

**CASUALTY ACTUARIAL  
SOCIETY FORUM**



Spring, 1988 Edition

*CASUALTY ACTUARIAL SOCIETY*  
*ORGANIZED 1914*





## CASUALTY ACTUARIAL SOCIETY

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March 1, 1988

TO: CAS Members

RE: Second Issue of the CAS Forum

Dear CAS Members:

We are proud to provide you with the second issue of the CAS Forum. This is a non-refereed journal and is designed to provide a convenient means of communication between our members.

There are many interesting items in this issue. We have two additional chapters of the CAS textbook: the "Principles of Ratemaking" by Charles McClenahan and "Special Issues" by Steve D'Arcy. It is very important that you read these chapters and provide substantive comments to the authors. Recall that this is written as a basic textbook and your comments should be directed towards content appropriate to that level.

We have a committee work product - a Statement Of Guidance Regarding Management Data and Information.

We have two new articles: "An Actuarial Analysis Of Simplified Experience Rating Adjustment" by Howard Mahler and "Beware Of Mismatch" by Charles Berry. Please write these authors directly with your comments.

We also have a number of other special features, including two CAS panel discussions, a 1964 Fellowship exam, and even a vintage musical comedy.

We hope you enjoy this second issue of the Actuarial Forum. Please send articles for the next issue to me by August 1, 1988.

Yours truly,

  
CHARLES A. BRYAN

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**CASUALTY ACTUARIAL SOCIETY  
1987 MEMBERSHIP SURVEY**

**REPORT OF THE TASK FORCE  
EXECUTIVE SUMMARY OF HIGHLIGHTS**





CASUALTY ACTUARIAL SOCIETY

1987 MEMBERSHIP SURVEY

REPORT OF THE TASK FORCE

EXECUTIVE SUMMARY OF HIGHLIGHTS

As the membership of the Casualty Actuarial Society expands and diversifies, it is critical that the CAS leadership stay in touch with the needs of its members. The 1987 Membership Survey was intended to assist the leadership in this communication effort, and to provide input on future directions for the CAS. This survey solicited the opinions, attitudes, and priorities of all CAS members and of approximately one hundred students actively taking CAS examinations. The Report of the Membership Survey Task Force summarizes the survey results; complete tabulations of responses are available as an Appendix to the Report.

One of the most exciting results of the survey is the level of interest it generated. For example, more than 62% of those surveyed responded, many with lengthy written comments in addition to complete responses to the multiple-choice questions that formed the body of the survey. More importantly, the level of interest in the survey, and the nature of the survey responses, provides a clear indication that CAS members are vitally interested in the Society, in how it is run, in the roles it plays, and in the ways it educates its members.

Information sought in the survey fell into seven general categories:

- o Demographics and miscellaneous
- o Actuarial issues
- o CAS activities and organization
- o Education: Fellowship and beyond (continuing education)
- o CAS examinations
- o Publications and papers
- o Meeting sites/attendance/content

Demographics and miscellaneous

The average casualty actuary is five feet ten inches tall, weighs 174 pounds, and wears size nine-and-a-half shoes. Chances are that he or she works at an insurance company and has management and technical responsibilities for pricing and estimating liabilities. The actuary typically has attained his or her most recent CAS designation, FCAS or ACAS, within the past ten years. Most actuaries studied mathematics, and many have advanced degrees. Of the survey respondents, 12% are female, with the proportion increasing in more recent years.

If casualty actuaries could not be actuaries, most would be something else. Leading alternative career fields include education, law, computers and data management, athletics, medicine, and engineering. If all finance-related careers were grouped under one heading, "finance" would be the leading alternative career preference.

### Actuarial issues

The majority of respondents (72%) believe there should be formal standards of practice. Close to half (42%) of the respondents believe there is not sufficient formal monitoring and discipline of actuaries' work. The same percentage of respondents believe the actuarial profession should pursue legislative approval, licensing and accreditation of a designation of certified actuary.

Almost half of the respondents (48%) indicate they would not support unification of the five North American actuarial bodies. Twenty-nine percent would support unification, and the remaining 23% are undecided or did not respond.

Most respondents (84%) believe that valuation issues are important to the CAS and its members. Although most respondents understand some of the concepts, most of them want to learn more about various areas of actuarial valuation.

Most casualty actuaries favor showing discounted reserves and bond market values in the annual statement, but many would show undiscounted reserves and amortized bond values as well.

Asked to list the most important issues facing the CAS during the next five years, respondents list professional standards and professionalism most often. Other issues cited frequently include education of actuaries; the public image of actuaries; and the organization, role, and functioning of the CAS. Respon-

dents also list issues facing the insurance industry more generally, including loss reserves, regulatory issues, ratemaking, and valuation.

#### CAS activities and organization

Most respondents (77%) are satisfied with election procedures; more recent members tend to be less satisfied. The most common suggestions for changing the election procedures are to give Associates voting rights; to hold elections for Vice Presidents; and to allow candidate nomination by members at large.

Representation by the Board of Directors is rated good or excellent by half of the respondents, with 30% having no opinion on this subject.

Dues are paid by employers for the great majority (90%) of respondents, and most casualty actuaries believe they are getting their money's worth for their dues. Employers pay exam fees in many or most cases as well, and again respondents generally believe the fees are about right. Students and individuals who pay their own fees are more likely to judge the fees too high.

While many CAS members are serving on committees currently (23% of respondents), an even larger pool (48%) would join a committee if asked. These results are presumed to overstate the characteristics of the entire population somewhat, since active members are more likely to have completed the survey.

Respondents believe the CAS should maintain or increase emphasis on each of the categories listed in the survey. Public relations and continuing education were selected for increased emphasis most often; lobbying least often.

Respondents prioritize listed activities in the following order: develop practical research; improve the syllabus; clarify actuarial principles; expand continuing education; clarify standards; improve examinations; broaden research; attract qualified individuals; improve CAS meetings; unify the profession; and, last, broaden membership services.

#### Education: Fellowship and beyond

Most respondents (62%) believe the CAS should provide opportunities for continuing education, and an additional 26% favor guidelines. However, only 7% of the respondents believe the CAS should establish mandatory requirements for continuing education.

Most members have attended a CAS meeting, regional affiliate meeting, or special interest meeting within the past three years.

#### CAS examinations

Many respondents suggest changes to at least some part of the examination process. While the overall educational content of the syllabus is characterized as good or excellent by 70% of respondents, many respondents note the need for updating. Sixty-four percent judge the volume of material about right, and 31% judge the volume too great.

More than half of the respondents recommend increasing the syllabus emphasis on financial operations, reinsurance, and loss distributions. In addition, topics related to Finance are most often listed as important for addition to the syllabus. Seventy-four percent of respondents feel they are sufficiently informed of syllabus changes; 24% do not.

Part 7 of the CAS exams is most frequently selected by respondents as the part having the best syllabus, while Part 8 is most frequently chosen as having the worst syllabus. Parts 1 and 2 of the examinations, which are professionally administered, are judged to be of somewhat higher quality ("moderate" to "high") than Parts 3 through 10 ("moderate" quality).

An overwhelming majority of respondents (82%) believe that the CAS exams place too much emphasis on memorizing details, and a majority also believe that the exams place too little emphasis on conceptual understanding and problem-solving abilities. While 41% of the respondents favor breaking the CAS examinations into smaller units, 36% do not.

Sixty percent of respondents oppose granting exam credit on the basis of college course work. Thirty-one percent favor granting credit for Part 1 or Parts 1-3, and only 4% favor granting credit for Parts 4 through 10.

### Publications and papers

Most respondents (68%) are satisfied with the frequency (quarterly) of the Actuarial Review, and most (64%) prefer the hard-bound Proceedings format. Although the vast majority of respondents use the Proceedings as a reference periodically, only 35% use it more than twice a year. Unavailability of an index and irrelevance of the papers are the most common reasons for not using the Proceedings.

Most respondents believe that CAS papers are generally relevant, free of major error, and understandable, and that they warrant publication. A minority of respondents believe the papers generally strike the right balance between theoretical and practical.

The vast majority (94%) of respondents think the CAS should encourage the writing of papers for the Proceedings. Most often, solicitation of papers on specific topics is recommended as a way to accomplish this. More than half (57%) of the respondents do not know whether the review process for Proceedings papers is too stringent.

### Meeting sites/attendance/content

Most of the respondents attend one meeting every one or two years. More recent members attend meetings more frequently.

The most important factor in a decision to attend a CAS meeting is the program and topics. Employers' policies on attendance is next, and site third. Entertainment is the least important of

the factors listed. Reasons for attending a meeting include education (cited by 88% of respondents), business contacts (75%), social contacts (61%), and rest and relaxation (50%).

Survey responses do not reveal strong sentiment for altering the proportion of panels and workshops at CAS meetings: thirty-nine percent recommend no change, and 28% are undecided. Twenty-five percent would prefer more workshops, and 8% would prefer more panels. A significant majority of respondents (81%) favor the continued use of paid outside speakers.

Extending the November meetings to two and one-half days is favored by 48%, opposed by 22%.

California is viewed as the most interesting meeting site, followed by the Southwest and southern Florida; the Midwest is least interesting to respondents. Cities, resorts near cities, and isolated resorts attract approximately equal levels of interest among respondents.

Entertainment factors at a meeting site generally are of little interest to respondents. None of the extracurricular activities or facilities listed is of considerable importance to more than one-fourth of the respondents.



## TWO PANELS PRESENTED AT THE MAY 1987 CAS MEETING

At our May, 1987 meeting, we had two panels. The first was a panel on the McCarran-Ferguson Act which provided insights from several individuals on the future of the McCarran-Ferguson Act and the impact on insurance if it should be modified or repealed. The second panel was on the way insurance companies are rated. This provided insight into the way in which certain rating organizations assign a particular grade to an insurance company.

The Actuarial Forum will publish transcripts of panels presented at CAS meetings and at regional affiliate meetings. This publication will provide those who attended the panel a way to review what was said and those who were not able to attend a flavor for the discussion.



**CASUALTY ACTUARIAL SOCIETY  
SPRING 1987 MEETING**

PANEL: The McCarran-Ferguson Act;  
Have We Seen The Last Of It?

Moderator: David G. Hartman  
Senior Vice President & Chief Actuary

Panelists: James M. Stone, President  
Plymouth Rock Assurance Corp.

Bruce A. Bunner, Principal  
Peat, Marwick, Mitchell & Co.

Representative Edward F. Feighan  
U.S. House of Representatives (D-Ohio)  
Member of Judiciary Subcommittee  
on Monopolies and Commercial Law



We're very fortunate to have Dave Hartman, the president-elect of the CAS. He is a graduate of the University of Michigan, with a Masters Degree in Actuarial Science, and of course, a fellow. He began his career at Kemper, and for the last 16 years he's been with Chubb, where currently he is senior vice president & actuary. Dave will introduce the panelists and also handle the question and answer session. So without further ado, Dave Hartman.

DAVE HARTMAN: Thank you, Mike. It's certainly my pleasure and privilege to moderate this prestigious panel. We have three people here today who I am sure you'll find most interesting and varied. You can hardly pick-up a copy of the trade press and not find something about the McCarran-Ferguson Act or competitiveness. In fact, it's getting more difficult to pick up a copy of any periodical or newspaper and not find some mention of property/casualty insurance competitiveness and the future regulation or property/casualty insurance. There is an increasing national debate broiling on this topic. We in the Casualty Actuarial Society generally do not take positions on debates of this sort. However, we have an opportunity today as members of the CAS to increase our level of knowledge and understanding about some of the issues, and also I think we're uniquely positioned to contribute education to the debate that is going on. When you stop to think of it, who else has had the kind of training that we've had through Part 8 of our examinations? Who else has had the experience in data

gathering? The experience in putting together rate indications? The experience in filing and defending those rate indications with state regulators? The experience in dealing with data requests at the federal level? I visited Abcott on Saturday and was impressed with one of the exhibits about using our imagination. Consider, if you will, the impact that this group of 600 people could have as you return home and discuss some of the things that you're about to hear with your colleagues. To talk with others who influence opinions, both CEO's and perhaps legal representatives of your firms. And furthermore, the opportunity that you'd have to help provide knowledge to people in Washington who set policy in this area of regulation of insurance.

Our first speaker this morning is from Washington, Congressman Edward F. Feighan. He was elected to the U.S. House of Representatives from the 19th District of Ohio in 1982. A Democrat, Mr. Feighan was re-elected in 1984 and 1986. Prior to his election in Congress, Congressman Feighan was elected to the Ohio General Assembly at the age of twenty four in 1972. He was re-elected in 1974 and in 1976. I think clearly he is one of the new generation of political leaders that we heard reference to by Pat Choate. Mr. Feighan is a member of the House Foreign Affairs Committee, and the House Judiciary Committee. Early in his first term he was named chairman of the House Foreign Affairs Task Force on International Narcotics Control. He was the only first-term Member of Congress to hold a Chairmanship during the 98th Congress. In the current Congress, Mr. Feighan serves on the

Judiciary Committee's Subcommittee on Crime and on the Subcommittee on Monopolies and Commercial Law. It is this Subcommittee on Monopolies and Commercial Law, that deals with all of the proposed legislation that comes before the House, addressing any possible revisions to the McCarran-Ferguson Act. In other words, this would be the first subcommittee that would review such legislation.

