage Guarantee Insurance Corporation; Ticor, who I don't think is writing business now; PMI; Verex; and United Guarantee. The municipal bond insurers would include: AMBAC; MBIA; FGIC; and Bond Investors Guarantee.

[Exhibit 4]

There's been a huge growth in the financial guarantee insurance industry as a whole, and specifically as you can see in these numbers, looking at net written premiums for mortgage guarantee insurance, there has been a five-year growth here of over 200%.

[Exhibit 5]

Associated with this huge growth in premium has been a horrendous deterioration in loss and combined ratios. The low 1981 level had persisted in prior years. I don't think that's something that anyone would expect to see in normal property/casualty business. I'd would venture to say that 1986 is going to be looking worst than 1985 for the industry, so there have been some tough times, and Lou is going to get into what's been going on behind these numbers.

[Exhibit 6]

For the municipal bond industry, we can look at direct written premium before reinsurance. Here again, we see a huge growth in direct written premium -- tailing off a little bit in 1986.

[Exhibit 7[]

Looking at loss payments over the six-year period, we see minimal loss payments in the early 80's, and then the WPPSs situation is leading the deterioration in 1985; 1986 has dropped off a little bit.

[Exhibit 8]

Finally, we'd like to present what we view as some critical success factors for anyone wanting to get into the business or in the business already. Financial strength is key to success in this business. There are substantial capital requirements for entry into the financial guarantee business. Additionally, you need retrocessional reinsurance support. There are relatively few suppliers of reinsurance for the financial guarantee insurance industry, and they have typically have capacity limitations. You also need to have disciplined management and underwriting. And I would also include pricing in this category. I guess Lou would probably concur that part of the problem driving the deterioration in the mortgage guarantee business has been the fact that underwriting was a word that was ever used in the past; and price changes were relatively small and few and far between. Finally, you need strong sources of business and product development capabilities. There's a great deal and flexibility in the kind of products that are offered for financial guarantee. I think this goes hand in hand with some good management.

To get a little bit more detail on these subjects we're going to start off with the topic of municipal bond insurance. We've got Mark Stuckart, who is a Sr. Vice President with AMBAC, in New York. He's been in the industry for about 10 years. He's been with AMBAC since about 1985, and he's Sr. Vice President for New Product Development. Prior to that he was with Citibank for a couple of years as head of the municipal credit research department. For 7 years prior to that he was with Aetna as their Sr. Investment Officer and Chief Underwriter for MBIA. Mark ...

MARK STUCKART: Thank you Gail, and good morning. It is a pleasure to be here in Minneapolis with this distinguished panel. I should point out that Lou in the past was one of the prime regulators for my company, AMBAC, when she was with the Department of Insurance in Wisconsin. She has gone on to join MGIC, as you know, which used to be the parent company to AMBAC. TPF&C, Gail's firm I should point out, and I have to be very careful here, is the firm, that does the compensation studies also for AMBAC, so I'm sort of treading lightly here. I do have to say that I'm disturbed about one thing. When Gail contacted me some months ago and it was reviewed with my marketing PR group that I was going to be talking with a group of actuaries about the industry and losses, they indicated that we needed a little levity. They proceeded to develop a series of four political jokes for me. They said you'll hit everybody, nobody will be offended. And this will work well -- it'll start off your talk. So they developed a great joke about Ronald Reagan's age. And lo and behold this week I got the wind taken out of my sales when he got together with Al Landen, and said here is a guy who could call him a kid, quite legitimately. There went that joke. I had a great joke on Jesse Jackson, about his political aspirations, and what does he do to me. He announces he is going to announce in the fall. Well, there went that joke. I said I can always count on New York City Mayor Ed Koch, now here's a guy who comes through for you. I had a great joke developed at great cost in this whole process, talking about how narrowly focused New York is and how New York thinks it is the center of the world and there's nothing beyond it. What does Ed Koch do to me? He goes ahead and says he is going to supervise the Central American peace process. My ace in the whole is Gary Hart. What does he do? He goes on Nightline with Ted Koppel, and he says basically everything, there was nothing left to tell. He admitted to the so-called cheating heart which the papers in New York made a big field day of. Anyway, you're going to have to just listen to the talk. I'm sorry there are no jokes. We'll try to see if we can give you a little interesting information about it. If you people promise not to go to sleep we'll keep the lights down so you can see the slides here a little easier.

[Exhibit 9]

I'm not going to spend much time on this slide because I think Gail gave us a very good overview of financial guarantees. Just remember that in any financial obligation where one party promises to deliver something to another, you have, in essence a financial guarantee. Think about that. That's a wide, wide spectrum. Here, we're not talking about a loss in the traditional casualty sense, we're talking about an implied promise about an investment of some type to an investor. All of these types will fall into that category. One distinction I'll draw just very quickly -- monoline versus multi-line. I think it is an important one. The whole thrust of the municipal bond insurance industry is moving rapidly towards monoline. The NAIC model bill was passed about a year ago -- legislation that has been proposed in New York and didn't pass this time around, but will be reintroduced next year. All of this is moving in this direction. I think it's a good direction in the sense that you get a segregation of a product line. You can follow that product line very carefully, and you're also in a position where if there was ever a catastrophe to the industry, you've created a fire wall around that industry. The other side of the coin, and I'll try to be equally fair, there are other companies that are still writing multi-line financial guarantee insurance. The argument there is that because you have greater resources, a diversification of product lines, if one is down then it can help out another, that makes for a greater financial strength. That's the debate that's been going on and I'll say a little bit more about it later. I think it's a good distinction to just keep in mind.

[Exhibit 10]

Municipal bond insurance was pioneered by AMBAC in 1971. It guarantees the timely payment of principal and interest on insured bonds. The liability for payment may not be accelerated. A key point -- unlike a letter of credit where something goes bad the whole amount is accelerated, my industry pays principal and interest as originally scheduled and due. That means that we might insure a $10 million bond, but we don't have to pay $10 million if it goes bad -- not all at once. It gives us time, and time is very important. We would only pay on that bond may be $1 million a year. That would be the scheduled debt service on a typical long-term bond. That, I think, is the key thing that gives stability and strength to this industry. Typically, we would have a "AAA" rating from both Moody's and S&P, and the rating is critical because what we're selling is quality. We're selling sleep insurance, we're selling an ability to an investor that he doesn't have to worry about his investment. From the issuer standpoint, that municipality be it Minneapolis, Topeka, or wherever across the country, they might have been an "A" rated bond on their own. With insurance from the industry they've become "AAA" rated. What does that mean? Normally, they would have had to pay about 8.5% of interest rate. With the insurance being "AAA" rated, they will now only have to pay perhaps 8%. That's a lot of savings to the municipality. Of course, they have to pay the insurance premium which we enjoy receiving, but is points per year. And on these dollar amounts that's an enormous savings to the municipality. That's why insurance has been catching on. We've enhanced the marketability of good credits. We do not make good credits out of bad credits. The premiums we charge are very, very small relative to the risk. We can't afford to be wrong and credit quality. I'll speak more about that whole process as we get into our underwriting and our loss reserving.

[Exhibit 11]

You can take a look at the volume of new long-term municipal bonds and insured bonds. A couple of simple stories here. Enormous growth, in fact. If I would have extended this chart back into the 70's, you would have seen it go down to practically nothing in terms of insured, and very, very low in terms of municipal bonds issued. What happened? I think there is a good long-term growth trend in here but along came 1985 and 1986, when we had a Tax Act pending which was passed in 1986. Everybody who had financing needs rushed to the market. A lot of them were refundings, and we had a very atypical, abnormal pattern in those two years in particular. I think we're getting back to a more normal pattern and I think that in 1987, you will see municipal bond issuance between $100-125 billion. I think its going to be resuming it's old, steady, secular growth trend going back to the early 80's, and I see that going out to the future. Why? Because municipalities increasingly have needs to fulfill--aging infrastructure, population has been growing, and we also have a basic desire in the populace to have certain services performed. We had sort of a hold up for a while, after the tax bill was passed, but I think we will resume were a normal pattern.