A native of Lakewood, Ohio, Congressman Feighan graduated from St. Edward's High School, the following year at Baremo Seminary. He completed his undergraduate studies at Loyola University in New Orleans. He received his law degree from Cleveland Marshall College of Law at Cleveland State University. He and his wife live in Lakewood, Ohio, with their three young children, probably a little too young to bring here to Disney World. But we would like all of you to join us in welcoming Congressman Feighan.

CONGRESSMAN FEIGHAN: Thank you very much Dave, and let me thank you and Mike Walters and others for the opportunity to join with you for a few minutes this morning to talk about what's happening in Washington in your industry, and particularly McCarran-Ferguson legislation. I was eager to join you for a number of reasons, not the least of which is to serve on a panel with two distinguished members of the industry, Jim Stone and Bruce Bunner, but also, as a Member of the House Judiciary Committee, a committee, as Dave had said, that has oversight for McCarran-Ferguson, to share some thoughts with you and hear from

some of you about your views on various proposals.

I think I was also eager because as an elected official I have the opportunity to speak to a wide range of audiences, and I particularly like it when I have a sophisticated, aware, intelligent audience to speak to, as I know this is this morning. That compares with my experience of Saturday morning, while many of you were here perhaps relaxing with your families. I was speaking to a third-grade Cub Scout group in Lakewood, Ohio. Not to make an analogy too strong. I was dangerous. I did something with that audience that I would not do with this. I began by asking questions in order to determine their level of awareness of politics and government. I asked the group of young men if anyone in the audience could tell me what the difference was between their Cub Scout pack and the United States Congress, thinking that would elicit some basic information about their level of understanding. And after a long uncomfortable pause, a hand went up in the back of the room and the young boy that stood up said, "I think I know what the difference is, we have adult supervision." I thought about it for a moment and I realized that this was likely to be more of a learning experience for me than it was going to be for that group. Hopefully, I'll have an opportunity in a few short minutes this morning to shed some light on the operations of the Congress so you are able to have a view about the nature of the Congress that is not quite as harsh as the view that that young man had had.



McCarran-Ferguson is a particularly interesting debate. Hearings on the insurance industry, of course, are always interesting in the Congress, but particularly I enjoy the McCarran-Ferguson hearings because we have before us individuals who will testify that repeal of McCarran-Ferguson is without question the magic bullet to cure all the problems of the insurance industry, particularly property and casualty. And then at the same time we have individuals who tell us that retention of McCarran-Ferguson antitrust exemption is actually the fundamental cement of an industry removal of which is going to cause virtual irreparable and total collapse of an industry. Attempting to balance those two perspectives has become a real challenge in the Congress.

McCarran-Ferguson repeal efforts, I think, have to be understood in the context of what is driving congressional interest in your industry, generally, and in McCarran-Ferguson, specifically. I'd like to just touch upon some of those forces that I think have been fueling the debate. Most importantly, of course, in the past several years we've seen dramatic increases in the cost of insurance, and that has fueled concern among consumers who come to town hall meetings and other public forums with members of Congress and ask them why they can't correct that experience.

Liability insurance, as you well know, has sometimes doubled or tripled in cost. In 1985, I thought it was interesting to note that Americans paid \$9.1 billion in liability insurance premiums, which was 60% higher than the amount of money they had

been spending in 1963. I don't have the data for 1986, but I'm sure that there was a significant, if not that high, a significant increase over the previous year. It would be interesting perhaps for you to know that that total amount on an annual basis is equal to the budgets of NASA and the CIA combined.

The causes of that problem we all recognize are very complex, and I don't want to get into them except to say that some insurance company representatives and others will point primarily to our legal system and claim that the costs are due to excessive litigation and the multi-million dollar jury awards. And pointing out, rightly in many instances, that some of the punitive damage awards that we've seen in the country really look more like lottery jackpots than they may look like the deliberative results of our judicial system.

Consumer groups, on the other hand, will point to insurance companies themselves and say that they are the ones that have raised rates to recoup losses resulting from irresponsibly low premiums charged in the late 70's and early 1980's, when interest rates were significantly high. The truth of the matter is, of course, both representatives have some considerable truth to their perspectives. A related reason, though, for congressional interest over the past two years, particularly in repeal of McCarran-Ferguson, undoubtedly comes from the much publicized liability insurance crisis of the past eighteen months. It seems to have been alleviated, at least in the media's mind in recent months. But last year, when the country was in the throes of

that crisis, many types of liability insurance, in fact, were either prohibitively expensive or simply unavailable. That publicity, of course, heightened congressional interest of a majority of the members of Congress who really had very little understanding of the fundamental operations of the industry itself.

One final factor that I would point to that has emerged really since August or September of 1986, and that is the new congressional fascination with competitiveness. Pat showed in an exceptionally fine commentary this morning, spoke to some of the factors that have led the Congress with a fascination with competitiveness. And how important it is that the Congress be focused in a responsible fashion in dealing with the problems of American competitiveness. It is not surprising that in that context a lot of members of Congress are looking at repeal of McCarran Ferguson as an opportunity to bring dramatic new competitiveness to a major and vital industry in the United States. There's no doubt that the high cost of insurance today, in fact, does have an impact on American competitiveness. Indeed, the pursuit of the American dream, either by a factory owner who is seeking to expand, or a young entrepreneur seeking to start a new enterprise, is finding that they're running into a obstacle as formidable as high taxes or high insurance rates which can be the cost of liability insurance.

I find it interesting that in that very context, a number of members are proposing that to deal with the problems of American competitiveness, what we should be doing is adding more

exemptions to the anti-trust laws of this nation. Particularly, for distressed industries to expand the numbers of anti-trust exemptions. And yet at the same time, many of those same members are saying that in order to increase American competitiveness in the insurance industry, we should be removing the exemption that has existed now since 1945. I'm not quite sure that those two thoughts can be held simultaneously, but members of Congress have remarkable capacities for accomplishing that. What has resulted really has been a two-pronged attack on the liability insurance problems that we have. One drive focused on reviewing the operations of the property and casualty insurance industry, and the other focused on overhauling both federal and state tort law that would govern liability lawsuits.

At the state level, of course, there has been tremendous explosion of movement in the efforts of tort reform. There have been a number of proposals introduced to the Congress, but as yet, there have been no significant bills enacted by either the House or the Senate, that would deal with a tort reform generally or industry specific tort reform. It's been interesting to watch those that are approaching the liability insurance problems from the perspective of an interest in the insurance industry's anti-trust exemption. Looking, for example, at an industry like professional major league baseball is one of the few industries that has that kind of protection under American anti-trust law.

Proponents of repealing McCarran-Ferguson have made a number of arguments. First, they claim that McCarran-Ferguson unnecessarily shields the insurance industry from competition.

They criticize the use of ratings organizations to develop rates that include expenses. Even if insurers do not adhere to those rates, they would argue, they still track the suggested rate and not sell insurance at the lowest possible price for the American consumer. At a recent hearing, as a matter of fact, just about ten days or two weeks ago, FTC Commissioner Dan Oliver testified that legislation to repeal McCarran-Ferguson in his words, "is long overdue." He said, "exposing the industry to the brisk winds of competition can only serve to benefit consumers and promote the general welfare." He was joined at the table by other advocates of modifying McCarran-Ferguson who were raising questions about the extent and the vigor of state regulation, which in fact, does vary considerably from state-to-state.

Finally, proponents of repeal or modification have argued that the industry, in fact, no longer needs that kind of broad anti-trust exemption. That the doctrines of state action and other doctrines that have been engrafted by the courts in recent years have now been fully developed and give adequate protection to the industry. I thought it was interesting to watch at that same hearing that the FTC Commissioner testified, the shrillness, the harshness of some of the exchange. We had a colleague of mine seated next to me who feels very strongly about retaining McCarran-Ferguson. He was questioning a representative from the American Bankers Association, a group, of course, that is arguing for repeal of McCarran-Ferguson, only because they'd like to enter into the profitable realm of insurance.

After the individual testifying for the American Bankers

Association was telling about the experience in West Virginia, and saying that the virtual boycott of insurance companies in West Virginia would not have happened except if we didn't have McCarran-Ferguson on the books. That irritated his colleague seated next to me who rightfully pointed out that McCarran-Ferguson does not exclude the boycott activities of the insurance industry, and that if there was a boycott taking place that the insurance industry would still be subject to American anti-trust law.

The microphone was still on when the member of Congress turned to me in anger and rather caustically, (he'd been dealing with this particular representative testifying before), turned to me and said, "you know, it's not amazing to me that this individual has his foot in his mouth once again, considering where his head is most of the time." I recoiled in my seat for a minute, but I didn't recoil quite as much as the individual seated at the table who could still pick it up because the microphones were on.

I'm not at all certain that shrillness or caustic nature is going to lead to the kind of reasoned debate that we need to come to the appropriate conclusion for American consumers. These advocates, which you should know include the National Federal of Independent Businesses and the National Conference of State Legislatures. A number of consumer organizations contend that in the long run repeal is going to result in lower prices, a very attractive prospect to American consumers. Politicians who believe that that's going to be the end result are clearly going

to be attracted to joining in the effort at repeal of McCarran-Ferguson so they can take credit for lower premiums in insurance.

Opponents, of course, of repeal say that there is no need to remove that vital anti-trust exemption. And they view the industry as already highly competitive. They're able to point to the approximately 3500 property and casualty insurers and over 2200 life insurance companies that are currently doing business in the United States. Compelling evidence, I would have to admit, of the nature of competition. Moreover, they would argue that the elimination of certain joint activities in the industry would harm especially smaller companies which don't have the capability to perform a number of those tasks in-house. According to these individuals, if McCarran is repealed, smaller companies simply will go out of business, and the end result of that, of course, will be higher interest or higher premium rates.

A related concern is that if McCarran is repealed then we will have an absence on the federal books of any laws defining and describing exactly what activities might be permitted. Certain collective activities such as pooling arrangements might pass muster under that arrangement, or they might not. Without McCarran, clearly insurers could face the high cost of business uncertainty as well as the cost of possible anti-trust litigation over practices that today are commonplace in the industry.

Insurers also take little comfort in the state action doctrine arguing that it is really unclear precisely what is going to meet that test in the final analysis. The interest has been heightened in recent months, and I'd like to leave with you

this morning a sense and a review of what is likely to take place in the Congress, in both the House and the Senate in efforts at reviewing and possibly taking action on proposals to either modify or completely repeal the McCarran-Ferguson anti-trust exemption. Currently there are McCarran bills that have been introduced in the Senate. In the House there has been nothing introduced until Friday of last week. But in the Senate there is Senator Howard Metzenbaum from Ohio's legislation which would be a complete repeal of McCarran Ferguson, and would leave in place only the state action exemption and the rule of reason to fundamental concepts of anti-trust law as protections for insurers.

Many industry representatives feel that those are really not protections. Then there is an alternative to the Metzenbaum legislation, introduced by Senator Paul Simon, that removes the anti-trust exemption for the insurance industry but specifies that certain collective activities would still remain exempt. He would propose that there are safe harbors in the legislation for collecting loss and trending data as well as for other joint activities. I think that my colleague from Ohio, Senator Metzenbaum, has recognized that it's very unlikely that his colleagues are going to accept the complete repeal of McCarran Ferguson. He told me in a conversation about a week ago that he intends in the next week or two to introduce a modified version of his legislation that also would include safe harbors for collecting historical loss data and exempting pooling arrangements from the repeal of the anti-trust exemption.



All of these bills, of course, would grant to the Federal Trade Commission the authority to bring deceptive trade practice cases against insurers, which clearly signals the emergence of a very significant involvement of the federal government in the regulation of the insurance industry.

The Senate Judiciary Committee has already held a hearing this year on McCarran-Ferguson legislation and expects to hold another one this June. It is interesting how the politics of different members of Congress will effect how the legislation might move. The chairman of the Senate Judiciary Committee is Joe Biden, running for President, and because of that, there's a good likelihood that there will not be any action on McCarran-Ferguson legislation, at the earliest, probably before the fall of this year.

There's been far less activity in the House. While Chairman Peter Rodino is very interested and seems relatively supportive of at least modification of McCarran-Ferguson, he has not introduced legislation. He's on the Iran-Contra Panel that is now working five days a week and will work until the end of July. The likelihood of the House Judiciary Committee addressing McCarran-Ferguson because of that, is very remote, and we wouldn't see action probably, at the earliest, until the end of this year.

I would like to urge all of you, being in a very unique position to have an impact on the United States Congress, to use that influence. You have a national network that has a great deal of knowledge and certainly tremendous experience in dealing

with these issues. That can be very helpful to the Congress if you use it and if you reach out to individual members to try and give them the guidance, the experience, the knowledge that you've acquired in this profession.

I almost hesitate to do that because I made a similar recommendation about a year ago to a group of CPA's in my community, and one of them in fact, the first time ever decided to contact his local member of Congress in the suburban area of Cleveland. And he called me up and said it was not a very satisfactory experience. During the course of the discussion, it was on RICO Reform legislation that effects CPAs. He had said to the member of Congress who represents him, appealing for what he thought would be his fundamental concerns, and said "I hope that you will consult your conscience before you vote on this important legislation effecting my industry." The congressman looked him dead in the eye and said, "Son, I'm not about to start taking political advice from a complete stranger."

I hope that that's not reflective of the approach that all members of Congress would have. I think you'll find a great deal of reception to bringing the experience and knowledge that you have. Thanks very much.

DAVE HARTMAN: Thank you very much Congressman Feighan. I consider him a true representative of the people. We will, by the way, have time for questions and those questions will be after all three presentations.