Let's take a look at the bond insurance side. Where we had a tremendous mushrooming. In 1985 you saw $43.4 billion par amount insured by the industry. That has come down quite a bit. At the same time, we've had some more competition come in and I'll talk a little bit more about that in a moment. I think the industry is going to insure roughly $20 billion to $25 billion for 1987 as a whole.

[Exhibit 12]

Let's look a little bit more slowly at the buyers. A key word in the title here is who owns tax exempt paper? This has a lot of breakouts between institutional groups and what I call individuals holding municipal bonds. Individuals, remember, buy mutual funds, so that they're in several categories. The big story here is that over the past five years individuals have doubled or tripled the amount of municipal bonds they own. and institutions have been relatively flat. In fact, casualty things like insurance companies have almost been exactly flat as you look at this graph. They've were at $96 billion in 1982 and are at $99 billion in 1986. What does that mean? It means that the institutions which normally like to buy that high yield lower quality paper are not so active, but the individuals who want that high quality paper are buying a lot, and they want insurance. This has been part of the dynamics that have created this phenomenal growth in the municipal bond insurance industry.

[Exhibit 13]

Here we have a slide on the players, and Gail had a very similar slide. I think mine has one additional entry -- Capital Guarantee Insurance Company out on the West Coast. All of these companies are owned by a consortium of very fine quality institutions. I think the important point there is it gives the industry a lot of stability. In the case of AMBAC, for example, Citibank owns 85% of AMBAC, with the remaining 15% held by Xerox Stevens, Inc., which is in Little Rock, Arkansas, and management. If you go down the list really all of these companies have very, very fine parentage. I think that it's worth pointing out that there are now two public companies. They are MBIA and FGIC. The others remain privately held. In terms of size, AMBAC and MBIA are at the top of the list. Both of those companies have assets of over $1 billion, the rest of the industry goes down from that point. We'll turn for a moment now to some of the products insured by AMBAC and the industry, I won't go through all of these with you.

[Exhibit 14]

I think the key thing is that there is diversity by product type -- by bond type and category. I think this is good because it helps again, in another way, to make the industry safer and it plays through right into our loss assumptions and things of this type. There are also a smaller percentage of some of the riskier types. Types that that have historically had higher default rates. For example, when looking at non-investment grade bonds, you find things like leases, bonds from communities that have very small populations, like a mining town with 900 people. Those are traditionally where a lot of the defaults have been, and there haven't been very many. If you get into the safer categories, and I'll show you a little bit about AMBAC's portfolio, which is representative of the industry, I think you'll see that.

[Exhibit 15]

Turning to pricing -- which is near and dear to everyone. We have a question here?

QUESTION: What are TANS, RANS, and BANS on the slide?

TANS are tax revenue anticipation notes, RANS are revenue anticipation notes, and BANS are bond anticipation notes. They are one year obligations usually. If the school district has a temporary cash flow situation, which it always has because of the cycle -- let's say it collects its taxes in February, but they have to start paying the teachers back in September. They will do a note issue, raise money, and that is secured by taxes-- hence the term tax anticipation notes. The other would flow through in a similar fashion. There hasn't been a lot of insurance in that area. It has been a very liquid market even on its own and fairly highly rated issue spreads are very narrow.

In terms of pricing we have two types of pricing -- up front, which is a one time charge for the life of the issue, and we also have annual premiums. The one time up front premiums comprise, I would guess, somewhere between 80 and 90% of industry price quotes. What do we charge? If it's an annual premium it may be 25 bases points per year. If it's an up front premium, the industry has been historically in the level of around 2% of the bond par amount, which translates into about 7/10ths of 1% for the insured principal and interest. We guarantee the whole debt service, not just the par amount. Consequently this is a very, very thin pricing in which you can't afford to be wrong on credit. You have to have good underwriting. Pricing is a function of number one credit risk and number two, losses. The old spreads in the market and the value added our product gives to issuers, number three,competition, number four, the cost of capital, which is often about 50% of the total cost depending on bond type and number five, volume. Capital is mandated by the insurance departments, and also by the rating agencies. In fact, in certain ways and areas, the rating agencies are more stringent than the insurance departments across the country. They are requiring a lower amount of leverage. Of course, underwriting and marketing expenses are set off a little bit by investment income. We don't really look at that to try to look up front.

[Exhibits 16 and 17]

Insurance is restricted at AMBAC to investment grade municipal issues. This is an important distinction because there is a great big difference in default rates between investment grade and non-investment grade issues. This sets the basic parameter-- this is the universe of our risk, and it's an awfully fine pool to be in. Take yourselves -- how many municipal defaults out of the roughly 40,000 or 60,000 credits that come to market in the U.S. -- how many of them can you name right now that have defaulted in the past 30 years? I don't think there would be many people who could name five. New York City actually paid on all of its bonds, which many people don't know, when it had all of its trouble. It's a very safe environment. Municipal bonds are much safer than corporate bonds, and that's where financial guarantees were started. They didn't come in on the corporate guarantee side of insurance, they started with municipal because they were safer. We turn to take a quick look here at AMBAC's insurance in force by rating. These are the ratings that they had before we put our insurance on it. You can see up here that there's a nice spread, there's even some "AAA" bonds. Bonds that have gotten better in quality after we've insured them. On their own they've gotten better. The actual amount of non-investment grade bonds is very, very small.

[Exhibit 18]

If we look at diversification by bond type you can see here some of the major sections -- and I've condensed them a little bit from that earlier slide that you've looked at -- we have a lot of diversification. The really strong sectors which are municipal utility, and GL taxed and government backed, those are the ones that we're wading in the most heavily. That's true of the industry, I'm not just pointing out AMBAC here. There are a couple of abberations, but that's essentially what the industry is close to. This diversification strengthens the overall portfolio, and it reduces risk.

[Exhibit 19]

Looking at another quick slice of AMBAC's distribution by original net par, you can see the vast majority of what we have done is less than $10 million in size -- 74.2%. And that's where we want it to be. We want to target for that lower amount. We have done larger issues, but what we try to do whenever we try to do a big issue, and the market demands that we do very big issues is try to be very, very choosy. If we're going to do a big one the insured has got to be a very, very clean, good credit.

[Exhibit 20]

Let's look at another slice of diversification by state. States with big populations, big amounts of bond needs tend to be higher percentages than others. I noticed this morning when I looked this over, that Minnesota is represented here -- 2.7%, that would be the 10th largest state right now in terms of our book of business. This diversification helps. Why? Because of regional economies are very important to financial guarantees. And you want to have a mix so you don't have all of your eggs in one basket.

[Exhibit 21]

These past several slides have shown how the industry reduces risks in a macro sense. I'd like to go through now how this translates into actual loss assumptions. The default rates are low on all municipal bonds. We attempt to write to a zero loss ratio as our goal. We have high underwriting standards. I'll give you an example. Each credit that we look at has the equivalent of perhaps five or ten man days of a very experienced team of professionals underwriting it with lots of experience. It's an average size deal if it's $10 million par amount, you have $30 million in total debt service. We can't afford to be wrong. We've got a tremendous amount of information and have a highly disciplined underwriting process. I think it does a good job. Over the past 10 years paid losses in the industry, net of salvage, represented less than 700,000 of 1% of the total P&I. That's very, very low. You would say well you should be taking more risk. But we are the last guardian. We are the shield against things like the depression. We are built so strong that we will sustain and pay through a depression. A depression, I don't know if we'll ever have one again. But back then 4,000 municipalities went into default out of about 40,000. We tend to forget that this can happen again, but we're geared so that we're ready for it. Our loss assumptions take that into affect. Two years ago we went through that exercise again with an actuarial consultant, and we analyzed severity and frequency. We did a lot of modeling about what the depression would look like to be prepared if there ever was one.

[Exhibit 22]

If we look at the industry loss experience -- take a look at these numbers and I think you'll find that by any sort of a casualty sense they're excellent numbers. In fact, we're going to get a lot of that $47 million back in the case basis loss reserves. I saw in the paper just this morning that WPPs is paying a little bit on a settlement, but it's a good track record.

[Exhibits 23 and 24]

Again, this is just another illustration of that. Let me stress at this point that the defaults are temporary rather than permanent. Gail mentioned that timing is really important. It's very much the case that we are looking at credits that can get into problems for a while, but then they get out of the problems. You may think of New York City. Basically, the bottom line is municipalities don't go away, they are here. A steel company, an oil company, they can go away, but municipalities stay around and usually they get fixed up and put back on track. And that's why the salvage rate is somewhere between 60% and 70% as being the norm in the industry.

[Exhibit 25]

Let's take a look at claims. I generally do two of these temporary cash problems, usually resolved in about three years or less -- high salvage rates as we mention, and we only pay the principal and interest as due. We've gone through why the industry has experienced few losses and how underwriting minimizes these losses. Let's go to how the industry sets up reserves when losses do occur.

[Exhibits 26 and 27]

The first category is case basis loss reserves. You guys thought you were going to get away easy and this was just going to be an overview of the industry. Now we'll get into a little more of the tough part. Case basis loss reserves are established when a default in the timely payment of P&I is judged to be imminent. Let's go into a little bit more detail. With interest based loss reserves there are two subgroups: temporary and permanent. By the way, all the way throughout here I'm talking about statutory accounting. The temporary default reserves are set up when we think an issuer is going to come out of it. We include in those reserves, generally speaking, the present value of three years of debt service payments. The discount factor that we use is the embedded rate in our investment portfolio over the past three years. Again, there is some discussion usually when this happens with the department of insurance and the state where the company is domiciled. If the defaulted issuer can pay part of the amount that's becoming due, then we may set up a reserve or just the difference. Again, the present value, we're expecting the issuer to be able to make some partial payments over the three-year period of time. That's been a more recent development. Permanent default loss reserves occur when we think there is absolutely no hope of getting any money out. It's really a project financing, perhaps, that has gone bad, or something of this type. I'm sort of reminded what Dante wrote in the Inferno -- abandon hope, all ye who enter. This is pretty bad because we're talking about a thirty year bond quite often. Washington Power Supply -- WPPs as the investment bankers of Wall Street named it. That was a permanent loss -- I don't know, in reading the paper today maybe there is a little bit of hope. They are very rare and they usually relate to a credit which is not just a municipality but some sort of an entity, a project. We set up a reserve based on the present value of the remaining debt service over the life of the issue.

[Exhibit 28]

Okay, let's turn in this next slide to contingency reserves. Contingency reserves are required by regulators because the bonds typically remain outstanding for about 20 years. It's not specific to any one bond issuer. The contingency reserve provides an extra conservative statutory mechanism to give the industry strength and stability. Let's go through that just a little bit more in depth.

[Exhibit 29]

What happens is that each year as premiums are earned out, 50% of each year's earnings are held in the contingency reserve for 20 years. This is a very conservative mechanism, and it was set up very close to the formation of the industry. The contingency reserves can be drawn down in any year in which the incurred losses exceed 35% of net earned premiums. This was done to alleviate the financial strain that can result when an insurer experiences adverse losses. The industry does not have IBNR reserve per se. Contingency reserve is somewhat similar to this but it is different. Again, it's a cushion that is there to help the insurer to weather a very tough time.

[Exhibit 30]

Okay, we've gone through essentially the three types of reserves: case basis loss reserves, which are specific to an issue; the contingency reserves, which are broader based -- and again it is 50% of the earned premium from each year held for 20 years; and the unearned premium reserves, which are typical to any casualty insurance situation. The one thing to note about them is again, they tend to be held for about 20 years. We earn out our premium very slowly. If we insured a twenty year bond and had equal payment within those twenty years, we would only earn out five percent of our premium each year. It's a very conservative posture. Let's take a look at just one example. I should say AMBAC Indemnity Statutory Summary Balance Sheet. You can see here how the typical balance sheet would be set up from the industry. We have a tremendous amount of reserves, a large policyholder surplus mandated again by capital requirements of the insurance department, from the rating agency, and a very small amount of other liabilities. I'll show you a breakdown of that in AMBAC's particular case.

[Exhibit 31]

Here are the reserves. We see a very small case basis loss reserve. We have a much larger contingency reserve of $116 million, which again represents 50% of the premium already earned, and a very large unearned premium reserve of $345 million. That's a nice base, and of course, I don't need to point out that all that earns investment income.

[Exhibit 32]

I've really been talking about statutory accounting, but I'll make a few points here. Statutory accounting is very conservative. You earn your premiums over the life of the issue and very slowly you put away 50% of your earnings in a contingency reserve. It's good in terms of cash accounting, it's a good measure of cash flow. And by definition it's required by the insurance regulators. A GAAP accounting is more flexible in terms of recognizing earned premium. And the policy that company adopts is the really almost identical to the statutory approach-- it's on the conservative end of the spectrum. It also allows the spread of underwriting expenses over the life of the issue, which gives you a good matching of revenues and expenses in statutory accounting even though its a thirty year book of business, all expensed right up front in year one. GAAP does not have the contingency reserve requirement. There are less reserve requirements in general.

[Exhibit 33]

We've touched on a number of issues in terms of the industry, and let me give you a couple more here. Again, leading towards a very strong foundation. Mono-line requirements, capital requirements, which have been increasing; rating agency requirements coming into those. We have New York State with a piece of legislation that will be re-entered next year. We have the model bill which was passed. In terms of pricing, we have hit a maturity phase very, very quickly in the industry. We have a very competitive market. We had more competitors enter the industry, and a lot of additional capital has been added by these competitors, and by existing competitors as well. It was the case four or five years ago that the industry was operating at perhaps a 300 to 1 ratio. Three hundred dollars of P&I exposure for every dollar of surplus, and now that ratio is closer to 140 or 150. It depends a little bit on the mix of business, and if you look at the model bill you'll see that, and also there are the tougher requirements that Moody's and S&P have been placing on the industry. Again, looking at the long-term, you can make as much money, but you want to have a very solid and secure industry. In 1987, we've had lower issuance, low volume, narrower spreads in the marketplace between quality levels of insurance. And we see that continuing for a while the industry getting back onto more of a normal track.

GAIL MENDELSSOHN: Thank you Mark. I'd like to introduce Lou Turner Zellner. Lou is Sr. Vice President with Mortgage Guarantee Insurance Corporation, involved with claims in reinsurance. She's been with them since 1986. Prior to that, for three years, she was the Chief Deputy Commissioner for the State of Wisconsin, and her name and face appeared in the paper quite regularly I am told. And then for four or five years prior to that she was with University of Wisconsin in Madison in Systems Administration. Lou is going to talk to us about mortgage guarantee insurance.