Our next panelist is James M. Stone. Jim Stone is President

of the Plymouth Rock Assurance Corporation, a company he founded in 1983. Plymouth Rock is the Boston based property and casualty insurer specializing in personal auto and homeowners' coverages. For those of you who are interested in numerics or numerology, you'll be delighted to know that the last four digits of the telephone number and the post office box of Plymouth Rock are 1620. He holds a B.A. with highest honors and a Ph.D. from Harvard University, both in economics. He also holds the designation of chartered, property and casualty underwriter.

This audience will be particularly interested to know that he has passed six of the actuarial exams, including Part 8 and sat for Part No. 6, last Friday. One of the many reasons he was invited to be on this panel is not the fact that he's already passed Part 8, but rather his experience as a state and federal regulator combined with his experience as president of a small insurance company.

In February of 1975, Mr. Stone was appointed by Governor Michael Dukakis, who is another democratic candidate for president over age 50, to serve as commissioner of insurance for the Commonwealth of Massachusetts. He served as commissioner for four years. Mr. Stone was nominated in 1979 by President Carter to be chairman of the Commodity Futures Trading Commission. The CFTC is the federal agency vested with exclusive regulatory jurisdiction over futures trading activity in more than 60 commodities. He served as chairman and then commissioner of that agency until January, 1983. Mr. Stone is the author of a book entitled One Way for Wall Street and numerous articles on

insurance, finance, and economics. Please welcome today Jim Stone.

JIM STONE: Thank you. I can't resist beginning by saying that I was asked to make this presentation by Russ Fisher, and when he called me I told him that this society had put me through so much pain over the years that I was reluctant to make this sort of speech, but that I would do it if he would promise me one point of exam credit on Part 6. He made me that promise and I now consider it ratified by your silence. What I am not sure of, however, is when I get my 2 or 3 on the exam I just took, how will I know whether it includes the extra point or whether I get to add one to that.

I thought that I should begin with an overall summary of what I'll say in about ten minutes after that, because I have a view on McCarran-Ferguson that may be different from most of the people in the audience, and I thought I should summarize it rather than ask you to try and guess it as I go along. The view is that I think it's something of an overblown issue from the industry's point of view, economically. It has a significance but the significance is not the economics.

I don't spend a lot of time worrying as a company president about whether McCarran-Ferguson is going to be amended or even repealed. I think it's more of a symbolic issue than an economic one. If a repeal or amendment should pass, I would view it as a very serious symbolic act. It's a very serious slap on the wrist

from the society that we're all here to serve. If Congress is angry enough at the insurance industry, that means something. The specific consequences of what would come out of the legislation I think are somewhat less important. But let me give you what I think are five things that you might look for if indeed McCarran-Ferguson should be repealed or changed in some very important way. The first is, that whatever is done by the Congress almost certainly, I believe, will include some exemption for small companies. The second is that large companies will continue to be able to exchange experience data in some manner that will be helpful to them in deriving rates. The third general observation is that most state regulation as we know it would be absolutely unaffected. The fourth is the one area of state regulation that would be effected, which is rate regulation, particularly in the personal lines, is going to be subject to continued debate anyway, and it's hard to tell what the impact of McCarran-Ferguson will be and how that debate is decided.

Lastly, there will be some changes that will come about if McCarran-Ferguson should be repealed or greatly amended, but they're probably in things that most people in this room haven't even thought about. It's a convention of lawyers that would be interested in discussing those issues. Let me go to each one of those in turn and briefly give you an explanation of why I feel that those are the consequences should it be repealed.

With respect to small companies two facts I think are beyond dispute. One is that entry into a market of new participants

enhances competition and that's a good thing. Secondly, small companies cannot assemble credible data or pay for the high salaries in this room to assemble an actuarial staff without some pooling of resources. I really don't see how any rational observer and any legislator or any policymaker could dispute either of those facts, and therefore I think they'll be taken into account. I would add a third, although I'm reluctant to go outside my own area of expertise, and perhaps the congressman can confirm it later in the question period whether I'm right or not, and that is that small companies and their agencies are a powerful political force and they'll get listened to in this process.

In my eight years in government I observed a lot of issues in which you could say that the merits were on one side, matched against some vested interest and the power of campaign contributions, advertising budgets, and so on on the other. In those cases results are unpredictable. You never knew which side was going to win in a particular case. In this one, that is with respect to small companies, where they enhance competition, where they need some pooling, and where they're politically powerful, it seems to me, that the result is inevitable. That you're going to see if there's a repeal of a small company exemption.

With respect to large companies, there you've got carriers that can afford actuaries and often do have credible data. But even there, the repeal of McCarran-Ferguson wouldn't be able to wipe out what exists now in the exchange of data because regulators need to pool the data. You're going to need to know

in areas, particularly the controversial areas, what the overall industry results are in order for society to judge whether insurance is being priced fairly. If companies simply send that information into public agencies and that information is published, large companies are going to have all that they really need.

It isn't really necessary, in my view, and I think it never has been necessary, for very large companies to see anything other than the pure premium, that is the loss experience. I don't feel that large companies need to pool anything to be able to determine their own expense loadings, to be able to decide what departures and modifications they want to use from standard programs. Those are not things that they really need bureaus to do. I think that what you would end up with is the pooling of all of the experience data around which the difficult rate decisions have to be made, and a non-pooling of the expense data and some of what I consider more incidental data, or the predictions for the future, which again, large companies are perfectly capable of doing on their own. In fact, for most of the giant companies this is the real world today anyway, and what happens in theory at the bureaus is more or less irrelevant except with respect to the pooling of that huge experience data and we're going to see a demand from government for more of that rather than less of that, whatever way the McCarran-Ferguson debate comes out. The government is going to want to know after the liability crisis of the last couple of years, what the overall experience was in all of those controversial lines.

They're going to demand the pooling of data, not forbid it. Expect the public policy change in that direction and not the other.

With respect to most of state regulation, when you think about what a state department does, most of it isn't rate regulations, and most of it would be unaffected by whatever happens in this debate. When I think back to how the Massachusetts Insurance Department was organized when I was commissioner, there were 5 major areas, one of them was rate regulation, and I'll come back to that one in a second. The other four were business conduct and complaints. That is the handling of problems where customers on a local basis feel offended by an agent or a company and that's always, in my view, likely to be handled by some local dispute resolution mechanism and the insurance departments have done a reasonable job of doing that. A local focus for that is probably the right way because customers are just not comfortable calling the federal government and shouldn't be expected to, about a problem involving a cancellation of an individual policy or a billing matter. All of the usual things we got those complaints about, all of that will continue whether or not there's McCarran-Ferguson reform or not.

The second general area was policy forms and again, since policy forms become a matter of public record when they are filed, seems to me, that you'll have very little change there. The public does have some right to look at how policy forms, to follow the standards of fairness and clarity and so on. They'll continue to do that, as those forms are filed, and go into the



insurance department records. They become available to the public. Other companies can then use them if they're good, and I suspect that that will continue just exactly as now.

The next area was the licensing of agents and new companies. There the department is trying to judge whether an agent or a company is trustworthy and competent to be able to do business in that state. Again, that will have to continue at the state level. Particularly, the trustworthy aspect really has to be judged on a local basis, and I suspect we'll continue to. It's conceivable that you could have some kind of federal chartering as well, but my bet would be that even if you had federal chartering, that state authorities would retain the right to forbid entities to operate in a particular jurisdiction if they didn't meet that standard of trustworthiness that the state demanded. In any case, I think that's a sensible way to handle that. Even if someday there's some mixed jurisdiction over a licensing.

Lastly, there's the issue of solvency, which of course is the one state regulation really began with and in many senses is the most important. The insurance industry is an industry in which there is a trust feature. Somebody is holding a lot of somebody else's money and it's important that those pools of money be kept from being plundered or being foolishly wasted. States have concerned themselves a great deal with the regulation of solvency as well as it should. I've always had my doubts about whether that is something that ought to be handled on a state basis as opposed to a federal basis. And there I had

departed when I was commissioner from my colleagues. The NAIC felt very strongly the other way. I'm not closed, wasn't then and not now, to the possibility that there is a federal role with respect to the monitoring of the solvency of interstate companies. Whatever happens in that debate that's a different debate for McCarran-Ferguson and that's not going to be effected either.

That brings us then to the issue of rate regulation. There there is a genuine philosophical battle going on anyway. And the repeal of McCarran-Ferguson would certainly raise its furvor and focus some of the issues. States vary across the lot and across the country. I guess Massachusetts and California are about as different as any two can be. Somebody from California once told me that we were a whole generation culturally behind California, and someone from Massachusetts once said to someone out there that he didn't understand how anyone could want to live 3,000 miles from the ocean. In regulatory matters there's just as much of a difference.

The ironic thing about the McCarran-Ferguson debate is that in a very strange way, if you look at it legalistically, it favors the two extreme systems, the Massachusetts system and the California system more than it favors the system in between if the anti-trust exemptions should be repealed. That may be a strange sounding statement but let me make a case for it. The California system that is relatively pure competition, is clearly one compatible with the usual methods of anti-trust regulation. The Massachusetts system, where the commissioner makes the rates,

this is in auto insurance I'm talking about now which I would like to use as an example of what I'm going to talk about for the next couple of minutes, although you could say some interesting things about the other lines as well.

Auto is the biggest line, it's also the one I know best, so let me illustrate things by that. In Massachusetts where the commissioner makes the automobile insurance rates, you clearly have mandated state action. The law says that the commissioner shall make the rates and the company shall use them. It's the cases in between where it's not clear whether it's mandated state action or pure competition that is going to be confused if there's a change in McCarran-Ferguson. In a way the two extreme systems are favored. As to which of those two extreme systems will survive, or which one will win if they become more and more pitted against one another, I don't know the answer to that but I have an idea as to where to look.

My idea of where to look is not to look in overall rate levels or overall rate of return or profitability, it's all in relativities. That's where I think the issue is. So as far as I can tell from the data, everything that's been written indicates that it makes a lot less difference than you might intuitively think it would, whether you use the California system or the Massachusetts system. That is, whether the commissioner makes the rates or whether the industry does. There have been whole periods of ten years in which the Massachusetts states made rates, have given higher profits to the industry than the most competitive states have, and there are periods like now, I think,

in which the reverse is true. The data doesn't support a simple conclusion that pure competition or state made rates is better for regulating profit. It can go either way.

Competitive cycles can cause insurance to be underpriced or overpriced, and so can regulation. Where there is a tremendous difference is with respect to the relativities. It's in that area where I think the fight will be waged and not in the overall rate levels. With respect to most states in the country that would tip the balance towards competition. Those states that do not have pockets of very high traffic density or very high crime, aren't going to have the relativity problems that bring this to the fore. The balance share should tip toward competition. Those states that do have these high cost pockets have a much more difficult problem. To try and put it in mathematical terms, I would say that there are three things that the best mathematicians in this audience are going to get stumped on or at least challenged by looking at, and they are the issues that the public in its own intuitive way is really looking at. The first one is the question of heterogeneity. We know that when you set up classification cells that there is some tradeoff between creditability and homogeneity but not a lot of attention is focused by actuaries on anything except the means of the distributions. What happens when a distribution is heterogeneous? What happens in the tails is very important. I would urge you not only to think of the first moment of the distribution, but particularly in high paying classification groups, always think about the tails because that's where the

political pressure will focus.

If there's a single thing that caused our Massachusetts competitive rating law to be removed or obscured by a return to state-made rates within the first year, it was the fact that a Dorchester driver with seven years of a perfect record could be paying ten times as much for auto insurance as somebody in Wellesley with half a dozen accidents who happened to be in the right classification cells. The public and the legislature intuitively understood that there's something wrong there. It's a hard problem to solve what to do with tails of distributions, but you've got to solve it. Because if you don't then you end up with the state coming in and essentially saying you can't use this whole approach because the tails poison works pretty well at the means. The tails in the high rated distributions are where you can get very very large discrepancies from true expected rates.

The second general mathematical area for thought here is that it's fairly clear if you look at pricing patterns, that there are risk loadings for other than things that show up in a simple static distribution. That is, there are risk loadings for uncertainties about what the distribution is going to look like in the future. Again, those are particularly focused in the highest rated classification cells. You've got a double problem there. You can't prove by the shape of any curve some of the rates that make sense if you can take into the sort of generalized risk or the risk about risk, the kind of second degree uncertainty around which insurance pricing really has to

be based if you're going to preserve capital in the long run. The whole sort of field of dynamic models of how to do pricing is something actuaries have not paid a lot of attention to. But again, if the public looks at rates and sees that they don't match any kind of actuarial data, and you have to explain rather vaguely that they take into account some uncertainty about the future, you're going to have a tougher time than if there's a science of that.

The third is, I think that with respect to classifications the industry has not paid a lot of attention. The best scientist in the interest, as well as its business leaders, have not paid enough attention to the impacts of classification on behavior. This industry was founded on a tradition many many years ago, that it was our job to try to reduce losses as well as to compensate for them, to have a means of spreading them. Classification systems can have a lot to do with that. You can have a classification system that explains 10% of the variance and an alternative one that explains 9% of the variance. If the one that explains 9% of the variance produces useful incentive variables that actually change the overall loss experience, well, it's a lot better than the slightly predictive one. It's better for society; society ought to demand that we use it and I think you'll see we don't always do that.