[Exhibit 34]

LOU TURNER ZELLNER: Thank you Gail. I think both you and Mark this morning have covered a number of the basic aspects of financial guarantee insurance. I'll try to go through my presentation as quickly as possible so that we can get to the question and answer period which you're probably waiting for. I'll start out with a brief description of the mortgage guarantee business. There were mortgage guarantee writers back in the thirties. Needless to say at that period in time this was not a line of business that survived that period. It did not have very good experience and, in fact was not written in this country again until the 1950's, and in fact, 1957, when MGIC was formed. In making its reappearance in this country, the regulatory requirements, cap requirements and so forth that provided the framework for the reappearance of this line of business, were substantially tightened and improved, so 1957 really becomes the starting point of the modern history of the mortgage insurance business. We've only been around 30 years, and it really became an outgrowth of the 1950's baby boom, and seeking assistance for the first-time home buyer in the marketplace. While they may have had good earning capacity and good credit ratings, they did not have sufficient assets to make substantial down payments that were traditionally required at that period to make a home purchase. That led to the formation and the re-emergence of the industry. Today, there are approximately 10 companies actively writing the business. Gail showed you an overhead earlier that listed some of the major players. I should point out that one of the major players wasn't on that list and that's GE. They are a very big player in the market today having entered really in any substantial way in the last couple of years. Most of the other four or five companies that weren't listed are smaller and tend to be more nitch players. The other thing I'd like to point out though, in addition to the private mortgage insurance industry, perhaps our biggest competitor today is the FHA and the VA. If I could give you some historical figures I would point out that in 1986, we had a substantial number of the mortgage originations, that were insured, of approximately 30%. And this is a substantial reduction from 45% that were insured in 1983. We've seen the insured share of the marketplace declining over the last few years. I should also point out that apart from refinances that has occurred in the last eighteen months, the origination market itself is stagnant. We're in a situation where the originations aren't growing the way they did in the early 80's. The insured share of the market has declined substantially, and the privately insured share of the insured market has also declined. Back in 1976, the private mortgage insurance industry had roughly 45% of the insured business of mortgages. By mid-1986 this had fallen to about 35%, with really the biggest piece of the loss going to FHA as they began to more aggressively compete with us, and as the industry, frankly, began to tighten up on pricing and underwriting. The industry is simply not doing 95% loans the way we had done them in the past, so that's part of the reason for the change in the figures. The bottom line is the market share that we're seeing today of all mortgage originations being insured by the private mortgage insurers is running between 10 and 12%. That is a fairly substantial change from what we saw earlier in the 1980's.

[Exhibit 35]

I don't want to spend a lot of time on this because both Gail and Mark talked about it. But I think many of you who have more of a traditional surety background, it is important to point out that we're really talking about a performance guarantee made by a third party. Whether you're talking about a contractor, a municipality, or a borrower, the basic concept can be said to be quite similar. In terms of the true operations today, I guess I'd like to point out that they are actually quite different. I think when you look at surety, or even as Mark has pointed out, with the municipal bond issue, you are not expecting to pay losses. You've got your expense ratio and maybe you're going to have a loss or two, but that's really not something you build into your basic pricing decisions to any great extent. That is not true today in the mortgage insurance business, and that is one of the things that I want to come back to and spend some time on.

Just to give you the basics of the way that the product is written, we have master policies with business. The first thing we do is pick which lenders or high quality lenders that we want to do business with. The underwriting decisions are then made on the individual borrower basis, we then issue certificates on those individual borrower credits. Primarily when this product was thought of more as a credit enhancement, we'd be looking at young borrowers, good credit, two assets, low down payment, we're helping to put them in their first home -- maybe their second home. Today with the change in the business, especially with the tax law, and your mortgage interest being one of the few deductibles that most people have left, that may change the nature of the business.

[Exhibit 36]

I just want to talk a little bit about the regulatory framework, it's very similar to what Mark discussed for municipal bond business. It is a monoline business, which means we cannot write any other line of business within our mortgage guarantee company. It also means that when it comes to reinsurance, that we only get statutory credit with other monoline companies. I think that point is very important. It's not true in the municipal bond business; as far as I know, this is the only line of business that calls for this. As with the municipal bond business, we are also regulated on risk per capital, not premiums and surplus. We can't write more business by reducing our premiums. I've always found that as someone who came into insurance about three or four years ago, it was sort of strange that by lowering rates, a standard P&C company could somehow write more business based on premium to surplus regulation. We are regulated on a risk per capital basis which I think makes very good since for the financial guarantee lines and ours is 25 more as opposed to 300 more. I think that reflects the evaluation of the kind of risk that we're writing as opposed to the municipal bond risk. Again, the qualified capital for meeting those requirements include policyholder position, surplus, and again the contingency reserve. The contingency reserve operates very similar to the municipal bond business, and it is maintained in addition to the case basis reserves. We, too, must set aside in a contingency reserve 50% of every dollar of earned premium. I guess the one difference from municipal bond insurance is that the time frame that we're dealing with is shorter. Those funds would be released after ten years rather than twenty years, and in the interim, can only be drawn upon when the losses exceed thirty five percent. That part remains the same.

[Exhibit 37]

I'll talk a little bit about the nature of the risk. One of the keys is, of course, the time period. This is an average risk and the average half light of an insured mortgage is about seven years. When that varies it varies by the type of instrument that you're insuring, but that's approximately what it's been running. I think we've always understood in the mortgage insurance business that was part of the risk that we took on. Whatever judgment we made about the other risk factors we make it up front. We make it one time or we're stuck with it. Again, it points out the importance of underwriting decisions up front, because may be you can price adequately, to some extent, at the beginning. But the truth is that if you don't underwrite properly the pricing is never going to make up for those mistakes.

I think the credit risk portion of what we insure was what most people spent most of their time looking at in the early years of the business. We were looking at employment stability; income adequacy; was there a good credit history; good use of credit; all of those kinds of things -- savings patterns and the like. To try to make an up front judgment on was this borrower going to be someone who was going to make those mortgage payments. Having made those judgments, yes, as an industry we looked at the value of the house. Yes, we considered the appraised value and it's relationship to the underlying mortgage amount. But you have to remember in this country we've been through a period post World War II where housing values have increased every year. That was, at least in the early days of the industry, and probably up to three or four years ago, a very secondary factor. In fact, the collateral behind the loan itself was something that, more often than not, didn't increase the risk or size of the claim if we had one that mitigated it. I think, and I'll come back to this, the change and the nature of the collateral risk, the change in how the industry has had to view that is very important. It's one of the driving factors in looking at the pricing and underwriting decisions that we've made as an industry we've made in the last couple of years.

[Exhibit 38]

I just want to run through some of the factors that we look at. Rather that talking specifically about underwriting versus pricing versus loss reserving, I think to some extent these factors affect what you do in any one test. How you use them? How you weight them? Whether it's pricing versus underwriting, versus reserving, obviously there's change. Nevertheless the basic things that we're going to be looking at don't change that much. One of the key reasons, and this has been true since the beginning of the industry, is loan to value. How much does someone have on the property when they sign the mortgage note? Are they putting 5% down, are they putting 10% down. The more money they put in the more likely they are to see they have a personal stake in the loan and to stay with it even if times get tough. If they lose a job, or if it's a two worker family and somebody is out of work, or their hours are cut back. Whatever it is, the more they have invested in the property, the more likely they are to deal with whatever kind of income problems they might have, and stay with the property, pay the mortgage, and avoid a problem.

We did a lot of 95% loans, that is 5% down loans as did most of the people in the industry. This was especially true in the late 70's and early 80's. I think this is an area where we have, and I think a lot of other companies have taken a very hard look. Again, you can't look at these factors independently. I think this is one of the keys -- what you do on loan to value is going to depend on what decisions you make on loan structure. What the interest rate environment is, the type of properties and the use of the properties; the market characteristics and so forth. And you really have to look at the interaction of all those factors rather than looking at any one independently.