I am particularly interested in straying from the auto for a moment to the medical malpractice area, where I think we've sort of forgotten that altogether and concentrated entirely on prediction rather than impacting results. I think that the

insurance industry's job and the actuary's job is to have as much of an impact on results as possible as well as an ability to predict them. If we lose sight of that, boy we've lost half the battle already. It's not necessarily true as economists know, but insurance literature doesn't always say that what works best for an individual company in competition, works best for all companies taken together. There are such things in the economic world as extranalties, things that have to be done by state action. This area is one that's right for that kind of work. All of these are problems I think we're going to have to overcome one way or another. If McCarran-Ferguson goes ahead, it's going to intensify that focus, it's going to speed it up. But those are issues that weren't going to go away anyway.

My last point was that there would be some changes but they probably weren't ones actuaries thought a lot about. I'll tell you what a couple of them are. I think that if the federal anti-trust laws are changed, you take a look at those laws and you'll see there's a very very heavy emphasis on civil damages. Companies suing one another for impermissible behavior with respect to competition. And also don't ever forget that Southeast Underwriters was a criminal case. There are criminal anti-trust penalties as well as these treble damages. And that's where the focus is going to be.

The repeal of McCarran-Ferguson isn't so important for what it would do to the bureaus. It is important for what it will do with respect to litigation, for what it's going to mean to all of your lawyers, for what it's going to mean should McCarran

Ferguson be repealed. To industry behavior, the people haven't even thought twice about probably. It's only half facetious to predict that all of the country clubs in Hartford are going to change memberships if McCarran-Ferguson is repealed. People actually go to jail for sitting around having drinks and talking about pricing in other industries. This industry hasn't worried a lot about that. If McCarran-Ferguson is repealed, you're going to have to worry about what's said at these conferences during the breaks and at lunches and dinner. There's a lot of restrictions of a legalistic sort that this industry just hasn't thought a lot about. And it's in these legal areas that I don't think there's much economic significance. I really don't think it matters to which country club. And in this industry it doesn't seem to matter very much when people talk about pricing. It certainly doesn't seem to have helped much. But in any case, that's what people will become sensitive to. That will be the big change. There would be a big change in the way lawyers rather than economists would look at the insurance industry if McCarran-Ferguson is repealed. From an economist's or an actuary's view point this issue is not the greatest issue facing us. From a lawyer's viewpoint, it may be the greatest issue facing the industry. The repeal would be a lawyer's dream. You can't imagine how much legal business it would generate if McCarran-Ferguson is repealed. So as an extremely rational economist, I've prepared myself for this contingency and diversified by marrying a lawyer. I suggest that all of you do likewise. Thank you.



DAVE HARTMAN: Thank you very much Jim. Our third speaker is Bruce A. Bunner, who is a partner in the national insurance practice of Peat, Marwick in New York City. He earned a bachelor's of business degree in accounting at New York University, and recently received an Honorary Doctor of Business Administration degree from Asouza Pacific University in California.

Bruce also has many reasons why he's been asked to be on this panel. Clearly, one of them is that he's out in California or was before moving back to New York, and Jim has been in Massachusetts. As Jim pointed out, Massachusetts has state made rates and California has had an open competition environment for rate regulation. Bruce is a recognized authority on insurance matters, having significant experience in the field. He has twenty years of experience with Peat, Marwick in insurance and related industries. At the request of California Governor George Deukmejian, Mr. Bunner left the firm in 1983 through 1986 to become the California State Insurance Commissioner. There he initiated significant changes in the rating systems for workers' compensation and automobile, broadened the department's consumer activities, and implemented changes that have had nationwide impact on insurers reporting requirements. He's also served on the supplemental health insurance panel, a position to which he was supported by President Reagan in 1983. He's a member of the American Institute of Certified Public Accountants, the California Society of Certified Public Accountants, and the Insurance

Accounting and Statistical Association. He's been active in the National Association of Insurance Commissioners, having served as Chairman and/or Vice Chairman of a number of NAIC task forces and committees relating to such issues as federal income taxes, financial accounting and reporting, actuarial matters, and industry solvency.

Mr. Bunner also speaks and writes extensively on insurance matters, and you may have noticed in the January issue of Best's Review, an article that he wrote about escaping the regulatory bondage. We're very pleased to have him here this morning. Let's welcome him.

BRUCE BUNNER: Thank you Dave, and I'm delighted to be here with all of you. I always get a little intimidated because I know the wealth of knowledge of actuaries and I've always had difficulty sometimes communicating with them in getting my way. But I should set the record straight on a couple of things here. I'm really here because I'm the token Republican of this panel. They did forgive me last night because I told them I did vote for Jerry Brown when he first ran for Governor of California, although I didn't tell Governor Deukmejian that when he appointed me. Let me also add that I wasn't the one who said Massachusetts was a generation behind. I guess with those comments, I'd like to give a little perspective based on my experience as a California Insurance Commissioner, and again as Dave mentioned, coming from an opening rating state. I would

probably have to add, so you'll have to pardon some of my comments, because every once in a while my managing partner in my firm gets a few letters from the industry saying if you really want to develop any business in that firm of yours, you'd better keep that guy Bunner quiet, he's still talking like a regulator. If you'll forgive me, I'll just kind of keep a regulator hat on for a little bit because my experience has been somewhat jaded.

I can't quite understand the industry sometimes. I've always been a strong proponent of free enterprise and trying to preserve, if you will, the California open rating environment, and sometimes I just can't help feeling the industry is determined to destroy that environment and just let it erode and disappear and become one of those states that's going to be highly regulated. To set a little bit of the background for some of comments regarding McCarran-Ferguson. It's just been interesting, the number of things you do read in the trade press, if you will, and some of the conversations I've had with industry executives, certainly since I've been back in private practice. But you know, I can recall a meeting I had with one chairman and I was kind of reacting to your flex rating and the fact that California was moving in that direction. I was really kind of shocked that the chairman would just say -- what's wrong with that? Kind of harkening back to the Nixon years of wage price controls and what it did for the manufacturing industry in general, maybe it wasn't so bad after all. I don't recall anything being good about Nixon's wage price controls, but

somehow or other I think he felt that maybe it is appropriate for the insurance industry. I was really quite shocked by that because I've always felt the industry talks about open rating but sometimes you get into private conversations and they don't really feel that way at all. I think one other major company just made a comment very recently that competition can prevent prices from getting too high but it can't prevent them from getting too low. I don't know, I'm not an economist, but I had just never felt that way. I felt that if we had optimum competition, that prices will moderate at a level that is quite appropriate. It will remove excess profits and it will also remove inadequate profits, if you will. Some of the arguments that come in all of that.

I think there's a feeling among members in our industry that they want some form of price stability, and again, they use the whole argument that we need to have this because of the potential for insolvencies. I think that even some of the hearings that are going on in New York, and I need to be careful, I don't know whether I'm a carpetbagger or not. I haven't decided whether I'm a Californian or a New Yorker, even though I was born in New York. I was asked the other day to testify next week on financial guarantees, and I keep saying well maybe I'd better keep my mouth shut. I'm not sure whether to go or not. But like the junk bond issue, the industry's come back and basically said that they would support some sort of restrictions on the investments and high yield bonds. I just feel that whole approach is very arbitrary. We're not really getting to the nub

of the problem; it's another band-aid approach to a particular issue within the industry. Again, I think the companies that are in support of putting some limitations there are some of our larger companies. I think there's sort of a feeling, if I were to sort through all of that, it's a little bit of protectionism, I think, that they're looking for in that particular regard. If you spill over outside the industry, the congressman mentioned some of the comments. Oliver of the Federal Trade Commission really says McCarran-Ferguson is anti-competitive, it limits consumer's options by agreeing on forms and types of insurance plans, divides customers up into territories, and imposes uniform terms on agents. I sort of respond to all of that by saying, "so what?"

I know a number of times when I've testified in the California legislature, the complaint was that we've got too many forms and there is too much latitude and they're trying to narrow this down. That's where the consumer groups were coming from. We had this smorgasbord out there, which I think is quite appropriate, and yet they would like to have less forms and plans. You can't have it both ways. You need to decide, and I think perhaps Jim put his thumb on it, that probably both systems have some merit. There is a lack of credibility within our industry when there are senators who say the reality of life is that there is no competition in the insurance industry. I don't know how you can say that. It's an industry with a number of players in it. The fragmentations are there. I don't sense any real conclusion going on with price fixing. I think like

many have said, if that is going on they're really going at it in a very stupid way. Another senator says reality is that too many insurance commissioners are in the hip pocket of the insurance industry rather than protecting the American public. I think it's unfortunate that kind of perception comes forth in the regulatory environment from the states. I've worked long enough in the regulatory environment and I don't think that's true at all. Another congressman said the other day, in response to the GAO study that losses claimed by the industry disappeared when accounting practices in accordance with the Tax Reform Act, it sure is all of a sudden now have profits. They can devise any kind of accounting model you want and generate any kind of figures you want, and I think the consumer groups came back and said just eliminate all of the loss reserves and we've all made quite a bit of money. You can get there if you want to get there. But the whole point is the accounting profession has been around a long time and I don't know why we object to vbeating up on my profession.

I think the whole point is there are a lot of smoke screens going on. We're talking about price stability, protectionism, I've kind of alluded to, some of the small company issues. We're worried that maybe they may go out of business. I'm not sure that's the bottom line issue, but certainly we should have some sort of mechanism to reflect industry statistical data, it's certainly needed for the large companies as well as the small companies, and certainly needed for the public.

Solvency, we use as an excuse for so many things with

respect to state regulation. I think that's an issue to itself it can be dealt with separately and not really drawn into this kind of an argument. The accounting area, we've done a very poor job of expressing what the industry is earning. That can be greatly improved. I've tried to be a proponent of that with the NAIC, but it's slow going. It's almost like Congress there as well. I think this perception is that there's a little bit of an "old boy" network going on. Maybe that might be true but I don't think that's true in the major states, if you will. I think the whole point is, we're attacking McCarran-Ferguson for the wrong reasons. The issues are not those issues, if you will. I don't think McCarran-Ferguson has anything to do with the liability crisis. I think really the basic issue, if we're going to focus on McCarran-Ferguson is going to be what is the industry's response going to be. We're really talking about competition and pricing. We're talking about data collection, how well it's done. If it's being done well at all. And we're talking about the whole efficacy of state regulation.

McCarran-Ferguson, I think probably doesn't do an adequate job, at least for all of us with respect to some definitional type problems. It talks in terms of state regulation dealing in the public interest, but I think really the key is state regulation serving the public interest. It doesn't do a good job defining competition. I think perhaps the problem there is there is a better way of communicating the competition type characteristic or either objective, if you will, in the sense that our states in fact are promoting and providing for optimum

competition of insurance within their states. I guess I'm saying there probably should be more of a burden on the states with respect to promoting competition and more accountability on their part.

The tragedy is that we seem to be moving in a direction of more regulation while the rest of the world is deregulating. If the consumer groups had their way we'd be a public utility, which I do not think will serve the public purpose. If we have price stability, we can have that. I think in California, the Workers' Compensation are the only rates that I set in there, and the workers' comp. companies have done fairly well over the years, primarily because we have the minimum rate law and we preserve some level of profit in there. But that really serves the trade-off if you will. Price controls will result in some form of higher premiums to the public. I just feel any kind of rate controls of any form are just going to breed inefficient underwriters in the marketplace.

In my mind, pricing is not really the regulatory issue or problem to be addressed. It is really the presence of optimum competition within our state environments, how can we promote that and how can we have effective competition. I think if we have effective competition, that will drive, if you will, inadequate profits up as well as bring excessive profits down. I think you can see I'm an ardent supporter of free competition. I think California has an excellent regulatory scheme. I think it's one we should encourage replicating elsewhere across the country. I think it's the only way to go. As I talk to



insurance executives over the years while I was a commissioner, and as well as since I've been outside of the department, I've always been sort of shocked that there's not more of an interest on the part of at least the Eastern the companies in preserving the open rating system that we have in California. I think it's eroding, and I think it's going to be unfortunate if we let it erode too far and we lose some of those basic concepts of free enterprise.

McBride-McGrinsky, which is the open rating law in the state of California, is very simple. It basically says rates should not be excessive or inadequate. It gives definition to excessive or inadequate and the rates shouldn't be unfairly discriminatory. I don't mean to imply that the California system in that sense is an ideal model. I think there are some problems with it. I tried to bring about some changes in light of the liability crisis and had some difficulty with the legislature. I again come back from a base point of saying what we need to have optimum competition and that's what we should be trying to promote and as regulators we should be trying to promote. But we do, in fact, have marked this location, we know that. What are some things that we can do about it? I think California is very successful in a number of areas dealing with market dislocations. I think the assigned risk plan was one example, and Dick Roth is in your audience out here with the California department.

When I came into office we had some problems with the public in general; they felt the auto rates were too high. We were

having difficulties in the inner-city areas, and we did a complete study and really found that competition really wasn't at an optimum level particularly in the high density areas of the state. Some of the things that we did there in the assigned risk plan was to give competition credits for those companies that were, in fact, willing to compete within the inner-city and within the Los Angeles County, in general, and in Oakland County. To my knowledge this is working very favorably, and basically I said to the industry that if you don't want to compete, that's fine, we'll just give you more assignments from the assigned risk plan. If you want to compete and you want to define those risks that are preferred, sub-standard, standard, or whatever your underwriting standards might be and take the time and effort to do that, then fine, you're going to get competition credits for that.