We've seen major changes in loan structure. The traditional product was the 90% mortgage, 10% down loan with the fixed rate 30-year mortgage. That is not today's environment. Any of you who have bought a house recently or read the press know that adjustable rate mortgages, graduated payment mortgages, even negative amortization loans made the appearance in the higher rate interest days of the early 1980's, and dramatically changed the nature of the risk we insure given any of the other factors that we look at. If you get a fixed rate I think everyone expected, the American dream of getting your home. You buy the most expensive one you can afford today, it's going to go up in value, and you're going to get a salary increase every year. This is an outgrowth of the 50's and 60's. It doesn't quite work that way necessarily any more. When you combine adjustable rate features, or a graduated payment feature, or worst yet, negative amortization, which actually means that the principal balance increases every month for some period during the period of negative amortization, you have some very risky products. I think most of us have re-looked at the adjustable rates, the graduated payments, and the negatives. I guess most people do not do the negative amortizations any more. On the adjustable rate side, we have one of the main things that has happened to lead us to these new kinds of loan structures. It's not just the interest rates in the early 1980's, but it was the changes in the savings and loan industry and the mortgage banking business itself. The deregulation from the savings and loan industry; improvement in the credit market; the rise in securities, all of those things led to changes in the loan structures themselves. We have adjustable rates now that I think have more reasonable limitations on what makes sense to insure. Annual caps and payment adjustments; total caps and the maximum amount of increases that can be made over the life of the loan. I think those, along with pricing changes and other things probably mean that we can, as an industry, do that kind of business profitably in the future. It also varies enormously in terms that it is very interest rate sensitive. I think this year we've ranged from having 60% of our business as adjustable rates, down to about 20%. It really reflects what's happening in the interest rate market. Obviously, interest rates themselves are one of the risk factors that are affecting all of us who have been in the business for a while today. We've got loans outstanding that were insured from '81, '82, '83, and '84, often at interest rates currently above 12% and in many cases above 15%. If you think about what that means for interest rate accruals, coupled with the fact that most delinquencies, and therefore claims are going to occur in the early years, you can have an added exposure of easily $1,000 a month for each month a delinquency sits there before a lender goes, forecloses, and takes title for property. This is very, very important.

Second, we've found that as we start to look at market characteristics of the types of properties are also very important. Single family housing has been more resilient, especially single family detached housing. Condos are much more subject to individual regional, and sometimes neighborhood market, situations. Also, when you get into problem areas, they can be subject to the VA and FHA requirements. If you've got a project that falls below 70% owner occupied, VA and FHA will not fill into those projects anymore. If you're in a situation where you need to take over houses, get some results, that can also be a factor that really influences your ultimate losses.

The use of the property is very important. I think in the early 80's a number of us did investor loans, we did second residences, vacation homes and so forth, and probably did too much of it. I'd say today we do few, if any investor loans, and look much more closely at second residences. We found that when times get tough people may be willing to stay in their primary residence and really scrimp and save so that they can keep their home, but the condo in Vail, or at the lake or someplace else is something that they're willing to give up if they can keep their home. It is a much riskier kind of business to run.

The market characteristics -- this is very important. I think all of us in the industry find that as long as you have a diversified portfolio by state, then we would have a reasonable dispersion of risk that would protect us against some unforseen event, i.e., a big depression. What we found is that state-by-state is not good enough. You really have to look at metropolitan areas, then in metropolitan areas you've got to pay much more attention to the makeup of the local town. Is it a one company or a one industry town, or is it a diversified economy that if one sector is down, there are going to be other sectors that continue to provide basic sources of employment. I think that in terms of the energy belt which has given us a lot of problems in the last few years, that one of the key lessons we've had to learn is to have that kind of market concentration in areas that are, in effect, single industry driven, is something that we want to take care not to do in the future.

Depth of cover is also very important. I think most people think of mortgage insurance as a 20 or 25% coverage. We have in the past in the industry written other kinds of coverage. I think we're probably going to have to continue to look at that and how we write those kinds of death recovers on that kind of product.

We continue to write what is effectively aggregate loss claimant coverage on insured pools of mortgages that are sold as securities. It is known as the pool business, you put together a package of mortgages and they're sold as a security issue on Wall Street, with the revenue from those underlying mortgages being passed through to the investors. The mortgage insurer will write an aggregate excess of loss equal to some percentage of the original principal amount of those mortgages. That means that when any particular default occurs, the borrower stops paying and it becomes an alternate claim, the insurer is then liable for 100% of that individual underlying loss up to the maximum of that aggregate loss. I think that if you look at the area of pricing, that may be one of the areas that we're going to have to come back to. Instead it is very much a Wall Street driven kind of market. It's still a product out there that was effectively written as a credit enhancement. The other experience has been that if we take claims under these kinds of policies. It's probably not as far a long as we might hope to be on that particular type of coverage.

The final thing that I really can't underestimate is the lender quality. The quality of the underwriting and of the servicing that they do. After all, what we review in underwriting with each individual certificate we issue, is the lender that's the person who is going to be sitting face to face with the borrower. They're going to be making the primary judgment about whether or not this person is going to repay that loan. It is very crucial to look carefully at the lenders you do business with and to pick them carefully.

From the servicing side I think as you get into a period where you pay substantial amounts of claims it becomes very important that the servicing at the lenders shop be well done. Because you can have situations where someone is behind in mortgage payment. If the servicing is done properly the lender will get in there and try to do work out some sort of arrangement or try to refinance. Servicing is very important after you've gotten to the point of making the assumption that you're going to pay claims.

[Exhibit 39]

I'd like to summarize this for you. If you take a high loan to value -- a 95% loan, combine it with very little reduction in principal and interest during the early years of ownership, whether it's due to high interest or the structure of the loan itself, you have a stagnant or a declining real estate market; when you then have a credit problem, an income reduction problem, you have a claim. I think it is very important to understand this kind of difference, because in the absence of those other kind of factors, having an income problem may not produce a claim in this business.

[Exhibit 40]

A couple of other things I want to mention that you can also look at in reserving. We obviously try to look at things like policy or underwriting year. We also try and look the age of the delinquency. How old is it? How long has the person been in default? When we find out about the delinquency, we look at the foreclosure log in the state of the property. To give you a good example, in the state of Texas it takes a month to foreclose and take title to property. In the state of Illinois, until recently, it took 18 months. As you can imagine, the size of your claim is growing that entire time. Your interest, property taxes has insurance in the life plus the fact that the property may be vacant -- you've got a for sale property in a neighborhood with potential for vandalism and so forth. Those factors can be very important in terms of what your ultimate losses are going to be.

The final thing is neighborhood affects of foreclosure. If you get into catastrophic situations where the kinds of depressed values and extent of foreclosures that we have in some places in the oil patch today, you can find neighborhoods where the number of foreclosures is so severe that it tends to make those borrowers who remain, pack up and leave. They want to go next door and they'll take the loss on their house but they'll buy the house they've got across the street or down the block, or the next development for half of what they paid for it. I think those are things that when times get bad, when market values are down or things that you have to be prepared to deal with, and they are very new to the business.

I don't want to leave you with the feeling that all is lost and that the business can't be done. But what I do want to impress on you is that we've done a lot of learning in the business in the last few years, and that's the way we're going to be doing business in the future. The fact that we've got the contingency reserve is very, very important. It means that having experience like we have in the oil patch is really what the contingency reserve is there for. It effectively helps us to disprove that term. I think that we're going to continue to evaluate the products. I think that we'll continue to evaluate our pricing and underwriting decisions, and probably any other business or areas where we've overreacted. We're going to probably, in the future, make those decisions on a much more market by market and regional basis so that we can selectively deal with changing risk situations.