Workers' Compensation. We've had some problems in that area with no real penalties, and we came out with a point-of-sale disclosure type of document. Again, this sort of gets back to where we fail so often in the industry, inadequate accountability and really being above board and really transparent in that which we were doing. I think the one thing that we were missing in California, and which really broadened the focus, was the day care crisis. It was kind of shocking to me that the industry could not do a credible job in demonstrating the problem they were having with underwriting day care. We knew there were problems there. I went to the legislature, changed the law, gave definition to the kind of coverage. It was a general type rule

that day care centers had to have \$300,000 of liability insurance, but it didn't give definition to what \$300,000 meant. We clearly defined that as \$300,000 on a single-occurrence on an aggregate basis.

We also moved to make provision for excluding child molestation and those kinds of issues. Despite of all that, the industry still didn't come back on the marketplace, put together a market assistance program. I think we were one of the first states that developed that, and yet the industry came together and had an opportunity to really demonstrate and did an adequate job. We've let applications pile up on the desk and very few were really written. We had an opportunity to really demonstrate for the legislation that they could have been responsive, but they weren't. It kind of drove me in the direction of saying that we needed to have some sort of a lever within the state environment in order to impose. In a sense, forcing the industry into the marketplace when we had these kinds of dislocations. I was sort of coming back to saying we should start with market assistance programs. We need to make the voluntary market work, and the market assistance program would be a demonstration of that. If, in fact, that kind of program wouldn't work where we had these difficult to place type coverages, then I was asking that we should be able to impose a JUA on the industry, but only after a public hearing, and only after a demonstration that competition wasn't working, and only after you could demonstrate that the coverage that you were talking about wasn't uninsurable. If it was totally uninsurable, then these are the

kind of issues that come forth in that environment. If we were effective in putting a JUA together, then these things would sunstate out after a year and a half or two years, once it had been demonstrated that the mark has come back to some measure of stability.

I guess if I was going to attack state regulation, I don't mean to imply by this that this is just an occasion for doing away with McCarran-Ferguson. But there are some things that do go on that tend to be anti-competitive. I think the omission process is abominable in state regulation. I had a call just a couple of days ago, a major New York State Exchange, one of the top twenty companies, wanted to buy a charter. And I said why don't you just start the company. I said it takes something like a year or two years to do that and that's much too long. When you think about the price you have to pay for a charter and just some of the stuff. It just gets mind boggling after a while. I know exactly what they're talking about. It's so difficult to make applications through the department in California. I think the whole market-entry issue has to be dealt with to provide greater ease for companies and competitors who come into the marketplace.

I think when a name you would recognize is trying to put together a tender offer on a major New York Stock Exchange Company that had a California domestic, and literally I can just stop him in his tracks, with merit or not. I look at the foreign control type thing and I just don't think these kinds of things need to be in the insurance codes. I know in California they say

if you've got one share of stock owned by a foreign government or it's under foreign control or domination, and for that reason the company can't be admitted in the state. This stuff gets kind of mind boggling. Whether you're for or against banks being in the insurance business, I think that's a U.S. government issue and not really a state issue. You go right down the line: anti-rebating, policy forums and approvals. I look at variable life as an example. There's no reason in the world why this shouldn't have moved through the California department much quicker than it has. It's a concept that should be expanded on. Risk retention is another example. The federal government's response to some of the group insurance type prohibitions in the insurance codes. You just go down the line on some of these issues. I don't think in the aggregate or a single basis any of these justify the abolition of McCarran-Ferguson. But I think these are some of the kinds of things we need to wake up to, whether we're state regulators or within the industry. Start moving in the direction to eliminate in the insurance codes. I think it would improve competition. I don't think in and of themselves they do anything against competition.

The other big issue that I have any real complaint with is the data collection area. I think the day care crisis brought it greatly in focus in California. I think as an industry we can do a much better job in data collection. I think Jim touched on some of the concepts that I would share. We are an industry in the statistic gathering business. We're probably the largest one apart from the federal government and in many ways I think we're

doing things the way we've been doing it for the last twenty years. I think if we did a better job, if we were more accountable, and more open, we'd be in a much better position and a more defensible position to talk about profitability, to talk about adequacy of rates, and to talk about underwriting experience.

I guess what I reflect on the most when we talk about data collection is, I think of the California Workers' Compensation Rating Bureau. It's one that I work with very closely. We made some very significant changes in 3-1/2 years that I was Commissioner, and yet I felt very good about the direction that that rating bureau had gone on the collection of data. I remember several times standing before committees and the legislature where you can stand up with confidence and say, "I challenge you gentlemen, any one of you on the committee or within the industry, or consumer group or wherever, to find fault with the data collection model, if you will, as transpiring in the Compensation Rating Bureau. If there is, we welcome the comments, in order that we can make the appropriate adjustments." I think it's a model. I think it's one we ought to look at in terms of when we talk about data collection for the industry, and it's one that's industry financed. And yet, structured in such a way that there is some interaction involvement or interface with the regulator. I think that the benefits that you would derive from sort of a quasi-regulatory/data gathering type system. I was sort of moving in the direction that when I testify before the Little Hoover

Commission in California, that perhaps what we need in California is maybe a data base structured in such a way that it would promote free enterprise, promote the open compensation. The benefits of something like that would have been the gathering of reliable experience statistics for the state. And if something like this was done on a national basis, which I think it could be done, I would want it done on the industry level, not on the federal level. It does provide for pro active communication between the actuaries within the department, as well as the actuaries with the insurers, dealing with rating methodology. We'd have more timely statistics. I was always kind of shocked with the assigned risk plan. The statistics that we got were something like a year and a half old when we received them. Perhaps more importantly, it would really enhance the public disclosure, and if they wanted to deal with these things, then this would give them some point if there was going to be an argument, then they would have to argue from those statistics.

I think the industry ought to think long and hard on how they could do a better job in the whole data collection side. I think it's something they can do within the industry with the cooperation of state regulators, and I think we should do it in such a way that it will promote open competition. My fear is that if we allow this to go to state departments or to the federal scene, then it's going to get so highly structured that we're going to end up going down a path, if you will, to inspect the coverages. It gets so highly structured that we lose in the benefits of innovation, creativity, and as time changes with

respect to risk.

In summary, again I say states do a good job in a number of areas. I think where they do excel is in dealing with the consumers. I don't see how the federal government can deal with that as well as the states. I think they do a very credible job with insolvency. There's a lot of room for improvement and I've certainly been an outspoken critic as to financial analysis, but on balance they've done a good job. I know of very few policyholders that have lost any money in the last forty or fifty years, certainly on the T&C side. That doesn't mean we haven't had a problem and couldn't have done a better job dealing with solvency. But on balance the states have done a fairly good job. I guess I'll come back again and say states should be held to a higher level of accountability.

McCarran-Ferguson, if I was going to quarrel with it, I wish we could have a better definition of what does, in fact, serve public interest, and what does, in fact, promote competition. I think where we need to be getting is to have state regulatory schemes take care of the consumers, promote optimum competition, unrestricted price competition, dealing with market efficiency, ease of market entry, and more ease of capital formation. I think these are some of the kinds of areas where the states need to get their act together. I think they can do it. Maybe it's healthy for the federal government to express some of the concerns that it does. That might be just the impetus that we need to correct some of these deficiencies. I don't think they are deficiencies that justify the elimination of McCarran-



Ferguson.

Thank you very much.

DAVID HARTMAN: Thank you very much, Bruce. We do have time for some questions.

QUESTION: Is it fair to say that repeal of McCarran-Ferguson is going to drive rates down?

BRUCE BUNNER: That is not a position that I have suggested that I hold. Unquestionably, the significant increase in rates in the past couple of years particularly has driven congressional interest. First, it has driven consumer interest, that means then that it has translated into driving congressional interest as well as interest throughout state legislatures, into some review of the industry, in Washington specifically, into a review of the continued appropriateness of McCarran-Ferguson. Actually, having set through several days of testimony over the past year and a half on McCarran-Ferguson, I don't think that the advocates of repeal of McCarran-Ferguson have at all made their case on that issue. I don't think that they have been able to offer data that can in any way demonstrates that repeal of McCarran-Ferguson is going to result in reduced rates for the consumers.

QUESTION: How easy was it for your company to enter the market?

JAMES STONE: When a former insurance commissioner applies for a license, the Department bends over backwards to go slowly and carefully for fear that somebody is going to say that there was any kind of favoritism. I suppose it was longer than I wanted it to be and by a few months it slowed us down. On the other hand, I don't think it was an inappropriately long time for a brand new company. I think I agree with what I took to be most of Bruce's point, which is, that when you're not dealing with a brand new company, but a company that already has a track record or that's part of an enterprise that already has a track record. Boy, I think every department takes much too long on those. The Massachusetts department has been as guilty as any. On the new companies you do have to be careful.

QUESTION: Our previous speaker talked about the Congressional interest in competitiveness of U.S. industry. I think he also alluded to pressure on the insurance industry. Have you given any thought as to how the two issues relate? Our competitiveness to foreign insurance companies and the repeal of McCarran-Ferguson. If they pull for cross purposes, which do you think will carry the day?

CONGRESSMAN FEIGHAN: I think that in many respects, the nature of our insurance industry, and the nature of what's

happening in coverage in this country is enacted to some degree, and maybe in a healthy fashion, as a non-tariff barrier. A number of potential exporters to the United States are intimidated by the litigious nature of American society and the complexity of our tort system and the insurance system generally. Many would argue in these days where we're trying to get a stronger trade to balance on our side, that that's a healthy non-tariff barrier. I don't know what the nature is. I'm totally unfamiliar with the insurance industry of our trading partners. I think that the Congress has been attracted to the insurance industry competition as an issue because of the widespread publicity of the liability crisis in the past year. As I had suggested earlier, it's very enticing to a politician to accept the simple premise that repeal of a federal statute is going to bring about lower rates and the wild enthusiasm of constituencies, if not their gratitude for that action. I think it is far too simplistic of an analysis. I don't think it's likely to happen. I think as Bruce Bunner has suggested, there are anti-competitive natures of the industry at play today. And there might be a federal role in correcting those, but I don't think that the majority of members of Congress have been persuaded that repeal of McCarran-Ferguson is the appropriate road to take.

On a final note, I think it's particularly interesting, I mentioned earlier that there has not been legislation introduced in the House to either repeal or modify McCarran-Ferguson. Late last week there was one bill, I don't know the nature of it. One

of the reasons that it has not been introduced into the House is that, notwithstanding the joint efforts of a large number of consumer groups, the American Banking Association, the Association of State Attorneys' General. There has not been one republican member of Congress who has been willing to co-sponsor the introduction of a bill. Congressman Edwards, out of California, who is primarily interested in moving legislation in the House for modification of McCarran-Ferguson has said he will not introduce the legislation until he can get a Republican co-sponsor. Bruce, as long as your party holds out, there won't be any disruptive effect.

DAVID HARTMAN: Let me conclude the panel by saying that we've had some indications that the sky is falling. We've had some clear suggestions for change even within the current regulatory environment. And we've also maintained the rosy colored lighting here on the panelists. We appreciate your attention as the audience. We trust that you'll take away from this panel some motivation to discuss this issue with your colleagues, influence further thinking on this topic. And we especially thank all three of our panelists. Please join me in giving them a round of applause.

**CASUALTY ACTUARIAL SOCIETY  
SPRING 1987 MEETING**

Panel: Insurance Company Ratings

Moderator: Robert A. Bailey  
Senior Vice President  
E. W. Blanch Co.

Lawrence A. Hayes  
Vice President  
Standard & Poor's Corporation

Michael Miron  
U.S. Editor  
Insurance Solvency International

Robert Arvanitis  
Senior Analyst  
Moody's Investor's Services

Robert A. Brian  
General Partner  
Conning & Co.



ROBERT A. BAILEY: We are fortunate this morning to have a varied panel of experts who have taken time out of their busy schedules to come and discuss this important subject with us. I am also pleased too see how many of you have come to the last panel of a three day meeting in Disney World.

In the past three years we have passed through the worst solvency crisis since the period 1930, 1931, and 1932. About 80 companies have become insolvent in the past three years. Normally, there are only about five casualty companies a year that go under. The magnitude of that crisis, and the fact that many of those companies carried a good rating, an A or A+ up until a year or two of becoming insolvent, has created the tremendous demand for rating services that are more timely and more widespread. In other words, it includes the whole market, international as well as domestic, going into more depth into the management and ownership of the company and the way it does its business, and being more sensitive to street information and less dependent on mechanical number crunching. As a result, a number of rating services have emerged or expanded in recent years. Our panel members represent several of those new or expanded rating services. And now, Mike, if we can have that first slide.

Our topic this morning is insurance carrier ratings: Who does them? How are they done? And for what audience? Can we have the next slide now.

I've tried to list eight different institutions that do insurance carrier ratings for other people. Of course, we have many reinsurance companies and otherwise that rate insurance

companies themselves for internal purposes. The paper presented to us at this meeting by Steve Ludwig and Bob McCauley of Hartford is a good illustration of the depth of the analysis and the effectiveness of the analysis now being conducted by a number of major carriers for their own purposes. Here we have eight institutions that rate insurance companies for other people. The NAIC being the oldest; a license is a rating. Unfortunately, licensed companies become insolvent. In the last 15 years, the NAIC has had an early warning system but they only publish part of it, the mechanical part. As a result, the part that is published is an incomplete rating system and the published part has not changed much in the last ten years. Nevertheless, it is widely used by many segments of the market.

A.M. Best Co. has been the primary rating agency since 1899. Unfortunately, we are unable to have a representative of Best's participate on the panel. We invited them but they indicated that this is the busiest time of the year for them. I must confess that this is the first spring meeting of the CAS that I have attended in about six years.