Exhibit 1

FINANCIAL GUARANTEE INSURANCE

TYPES OF RISKS

- CREDIT RISK
- TIMING RISK
- VALUE RISK
- PERFORMANCE RISK

FINANCIAL GUARANTEE PRODUCTS:

- MORTGAGE GUARANTEE INSURANCE

- CREDIT ENHANCEMENT PRODUCTS
  - MUNICIPAL BONDS
  - COMMERCIAL PAPER
  - INDUSTRIAL REVENUE AND DEVELOPMENT BONDS

- OTHER
  - RESIDUAL VALUE INSURANCE
  - LIMITED PARTNERSHIP GUARANTEES

FINANCIAL GUARANTEE SUPPLIERS:

- MORTGAGE GUARANTEE INSURERS
  - MGIC
  - TICOR
  - PMI
  - VEREX
  - UNITED GUARANTY

- MUNICIPAL BOND INSURERS
  - AMBAC
  - MBIA
  - FGIC
  - BIGI

MORTGAGE GUARANTEE INSURANCE INDUSTRY

NET WRITTEN PREMIUM (DOLLARS IN MILLIONS)

1981	1982	1983	1984	1985
$329.7	$364.5	$522.9	$759.8	$935.7
PERCENT GROWTH	11%	43%	45%	23%

MORTGAGE GUARANTEE INSURANCE INDUSTRY

LOSS RATIOS AND COMBINED RATIOS

	1981	1982	1983	1984	1985
L.R.	28.4%	60.2%	79.4%	73.8%	116.2%
C.R.	77.2%	108.2%	115.9%	108.7%	147.9%

Exhibit 6

MUNICIPAL BOND INSURANCE INDUSTRY

DIRECT WRITTEN PREMIUMS (DOLLARS IN MILLIONS)

	1981	1982	1983	1984	1985	1986
	$72	$128	$197	$320	$800	$500
PERCENT GROWTH		78%	54%	62%	150%	-38%

MUNICIPAL BOND INSURANCE INDUSTRY

LOSS PAYMENTS
(DOLLARS IN MILLIONS)

1981	1982	1983	1984	1985	1986
$0.3	$0.3	$0.9	$3.1	$11.2	$6.7

CRITICAL SUCCESS FACTORS:

- FINANCIAL STRENGTH/RETROCESSIONAL SUPPORT
- DISCIPLINED MANAGEMENT AND UNDERWRITING
- STRONG SOURCES OF BUSINESS
- PRODUCT DEVELOPMENT CAPABILITIES

Exhibit 9

Types of Financial Guarantees

Monoline	Multiline
• Bond Insurance (Corporate & Municipal)	• Limited Partnership Guarantees
• Mortgage Insurance	• Residual Value Insurance
	• Guaranteed Investment Contracts

Municipal Bond Insurance

- Pioneered by AMBAC in 1971
- Guaranties timely payment of principal and interest
- Liability for payment may not be accelerated
- Provides Aaa/AAA rating
- Enhances the marketability of good credits; does not make good credits out of bad credits

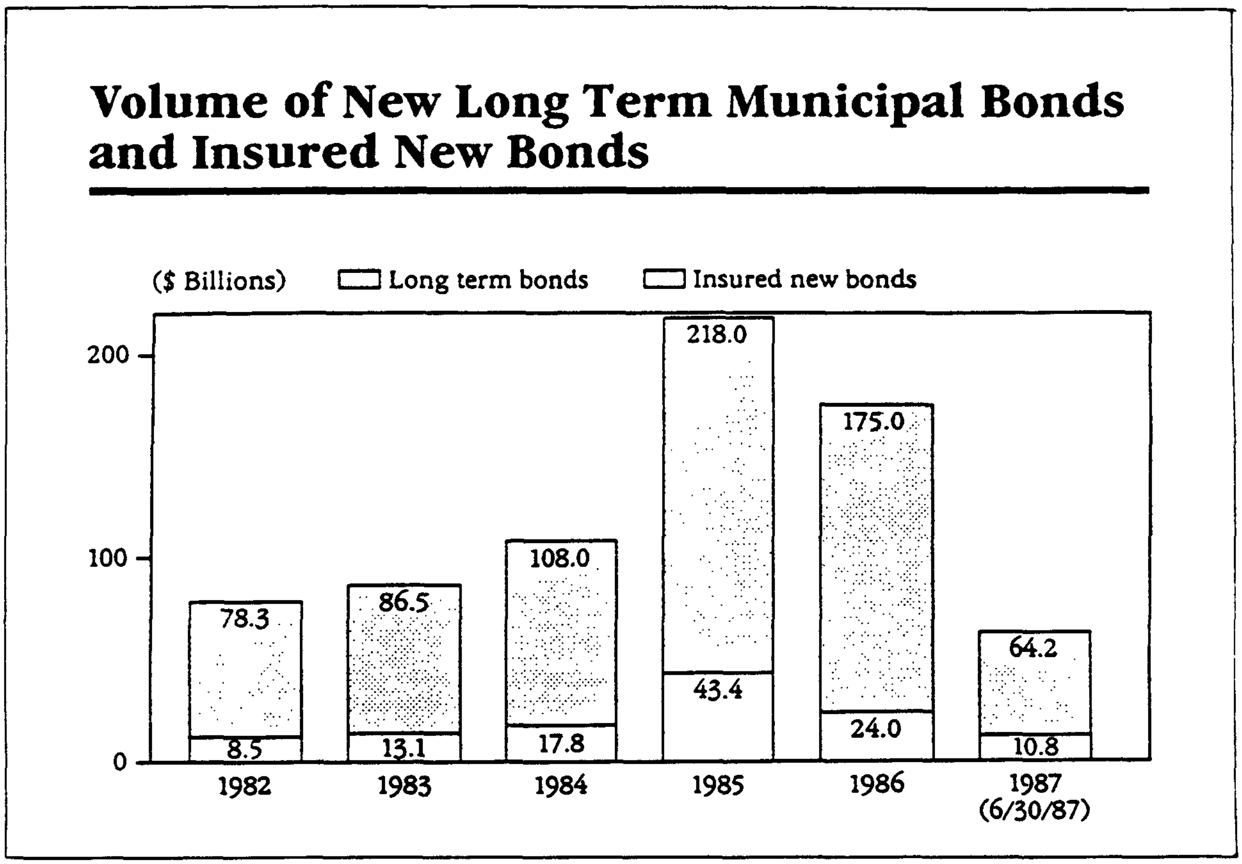
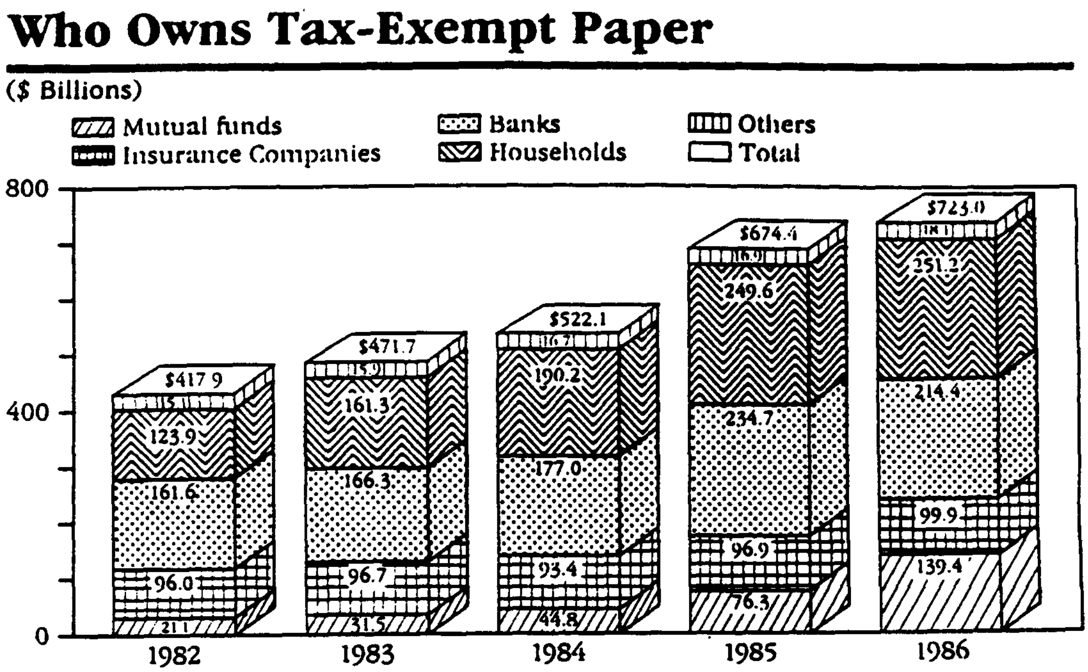

Volume of New Long Term Municipal Bonds and Insured New Bonds
($ Billions)
Long term bonds
Insured new bonds
200
100
0
78.3
8.5
86.5
13.1
108.0
17.8
218.0
43.4
175.0
24.0
64.2
10.8
1982
1983
1984
1985
1986
1987
(6/30/87)

Exhibit 12



Source: Board of Governors of the Federal Reserve System

The Major Players

- AMBAC Indemnity Corporation
- Municipal Bond Investors Assurance Corporation
- Financial Guaranty Insurance Company
- Bond Investors Guaranty
- Capital Guaranty Insurance Company

Products Insured by AMBAC and Others

- New Issues

  General Obligations
  Utility Revenue Bonds
  Housing Bonds
  Hospital Revenue Bonds
  Universities, Airports and Ports
  Lease Obligations
  Special Assessment Bonds, Tax Allocation Bonds, and Municipal Utility Districts

- TRANS, RANS, TANS and BANS

- Debt Service Reserve

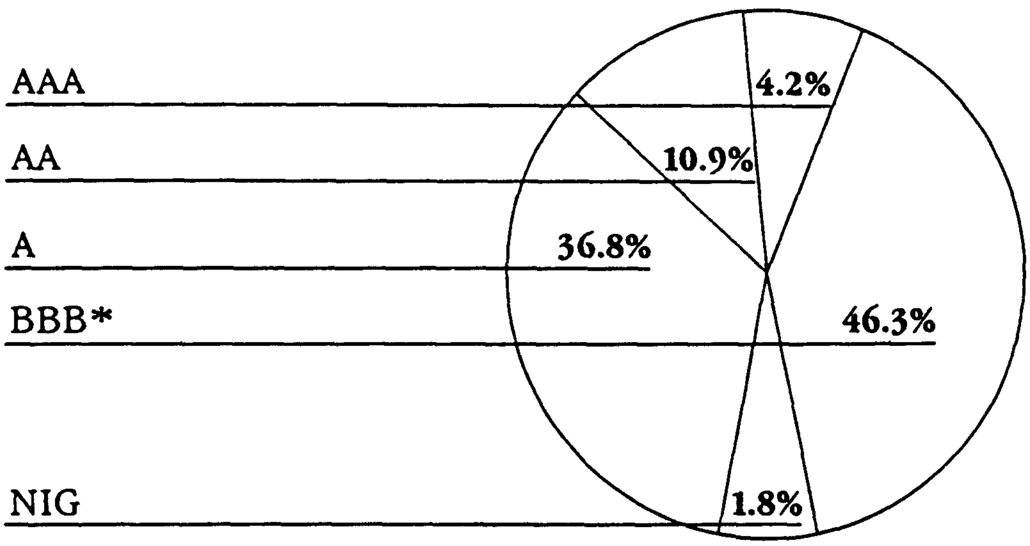
Pricing

- Up-front and annual premiums
- Percent of principal & interest varies: 0.25 - 2%
- Is function of
  - credit risk losses
  - spreads in the market
  - competition
  - cost of capital
  - expenses

Development of Loss Assumptions

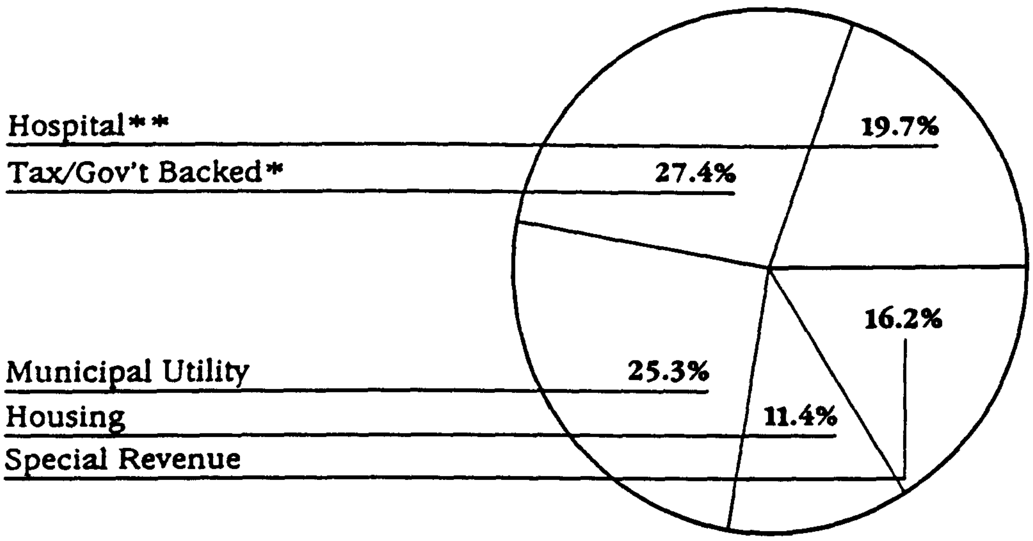
- Insurance restricted to investment grade issues