The next five are represented on our panel. They will tell you how they rate companies and for what audience.

The last one -- the stock market -- we don't have a representative for that. We probably don't think of the stock market as a rating of insurance companies; nevertheless, it is an important one which we cannot ignore. Either the insurance company or its parent is normally listed on a public exchange. What happens to that stock price and what the market valuation is



-- the price per share times the number of shares -- and the change in that value and the relation of that value to the book value is an important indicator, especially for international companies, of where the financial statements are on an average a year or two old when you get them, and where the financial statements are even more distorted by statutory accounting conventions overseas than they are in this country. The stock market evaluation of some of the foreign companies is truly amazing and very informative.

I'd now like to introduce our speaker, Michael Miron, who is the U.S. Editor for Insurance Solvency International. Michael joined ISI, actually he merged with ISI in December of last year. He formed his own insurance rating service, International Insurance Financial Service, about five years ago. IIFS rates international companies and then last year formed the American Reinsurance Financial Service, which rates U.S. reinsurers. Both of those services were merged last December with Insurance Solvency International. Michael has had thirty years of financial experience in the insurance industry, including many years as the chief financial officer of the Motor Club of America Insurance Group in New Jersey. Michael Miron.

MICHAEL MIRON: Thank you Bob, and good morning. It's my pleasure to speak before such a large audience, up so early and obviously on their toes on what's going on in the insurance business.

I would like to give you a little background about the

service that I originally initiated and about the service into which we have merged so that you'll better understand from where we're coming.

In 1981, Robert Durham, who had extensive experience as a reinsurance underwriter with Insurance Company of North America, North America Re, and other groups, and myself, who basically was a number cruncher, joined together to start a security service on international insurance companies. There was a huge void at that time in the market; the ailing companies were pouring into the United States and a good number of the second and third tier U.S. reinsurance companies were doing their retrocessions overseas and had this huge need to know.

Simultaneously, in London, John Gardner was starting a security service by the name of Insurance Solvency International. I think it's fairly well known by those who use this service and subscribe to them that the so-called mysteries of international insurance accounting are really no longer mysteries. After five, six, or seven years, depending on how you count, the statements of these companies around the world have been pretty well digested, in our case converted into U.S. formats, into U.S. dollars. The principles of accounting have been pretty well aired, and I think it's safe to say that you can get information on a basis comparable to the United States, although without all of the disclosures, almost anywhere on the globe. Both John Gardner in London, and myself from the United States, did extensive traveling and met most of the companies we rated, many times in Monte Carlo and, of course, in the London

market, we met people and had people visiting the United States visit with us. You really need that internationally because the level of disclosures is quite different. But the problems these companies have in publishing data and in compiling them is the same as in the United States. Sweden, for example, about three years ago redid its statutory reporting, and went into the problem of how do you report reinsurance transactions. The Japanese had the same problem -- where do you allocate investment income between the underwriting side and the investment side? All of these problems which lead to analysis are common worldwide.

In any case, I can state that by the end of last year we had ratings published on some 800 companies, all based outside of the United States. John Gardner had over 1,000 companies in his service with published data and available ratings.

Starting about a year ago, we came out with a service on American companies engaged in the reinsurance business. We called it American Reinsurance Financial Service, but it seems that we stepped on the toes of the American Reinsurance Company and their lawyers. I am very careful to describe it as a service covering reinsurance companies in the United States. In any case, there was again a perceived need. The one rating service we were aware of just missed out completely on the quality of its ratings. Too many companies were going under that had good ratings. There was another reason: I've done several studies indicating, and depending on how you count, somewhere between forty and 50% of the business done by companies engaged in the

reinsurance business in the United States have foreign parents. We believe sponsorship is a critical item in the evaluation of a company.

To look at a little company like Cologne Re, which was based in Stamford with \$10 or \$15 million net worth, is, in my view, of limited value unless you look at the whole family tree, at the parent company in Cologne, Cologne Re, which has a huge surplus and is the oldest reinsurance company in the world. And in turn, its parent, Colonia \_\_\_\_\_, which is the second largest company in Germany, and has a huge book of profitable automobile business. And in turn, the parent company to that, which is a bank, owned by private interests.

That's just one example of looking at a branch and understanding what the whole tree is. Almost half the companies we published last year and we did just over 100. One of the toughest assignments in rating companies was getting companies to rate. In early '86 we said we were going to do ratings on 100 companies without being very careful about our count. As companies withdrew from the market, the toughest thing we had to do was to find 100 companies. In fact, I think some of the intermediaries who bought our service really weren't interested in security; they were looking for new markets for their customers.

In any case, in December I sold out or merged with John Gardner's service. The international service is now being run or published, and the analysis done out of London with phone call service in the United States. To that extent, I'm available to

his customers. We think, and I know from my own experience, that the phone discussions with the subscribers is a key part of this service. It's difficult to put negative thoughts in writing but they exist, and even if you can't say them with all the laws of liable and slander and so forth, it's that flavor that sometimes makes the real difference. There is no doubt that many subscribers called me in Stamford, when I was running my own service, to get the flavor of the people behind the company. Who are they? Where are they from? That was a key part of the service.

In any case, the people from London saw the need to expand their service to worldwide basis. I might mention they are owned by a stock brokerage company which has a subsidiary in rating banks. They rate banks in the United States and the rest of the world. They are rating insurance companies in the rest of the world, and this is the last step in completing their circle. This summer they are shooting for the initial release of their American edition. It's take a lot of time to reprogram and set up computer analysis to conform the American service with the international service. But a lot of their subscribers as well as a minority of mine were overseas subscribers, and to some practical extent we're trying to conform the reports, though everybody knows that if they want to read about the sponsorship and the parentage of a company, that there is some logical place in the reports where they can find them.

As far as our audience is concerned, I think I can explain it best by who bought our subscribers to the American service.

The ten largest reinsurance intermediaries in the United States were all subscribers. Most of the leading reinsurance companies, well, certainly, many of them became subscribers. Not necessarily to learn security but for the reasons that I'll get into they wanted to read about their competitors. We issue in depth reports, and the people we interviewed who saw what we were doing, saw the reports on themselves and were interested in the same reports on other people.

Lastly, there were a number of service companies that bought a service, law firms, accounting firms. One of the major Big 8 accounting firms bought twelve copies so they could put them in various offices around the country.

Let me get a little closer to who we rate by looking at the history of insurance in the United States, taking it in three stages. First, there were breaks between stocks, mutuals, and reciprocals. While that's ancient history, I think you will still see some statistics published by that criteria and classifications. Later, we had the property companies and the casualty companies. I suspect I'm giving away my age when I say I can remember when we were first able to put them both together on an automobile policy and later came the homeowner policy.

In 1986, we really have a different break in the business, at least in my view, it's personal lines and commercial lines. While there are some companies who do both, I think mixing statistics, mixing the companies, does very little for you. The reinsurers I take as a completely separate industry and treat it that way in a security service. I might mention from a security

standpoint, the guaranty fund system on personal lines is almost identical or somewhat similar to the FDIC. I'm not sure that the insurance buying public of personal lines of insurance has much need for security service, any more than the depositor who keeps under \$100,000 in a bank with an FDIC sticker on the window, really needs much help in the analysis.

We're down to reinsurance companies and commercial insurers. The function, as we see it, of a security service is to provide data, and perhaps our judgement, to assist the professional buyer in making a decision. We eliminate his grunt work. What I always felt I was doing with the American service was collecting information wholesale and selling it retail. But this is a critical point because the services recognize that buyers really may not want all of this. They may just want the rating. There's a certain conflict in that. We don't pretend to usurp the buyer's responsibility in making the final judgment of where his money is placed at risk. We try to help them and give them information that we come to, but at least in our thinking the buck never moves from him. He's got the ultimate responsibility.

Going back to the information that we were gathering: wholesale and selling it retail. I might mention that the annual statement really is a problem for reinsurers. I spoke with the Reinsurance Association last week and they once again raised the question of a separate annual statement for reinsurers. I suggested that I would also like to be twenty one again. There is some merit to their position. The annual statement really

doesn't do justice for reinsurers in a number of ways. Funds that are held and are really offsets to outstanding losses can't be offset. We report losses net of reinsurance. We mix our apples and peaches. And perhaps the worst one, and the one I suggest that the Reinsurance Association get hopping on, is the accrual of premiums. In the course of our interviews last year, and during the American Reinsurance Service, we found that there is a small minority but a real number of companies who really ignore the accrual premium concept, which in turn throws off Schedule O and P, and they say, "so what"? Or they issue supplementary data to tie in O and P on an underwriting year, which at least is meaningful.

There are some alternate solutions that I might tell you about in the rest of the world. In Switzerland, they'll just leave the books open for six months or so after the end of the year, so that Swiss Re may incorporate all the accounts of its cedents for the activities through December, and historically will release its annual results around September or October. One of the problems of American reinsurance companies is they're operating in an environment that's geared towards earnings per share on a quarterly basis. There's a real inconsistency between that and the real life world of reinsurance and knowing your losses. As actuaries, I am sure you're all familiar with those long-tail development charts and recognizing the problem to which I am alluding.

The German companies have another technique -- co-terminus years. They have a June 30th fiscal year, but they include the



underwriting transactions ending with a prior December 31st and financial transactions through June 30th. Again, at least they tell you what's in their statement. Perhaps the more practical route for the United States may be to adopt what they do in the London market which is fund accounting, where you don't try to get all your accounts in at one time. You bunch them and keep them in a fund liability account and wait until the end of the next year before you take it out. Providing for deficiencies, of course, but not accruing the income. In any case, one of the difficulties in doing any mechanical analysis of American insurance companies on any meaningful basis is using their annual statements which aren't geared toward the real world in many cases.

I might mention the analysts method that we use. We interviewed almost all of these 100 companies. As a matter of fact, in the reports on the three or four that declined interviews, our rating summary indicated that the companies declined to be interviewed, which we thought was a significant red flag for our subscribers. The two people we used, one chap with twenty years of underwriting experience, first in direct business and then in facultative casualty business. The other chap was a financial analyst who had been doing security work for two of the alphabet houses and is now on Wall Street with Ray Dirks of Equity Funding fame.

I might mention another feature of this security service was loose leaf. That was particularly important last year when we had this flurry of public offerings. There were some companies

we issued three reports on and kept updating as material events took place. There were at least a dozen companies in that group that had public offerings and we had updated reports. There are other reasons that can occur such as interim reporting. And the advantage of a loose leaf service is that you can just update. I might mention on the international side, both services, international solvency and ourselves, had loose leaves because we got into the habit of distributing reports throughout the twelve months of the year, which more or less conformed with the way reports were released on a world-wide basis.

There's another key factor with respect to rating reinsurers. That is -- when do you rate them? Philosophically, in the rating service that I started last year, we began rating from the time a company went into business. That's before it issues its first contract. Basically, we felt if we are to help a subscriber who is being offered the security of a reinsurer who is issuing its very first contractor in their very first month in business. What they want is our evaluation. Where might it be? What's going to happen? I think that's what the subscriber is paying money for, in our judgment.

Obviously, the valuation has to be somewhat qualified when there are no numbers to work on. But people are ceding business to a reinsurer from the day it goes into business, and they're making judgments. Those factors, the sponsorship; who's putting up the money? What kind of management are they hiring? What kind of business plan do they have? Although they all have business plans that sound great up front and that sort of

judgment. That sort of judgment which the buyer of reinsurance has from day one is something that we believed we had a duty to respond to. There was a company, United Reinsurance, formed in Texas last year. Interestingly enough, its chairman had been a chairman of a company that failed about ten years before, which was possibly a positive or negative, but I had been familiar with that and really remembered it being identified with the chief financial officer who got into a line of business that caused a lot of mischief. It didn't bother me, and we looked at the money that was there to support it.

Recapital, which you may remember was a spinoff of North Star, got its license and was starting to write business in November or December of last year. People wanted judgments, what kind of rating might they get. Even companies like Nac Re, which is the re-incarnated Nac Pak. People wanted to know. They went from a company that was relatively dormant with maybe \$10 million a year of assumed business to a company that's doing \$100 million within one year. It really wasn't the same company. The subscribers wanted to know what's going on? Our people spent more than a day going over the business plans, evaluating the caliber of the people and so forth in order to pass it back to our subscribers our impressions of the company. This is what they wanted.

The management; we're big on pedigree. We really like to know who the people are and where they came from. Perhaps I ought to spend a few minutes on another subject, sponsorship, which is very important. Maybe more so internationally, where a

man's word is more likely to be his bond. I've done a study on the fifty major companies outside of the United States, or there are fifty of them, operating in the United States. I analyzed them in the middle of last year. To us those companies look like long-term players in the United States. They're here to stay and that's the core of a lot of the companies that are involved in security servicing.

There are a number of basic reasons for it. The rest of the world is mature economic-wise and there is very little place to grow if you're in the insurance business and you're locked into Switzerland and you want to go to Finland you have to issue policies in Finnish and that's difficult. There are restrictions in most of the world. There are two open markets in the world: the London market and the United States. And soon you realize that if you go to London you write a U.S. business anyhow. You might just as well come to the United States and be where the action is. The major players around the world, and I can give you a list of fifty of them, they're here to stay and in order to analyze them, at least in our judgment, a material factor is the whole family tree from which they come.

One of our concerns during '84-'86 was whether the parent company had put in more money. I take it as a very serious detriment if they had not put in more during the last three years. Because almost everybody around the world recognizes the opportunities that were available in the United States market during that time. I might mention what I call the second-tier of overseas companies. They are the ones who really got burned.

They went back to Europe, and it's questionable when they may ever come back into the United States.

There's a distinguishing factor: the large fifty have their own shops, and to a large extent they control their own underwriting activity. The lesser size companies were forced to do something else. Generally, they took parts of the action of U.S. reinsurers, either via quarter share reinsurance or participating in some manner as a retrocessionaire. Another group joined pools. I assume you are all familiar, or should be familiar, with the litigation arising out of the Pacific Re pool that was operated by Mission and the Penn-Atlantic Pool in the East, at least to the extent that the losses to the foreign companies became highly publicized and their allegations of misconduct by pool managers became known. I think the real problem is that we are getting the second-tier players back into America because they're going to be reluctant to give away their fountain pen again.

There is another area of sponsorship that grew up last year that concerned us, and that is the spinoffs. Score Re, which is really the French government, indirectly, or almost had been 100% not too many years ago, sold off a material part of its holdings of Score Re. The Phoenix Re, a major life company, started selling off part of Phoenix Re. There was an aborted effort by Home Re. We are concerned because in reinsurance you're obviously looking long-term. Who is the owner and are they really going to stay around? This trend toward selling off parts takes the owner off the hook. The biggest one was probably

Scandia, which was just a Rock of Gibraltar. It owned one-third of the commercial business in Sweden. And no matter what the reinsurers did, we always felt the parent company could make enough money on its domestic business to make good. They created an intermediate holding company, Scandia International, which creates the problem that the parent company is really no longer on the hook. This potential change of ownership is leading the market. I've talked with speakers from London to get everybody to raise the ante and not rely on parent companies. There was one other example, an American company, General Re, owned a company Trident in the London market. Trident lost money every year and General Re just kept making it up, and everybody was comfortable with Trident because of the General Re deep pocketbook. General Re sold Trident. It's been renamed, and if you're in for long-tail business in Trident, you don't have General Re to look to. That change in the mentality in the United States and around the world is of some concern.

There are other aspects that we deal with. I might go into them but the financial analysis that we do is somewhat similar, I'm sure, to things that you've heard of and that you are all very competent in. You're going to hear more about our service as the U.S. pages come out. I hesitate to toot our horn in advance. I think the market will be pleased by it, but I think performance will speak for itself. Thank you very much.

Thank you Mike. Our next speaker is Larry Hayes, the senior

vice president of Standard & Poor's Corporation. Larry is in charge of the insurance ratings division of Standard & Poor's. Larry has been with S&P for five years and has been in the insurance group for three years. Prior to that he was a lending officer with a major eastern bank.

LARRY HAYES: Good morning. I mailed down about 100 packets which really represents an extract from some presentations we've been doing, and I believe they may be over on the side as you exit. My comments are going to be in response and summary to some of these points, and a necessarily brief overview on many of them. In trying to keep with the spirit of the panel and try to give you a flavor for what market segments we at Standard & Poor's are trying to provide services to. That is, if you will, the broad theme I'm going to try and address. Clearly, Standard & Poor's is much better recognized within the fixed income bond and capital markets, both domestically and internationally, than it is in a historic sense, with the insurance community, whether it be the U.S. community or the wider international activities. We in the insurance group are trying to change that, and that is the real reason I'm down here, to help communicate what we do and how what we do with respect to insurance rating activities is different, or as the case may be, similar to our activities in rating bonds and other fixed income securities. We define the market I think a little bit more broadly than perhaps the way Mike does with respect to the reinsurers and the ceding companies. To us, the market begins with the primary companies

but includes the brokerage function that Bob Bailey represents in the reinsurance side. The direct brokerage function within both the life and non-life sectors of the U.S. markets. And ultimately includes the insureds and the providers are capital to the insurance company. There are four market segments and in its totality that covers a rather wide spectrum of the audience in both the United States and world markets. We believe almost all of those markets have a need for information with respect to the quality of insurers that historically hasn't \_\_\_\_\_ as well as we believe we can do.

What I'd like to do is comment on a few of the basic approaches that Standard & Poor's brings to rating insurance companies from a claims paying ability point of view rather than the more traditional debt ratings, and try to identify how what we do might be differently from what has been commonplace in the industry. It really begins with the fact that claims paying ratings that Standard & Poors are a voluntary system. All of the companies we rate for claims paying ability have requested the rating and have ultimately accepted our determination. A company has the right to terminate the engagement, if you will, at any point during the process until we have actually released the rating which we only deal with their agreement. The reason behind this approach is that we think it is critical to have ultimate cooperation on the part of the company in order to get the best quality information. If you will, information in our business is one of the key raw materials. The quality of the people that we have on the staff is an obvious raw material, but



just as equal is the quality of the information. With respect to property/casualty companies, reinsurers, and life insurance companies, each one of those type of companies has a particular area, from a financial and operating point of view, which until you meet with the management and get essentially confidential information no one from the outside, no matter how bright and experienced, I believe, is really going to be able to offer an opinion within very fine degrees of differentiation. So we believe that the voluntariness allows us to get that high-quality information converted into the best rating product that one can have.

Another element to our approach is that it combines both an historic review of the operations of the company as well as a judgment as to perspective performance. In this sense, one of our basic tenets is that we do not rate companies whether it be for fixed income ratings or claims paying ratings, until they have at least a five-year operating history. There are some exceptions to that, with respect to the bond insurers, the financial guaranty specialty companies, where essentially we review every underwriting decision that they make. And there are other conventions, if you will, that allow us to feel comfortable rating start-up situations. In the main, traditional operating insurance companies are not eligible for a rating from Standard & Poor's until they've developed at least a five-year operating history.

In addition to history though, and as critical and if not more so, is really a judgment as to the prospective performance

of the company. I would reinforce performance, i.e., the operating performance, the ability to earn an adequate rate of return on its capital and the stability of that return. That element, the operating quality is really the leading indicator of ultimately where the balance sheet, the other half of the equation, is going to rest. We believe that it's critical to focus on both parts of the financial statements, both the income and the balance sheet, and not, as I believe it may be more traditional, to concentrate almost exclusively on the quality of the balance sheet, traditional solvency measures and reserve adequacy measures, etc. I think those elements are critical, but have to be done in the context of a broader forum.

In addition to the quantitative analysis which generally doesn't differ from one organization to another nearly as much as the views from qualitative aspects. The role of the qualitative judgments we come up with is, at the margin, the determining factor. It's not scientific, but is a way of thinking about it. Typically the rating is 75% quantitative and 25% qualitative. That 25% being the tail; it determines the margin of difference between rating categories in almost all situations. In order to come up with that qualitative judgment, we have to meet the companies, we have to have their cooperation and that is why the voluntariness is important. And we do meet companies. We typically meet them at their place of business, typically for at least a full day. Oftentimes with more complex companies, with multi-line operations and particularly non-U.S. companies the meetings tend to run two-days. And we have

relatively broad exposure to the very senior management as well as the operating division heads. Our intent is not just to sit there and get a canned presentation from the CFO or the treasurer, but really get a good cross-section of the senior management, both those that are currently responsible and those people who ultimately will be moving up and run the organization.

We intend the rating to be a relatively long-term indication of the quality, and therefore try to take into account as many factors as we can that will give us a leg up on where the company will be, not just two or three years from now, but five to ten years from now in terms of their basic operating and philosophical strategies.

Another element that sets our rating scheme apart a little bit from traditional insurance organizations is that really we're comparing all insurance companies against one universe. Obviously that's easier within the United States situation, where you have much more homogeneity. But even with respect to international companies, the basic approach in standards that we bring to the ultimate rating decision tend to be reflective of the same basic concerns from an economic and ultimately credit point of view. There's no rigid set of standards that one can really identify and explain to you. We tend not to go to extreme point of dividing the pie into all its little pieces, because the situations tend to be too dynamic to render that useful. But we measure all companies against one another, and within the context of really having to define the insurance industry on a world-wide basis as seven sectors of insurance including, and moving from

the most risky to the least risky, we begin with reinsurance, which is really the most risky in our point of view. Next is commercial property casualty and private mortgage insurance. Moving further up the scale in terms of less risk would be the personal lines, property/casualty, group accident and health coverages and group/life included in that segment. Group annuities is even less risky than that. Lastly, in terms of least risk, is the individual life insurance business. We have seven separate sectors, each of which is analyzed separately and we identify parameters of performance and capital requirements that we think make sense. But once we've done that, we then tend to measure all the companies against those broad sets of parameters. Much of the focus that we've experienced in terms of marketing and explaining our rating approach really revolves around trying to explain our rating scale and what it intends to tell people from the A.M. Best rating scale, which really is the generic rating in the United States context. Therefore, I want to spend a few minutes briefly outlining how the scale works, what it is, and give you a little bit better flavor for it.

The symbols I think are rather well known. The obvious one and most well quoted, I guess is "AAA" and it's sort of like Coca Cola. The scale does not begin at triple-A. The scale begins at "BBB" (triple-B), which is defined as having an adequate capacity to meet contractual policy obligations. Adequate being what is not to be a prudent position in terms of operating performance and capitalization to run the business under most scenarios. Moving up the scale, we have differentiations "A", "AA", and

ultimately "AAA". Each of those levels is essentially defined by extra layers of protection. Extra layers can really be thought of as extending out in time the likelihood that that company will be an extremely stable and high quality and ultimately solvent organization. From an interpreter point of view, the rating levels above "BBB" extend out one's confidence from the point-of-view of time, and in the "AAA" sense, the time scale is indefinite. We expect "AAA" companies remain solvent and operate profitably under really all situations, including a very severe economic set of events for an indefinite period of time.

Working down the scale, from "BBB" scale...and the final bottom is "DDD," which is a situation where the terms of insurance obligation are not being met in a bond sense, where there is a technical default provision; it really refers to default. Much of the concern insurance companies and users of the ratings have is focused on the initial rating that we provide the company. In many respects, one doesn't need to have Standard & Poor's tell them that Aetna or Gen Re is "AAA" claims paying ability. However, we think our service provides an additional feature, we constantly watch those ratings in the companies which underly them that we do. Very typically today, with respect to maybe as many as half of all the companies we have ratings on, it's not atypical for us to have three to five meetings per year with these companies, although we tend to focus one of those meetings in a very comprehensive sense. More and more, the issues can't really be boxed into one or two days and then forgotten for the rest of the year. On both the parts of the

companies and ourselves, we have moved to a much more continuous process of physically meeting and implicitly surveilling the financial and operating performance of the company. We think that we offer users of our ratings not just an initial opinion that can be put away and forgotten, but a really continuous, alive, and current indication of the credit quality.

Lastly, I would just talk a little bit about the staff and the philosophy of an organization that we have in the insurance group. I'm probably one of the few members in the room that is not an actuary. We don't, as it turns out, have any actuaries on the staff. That's not particularly reflective of any bias against actuaries, it's more happenstance. Importantly, of the ten analysts that follow property, casualty, and life companies, and we really do divide the industry into the three major sectors, property, casualty, and reinsurance being one, life, and then mortgage insurance and mortgage related entities being a third, in our working organization. The focusing on life and non-life; by the end of the summer, we'll have ten analysts on staff. Seven out of those ten will have come to Standard & Poor's from insurance companies, a mix between property, casualty, and life, typically from planning roles and financial analysts roles. While we haven't turned up anybody yet who has a true actuarial background, we do recognize that it is critical to have industry experience as well as more traditional credit skills, and have tried to complement our abilities by bringing in people who should have, and in fact do, a working knowledge and understanding of the basics of the industry. I think that is a

critical component; if one half of the equation is the raw material, certainly the other half is the raw material from the human resources point of view. The majority of our staff have come to us from the industry. And the balance typically have joined us from major commercial banks where they have typically been responsible for credit and lending facilities directly to the insurance industry or the industry in question, whichever it may be.

Very lastly, I'll just point out, which is really more detailed in the material that is over here, in the summer of '87 we plan to introduce a insurance rating service which is solely devoted to claims paying ability ratings. Today and in the past communications and publication effort from Standard and Poor's have been within one generalist media, and we want to identify and give more flexibility to communicating the unique needs we identify within the insurance community on a world-wide basis. We think this service will provide us that opportunity, and will give us an opportunity to get into much greater depth, both with respect to the individual companies and the industry sectors, those seven sectors I mentioned, as well as a similar analytical material with respect to the ten non-U.S. companies in which we have some insurance organization rated, whether it be from a fixed income or a claims paying ability point of view. I hope I give you a better feel for what Standard & Poor's has been doing historically, what we're doing today, and what we intend to be doing in providing in the way of material going forward. Thank you for your attention.

Thank you Larry. Our next speaker is Bob Arvanitis, assistant vice president of Moody's, a long-time competitor of Standard & Poor's. Bob has been with Moody's for two-years. He is the senior member of the team that assigns ratings to casualty insurance companies. He's an associate of the Society of Actuaries since 1980. I understand he's passed many of the exams for our Society. Prior to being with Moody's, he's been there two years, he was with AIG for ten years, where he ran the international actuarial Department, and the reinsurance profit center.