AMBAC Insurance in Force by Current Rating – 6/30/87



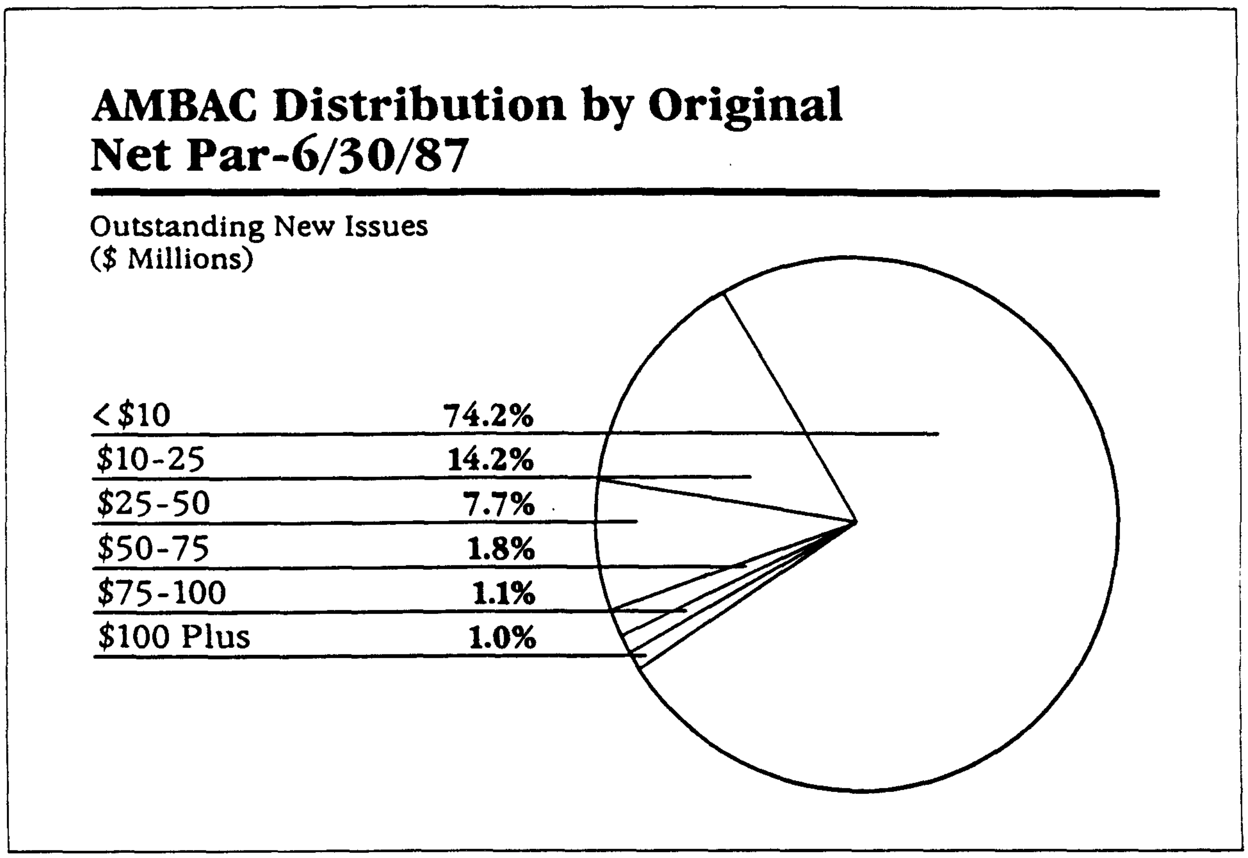
*Includes IG and NR

AMBAC Diversification by Bond Type
Net Par – 12/31/86



*Consists of tax based revenue bonds, including the obligations of cities, counties, states supported by ad valorem taxes & special tax bonds.

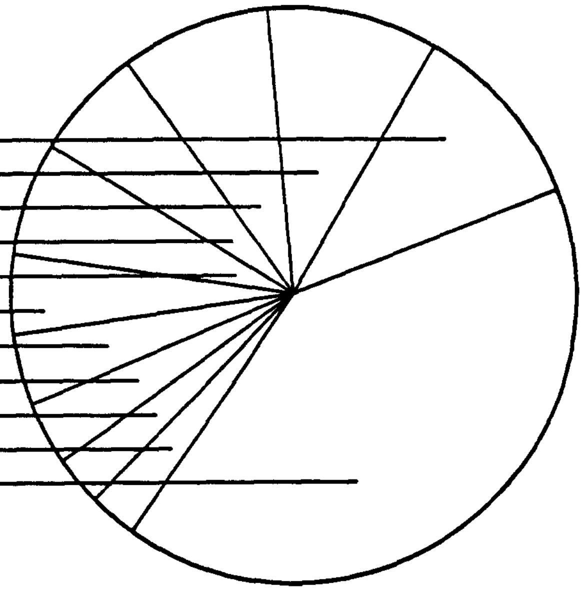
** About 9% are FHA/State Insurance Program.


AMBAC Distribution by Original
Net Par-6/30/87
Outstanding New Issues
($ Millions)
< $10 74.2%
$10-25 14.2%
$25-50 7.7%
$50-75 1.8%
$75-100 1.1%
$100 Plus 1.0%

AMBAC Insurance in Force by State
Net P&I-6/30/87

(Top 10)

State	Percent
Florida	10.88
California	9.68
Pennsylvania	8.54
Texas	6.50
New York	6.27
Ohio	4.44
Michigan	4.00
Illinois	3.44
New Jersey	3.02
Minnesota	2.71
Remaining	40.52



Development of Loss Assumptions

- Insurance restricted to investment grade issues
- Default rate low on all municipal bonds

Industry Loss Experience (1976-1986)

($ Millions)

$$\frac{\text{Losses paid} + \text{Case basis loss reserves}}{\text{Industry premium written}} = \frac{\$24 + \$47}{\$2200} = 3.2\%$$

AMBAC Claims History

• Total bonds insured	approx. 7500
• Total claims	22
— Resolved	10
— In monetary default	12

Development of Loss Assumptions

- Insurance restricted to investment grade issues
- Default rate low on all municipal bonds
- Defaults temporary rather than permanent

Claims

- Generally due to cash flow problems
- Usually resolved in 3 years or less
- High rate of salvage
- Principal and interest paid only *as due*

Reserves

- Case Basis Loss Reserves

Case Basis Loss Reserves

Temporary Default Reserves

- Present value of 3 year debt service payments
- Present value of difference between debt service payments and cash flows from project

Permanent Default Loss Reserves

- Present value of remaining debt service payments

Reserves

- Case Basis Loss Reserves
- Contingency Reserves

Contingency Reserves

- 50% of earned premiums held for 20 years
- Contingency reserves can be drawn down if losses exceed 35% of net earned premiums

Reserves

- Case Basis Loss Reserves
- Contingency Reserves
- Unearned Premium Reserves

AMBAC Indemnity Corporation
Insurance Reserves – 6/30/87

($000s)

Case Basis Loss Reserve	$ 47,891
Contingency Reserve	116,369
Unearned Premium Reserve	345,502
Total	$509,762

Statutory Accounting

- More conservative
- Cash accounting - better measure of cash flow
- Required by insurance regulators

GAAP Accounting

- Permits flexibility in recognizing earned premium
- Allows spread of UW expenses over life of issue
- Less reserve requirements; no contingency reserve

Exhibit 33

Current Industry Issues

NAIC Model Bill

- Monoline requirement
- Capital requirements
- Reserve requirements

Pricing

- Competitive market
- More capital
- 1987 low volume; narrow spreads

Market Competitors

Private Mortgage Insurers	**10 Companies**
Public Mortgage Insurers	**FHA and VA**
Self-Insurance	**Some lenders in some markets**

#058-2200 (9/87)

Exhibit 35

Basic Definitions

A Traditional Contract Surety	**Guarantees that a construction project will be completed at the agreed price and that the subcontractors and suppliers for the project will be paid.**
Municipal Bond Insurance	**Guarantees an investor that the interest and principal on the bond will be paid as due.**
Mortgage Insurance	**Guarantees a lending institution that interest due on the mortgage and the principal will be paid if the borrower defaults.**

#058-2198 (9/87)

Regulatory Framework

Monoline	MI companies may write only mortgage insurance.
Capital Requirements	A risk-to-capital ratio of 25 to 1 must be maintained.
Qualified Capital	Capital or Policyholders' Position includes Paid-in Capital, Surplus and Contingency Reserves.
Contingency Reserve	In addition to case basis reserves, 50% of Earned Premium must be set aside in a contingency reserve. Funds may be withdrawn: a. after 10 years; or b. when losses exceed 35%.

#058-2199 (9/87)

Nature of the Risk

Time Period	Long Tail Risk; the average half-life of an insured mortgage is 7 years.
Credit Risk	Employment Stability Income Adequacy Management of Credit Use Spending and Savings Patterns
Collateral Risk	If credit risk goes bad, value of the collateral (the house) becomes important. CONDITION: the lender is responsible for maintaining original condition of property. SALVAGE VALUE: will determine whether a default results in a claim and, if so, how much.

Factors Affecting Credit & Collateral Risk

Loan-to-Value (LTV)	LTV measures the Original Mortgage Amount as a percent of the original property value.
Loan Structure	Fixed-Rate Adjustable-Rate Graduated Payment
Interest Rate	High or Low
Type of Property	Single-Family Detached or Condo
Use of Property	Primary Residence Secondary Residence Investor
Market Characteristics	Economy Diversified or Single Industry
Depth of Coverage	Standard 20 - 25% Deep Coverage
Lender Quality	Underwriting Servicing

Summary of Risk Factors

A high original Loan-to-Value,

combined with slow or no reduction in principal balance during early years of ownership — due to high interest rates or graduated payment or a variable-rate loan structure, and

stagnant or declining market values,

means a sure claim when combined with a standard income reduction problem.

Additional Factors Considered in Reserving

Policy or Underwriting Year

Age or Extent of Delinquency

Foreclosure Laws in State of Property

Neighborhood Effects of Foreclosure

Casualty Loss Reserve Seminar
1720 I Street, N.W., 7th Floor
Washington, D.C. 20006
(202) 223-8196