BOB ARVANITIS: I'll start by noting that we have available today a consolidated insurance enterprise rating list, and I'd be glad to take business cards for anyone who'd be interested in a more complete package of analytic publications. Working outside the traditional area of our profession, I've grown accustomed to the time-honored corpus of actuarial jokes. I was a bit surprised today, however, to note how many members of the Casualty Actuarial Society seem to know inversions involving life actuaries. I can only suppose that as with nuclear physics, there is no limit to the subdivisibility, and at this very moment, some life actuaries relating an amusing anecdote involving two zebras and a defined benefit pension specialist. Despite the often heartless humor we visit upon the life profession, I would like to beg the indulgence of our colleagues



and borrow their classification scheme for risk. It will, I hope, provide a useful framework for discussing Moody's credit rating system. This will allow us to relate the systemic and cyclical stresses felt by insurers to an evaluation of their financial health. I will skip freely between the life and P&C industries and even into banking, because we cannot ignore the changing structure of the financial markets. First, the framework.

The Society of Actuaries has set up four broad categories of risks; with characteristic whimsy they have labeled these C1, C2, C3, and C4. The first is the asset value risk. This addresses the potential decrease in value for credit reasons of any asset a company might hold, for example, a bond or a mortgage which might default. A market scare might also make a junk bond difficult to sell. Even if it's not in default this would cause a loss of value for a credit related reason as well. An important asset for many insurance companies is the reinsurance recoverable. This does not appear on the statutory balance sheet as an asset, but Moody's will gross up losses in calculating leverage. Moody's extends the consideration of the C1 risk beyond traditional investment securities to insurance instruments such as reinsurance treaties and premium notes taken under cashflow programs.

The second broad area of risk, C2, involves the insurance process. This is the risk that assumptions regarding the pricing of insurance will be proven incorrect. The term parameter risk is sometimes used. A distinction here is that the risk is

selecting the wrong frequency, for example, for auto claims. If we have the right frequency, but a run of bad luck simply draws too many losses at Moody's we call that life.

The third category covers the risks associated with movements and interest rates. Yield assumptions used in pricing may not be achieved. Coupons reinvested at lower rates may not accumulate to target values. There may be early calls on an insurer caused by a catastrophe loss on a P&C side, or pyralapses on the life side. This would require the sale of assets at below book value. Finally, under particular stress liquidity may evaporate. The short-term financial markets are especially confident-sensitive. An event which suddenly increases a company's need for cash may perversely work to deny access to that cash.

The last category is something of a catch-all. The C4 heading encompasses all the risks common to any business enterprise. These include changes in demographics, law, social expectations, and technology. One factor which is extremely difficult to assess is regulatory behavior. There is a dynamic interplay between the interests of the policyholders and the bond holders, for example. The most important aspect of the C4 risk, however, is management's response to these changes. Using this framework for risks, we can observe several interesting areas of interaction. When a firm reinsures, it swaps insurance, or C2 risk, for asset or C1 risk. It is protected from an excess of claims, but takes on the risk of reinsurer insolvency. This changes the texture of a company's risk profile and puts new

calls on management talent. The size and potential lack of quality of reinsurance balances causes Moody's to adjust leverage as we described earlier. A similar interaction occurs with financial guaranty insurance. Here, the C2, or insurance risk, is just exactly the C1 or asset risk. Of immediate concern is the potential correlation of risks on the asset side with the liability side. This is analogous to the pressure Japanese property insurers feel to invest overseas. Otherwise, in the event of an earthquake, claims would have to be paid out of the stocks and bonds of just those claimants. To compound the issue, imagine a firm which has a significant financial guarantee exposure, which owns corporate bonds and which reinsures heavily. The potential for positive correlation of adverse circumstances is enormous. Along the same lines, insurers today are frequently letting the C4 or business risk overlap too far with the C2 or insurance risk. That is, many of the business risks faced by non-insurance firms are just those that constitute the insurance process for insurers. This is, of course, as it should be with insurance smoothing many of the physical and legal hazards which non-insurers face. With the D&O line, risks which ought to remain with the equity holders are carried by the insurance industry. The power of the scheme can be found in several analogies outside insurance. The commercial banks are great users of reinsurance techniques. For them, one of their process risks is, in fact, the C3 interest rate risk. They engage in interest rate swaps, a form of excess reinsurance. To share another one of their process risks, the loan credit risk,

they engage in loan participations. This, however, is more like a line slip than a pro rata treaty; they manage to avoid intermediation hazard. The potential for interaction of these various categories is the focus of much study at Moody's. Within this framework for viewing risks in the insurance industry, the rating process at Moody's can be described succinctly. To paraphrase the old real estate saying: "the three most important elements in the credit rating are management, management, and management." In actuarial terms, this would be C<sup>4</sup> cubed. I cannot overemphasize this point. We have a broad array of very sophisticated financial models at Moody's. We monitor the risk to firms direct and indirect. We are acutely aware of the areas of correlation. In the final analysis, however, it is our understanding of management's awareness of the risk and their capacity to handle them upon which the rating judgments are made.

There's an important difference in perspective between a closed block of assets and liabilities and an actively managed pool. When we rate a pool, such as a collateralized mortgage obligation or a securitized receivables, a scenario attesting approach is appropriate. Reliance on models, however, is too short sighted when the challenge is a firm face have yet to occur. It is quite likely that a large number of insurers would run off to the good if a depression started next week. A larger number, a larger number than the number which have Moody's "AAA". One thing of which I am quite sure is that I am not smart enough to predict the form stresses will take in the future. That is why the key characteristic is flexibility.

Management must have the capacity to respond to the unpredictable, yet inevitable dangers they will face. The view of the rating is prospective. Our obligation is to holders of instruments many years into the future. This applies to bond holders, owners of preferred stock, beneficiaries and claimants of insurers, in fact, anyone who has a fixed financial claim on a firm. The intent at Moody's is to provide stable ratings, ratings which look through the economic and industry cycles to the underlying strengths of a firm. A corollary of the long-term nature of the ratings is that they ought to be unspectacular. We do not aim at surprising the market, but rather intent to be a reliable measure of inherent credit risks. Having stressed the basis of our ratings, it may be worthwhile to touch on several of the ways we evaluate a company.

Central to the process is meeting with the company. But where this is not possible, our broad corporate knowledge of both the insurance industry and the financial markets, permit us to make what we believe are appropriately conservative estimates. It will be in keeping with my promise to be unspectacular, if I reveal that all the usual operating and financial measures one might expect of an analysis are reviewed. The difference, I believe, is in the perspective. As we noted, we are looking for an understanding of management's capabilities with respect to particular challenges they face and as a guide to their future behavior. On the topic of leverage, it may be noteworthy to say that Moody's takes a continuum. In terms of leverage, we include insurance, financial, and operating sectors in this continuum.

We attempt to make tradeoffs among the various types of burdens a firm shoulders and to weigh each burden properly.

Financial leverage is generally measured by such ratios as debt to equity. Adjustments are made for off-balance sheet exposures like asset sales with recourse and for guarantees of subsidiaries debts. Insurance leverage, historically measured by written-to-surplus, is probably better gauged by reserves-to-surplus. This reserves-to-surplus ratio is actually a form of actuaries' E&O Margin. Line of business, discounting, and the estimate adequacy of loss reserves, temper the measurement. While we will gross up loss reserves for reinsurance, the life insurers, for example, enjoy a reduction of leverage for the policy loan asset. This item is really more of a contra-liability or a pre-payment of benefits.

Operating leverage represents the fixed operating commitments a company carries. To the extent the firm has fixed rather than variable costs, it can increase its profitability by raising its thru-put. Conversely, unused origination capacity represents a drain on resources. For an insurer, the ideal plant might be a salaried workforce fully cross-trained in life and property/casualty, risk management and pension consulting, and registered as security advisors. Unfortunately, she was hired by Walton as a permanent fixture in Fantasyland. Real life is more likely to furnish us with a highly specialized agency system which must be painfully supported in the down cycles so that they are available in the upcycle to balloon acquisition costs. Pulling together the elements of leverage is really more an art

than a science. Capital charges for the various categories of assets, liabilities, policy limits and guarantees at least provide an initial index to compare companies. Moody's views on the trends and developments in the market allow the rewards and hazards of operating leverage to be factored in as well.

Among the trends and current developments are items disturbing to the analytic community; others may be surprisingly irrelevant. Tax reform, for example, is not as important in its dollar burden to the industry as it may be in setting new benchmarks for the buy versus self-insurer issue. This spread of risk retention groups is simply another hole in the cheese cloth called capital barriers to entry. Given the apparent ease with which capital can enter, the new battle for market share will, I believe, shape up as a struggle for investor dollars rather than a classic fight over insurance premiums. Moody's already has observed firms making pre-emptive financings to grab their share of the capital market pie. This, in an attempt to choke off competition at the root. Longer-term, the key issues for the industry will certainly include changes in distribution systems. The advantages of leverage to a direct marketing combined with the trend to unbundle services will change the fundamental structure of the industry. Risk management, loss adjustment, and engineering will be separated from ever more sophisticated risk financing techniques.

Finally, the sign most often read as negative, is, I believe, a cause for hope. The superficially disheartening level of insurer failures is in truth a sign of health and renewal when

viewed against the backdrop of new company formations. Start-ups, joint ventures, fresh capacity, all point to the underlying vitality of the industry. I am privileged to be able to observe these developments as a Moody's analyst, and would urge you all to make use of the tools of the actuarial profession to make that renewal come about.

ROBERT BAILEY: Thank you very much Bob. Our next speaker is Bob Brian, who has been a fellow of the Casualty Actuarial Society since 1970. Bob is a general partner of Conning & Co., the leading stockbroker that specializes in insurance stocks. Bob has been there since 1973, and he is currently in charge of the consulting and research division, which is the division that evaluates insurance companies. Bob Brian.

BOB BRIAN: It will be difficult to describe to you Conning's rating service of property/casualty companies in the time allotted, since we don't have one. I think I've been asked to speak not so much because we have a rating system, but because we're known for many of the different kinds of valuations that we do. As many of you know, Conning & Co. is essentially a stockbrokerage firm that has branched out into consulting, research, money management, venture capital funds.

In my role as director of the consulting division, we have had several experiences in looking at insurance companies from a solvency point of view, on a private consulting basis. I think this began perhaps five years ago when a risk manager of a large



company in New York called us and said they were doing business with fifty different property/casualty companies and what could we do for them from the point of view of looking at them from a long-term claims paying ability. That's the question we get -- who is going to be around to pay the claims twenty years from now for the policies that we're writing today? How would we have known back in the late 70's that some of the companies that went under in the 80's were really going to go under? Most of our consulting clients along these lines are mostly the large insurance brokers. Right behind them are some of the risk managers of some of the larger firms.

Actually, at Conning & Co. we're currently not interested in coming out with a wide-spread, off-the-shelf, rating service that you could subscribe to. That's an endeavor that we haven't undertaken. But perhaps I could tell you about the things that we have done.

We're interested in helping out in the solvency area, helping out in the evaluation of companies' financial strength. But we only want to be part of the activity and at this point to not have a rating system. What we did originally when we got these calls was to confine our analysis to the statutory annual statements. I know from having talked to people in this group for years, you've always been telling me to be careful of what you garner out of the annual statements. If you're out there in the world that I am, we don't have much more than the annual statement to go by. I still maintain that we can gather quite a bit of data from it. What we originally did was to run these

companies through just dozens and dozens of statistical tests that any of you could dream up, and just let the companies fall out one-by-one, test-by-test, and just to see what kind of profiles you come up with. In looking back, I can say that we were amazing successful in nothing but arranging the companies in the order in which they seemed to do on those simple tests. Some very interesting profiles came out of it and, of course, the service was limited to that.

Since that time we've got a little bit more sophisticated in looking at the annual statement, and we now actually put the statements into our computers. We run off an analysis book on each company, and when the thing comes out of the computer it's close to 300 pages long for each company. Essentially, we've broken the analysis up into perhaps ten sections. The first section being the reinsurance section, which gives you an idea of how important we think that the amount of reinsurance and the quality of reinsurance is. We have a premium section that essentially is trying to get at the book of business. Is this company writing property insurance or long-tail liability? What mix of business is it writing? We have a liability section which, of course, is getting at the loss reserves and the reinsurance. I might add who we have working on this. It's on a part-time basis, but three of us are fellows of the Casualty Actuarial Society. Another is a certified financial analyst, another is an ex-AIG and travels as underwriter, another is an ex-Gen Re underwriter, and two entry-level analysts. We have this team that meets on all of these companies, and we don't

leave it up to any one person to look at a company.

The next chapter we have is underwriting and, of course, we're getting at underwriting results. Another section on assets, and we're coming up with some interesting comparisons of assets and liabilities. We're fortunate that we manage the investment portfolios of about ten insurance companies, and we get some interesting input there on the matching of assets and liabilities and some good investment information. We have a cashflow section, investment income section, miscellaneous section, and then we wrap it up in an overall section. Each section is many pages long, has many different tests in it. We came up with the concept of risk factors by section. So each page and each section is loaded with risk factors, and we could spend a lot of time just talking about risk factors. Essentially, what we're doing is comparing each company with the industry, and we're looking at a company's relative risk or risk relative to the industry. So far, most of the work we've done is on pretty standard primary companies, so we have our own little industry model on that. Some day, we'll probably have a reinsurance model and excess surplus lines model, and what have you. We just haven't gotten into that yet. A company with a risk factor of eight on the loss reserve section we would feel represents a significant amount of risk, greater than industry averages on that one test, and a risk factor of perhaps two or three would indicate to us that a company has less risk than the industry.

When you finally have this summary page full of risk factors

and you have to come up with an answer, that's the hard part. I assure that we don't just take an average, sort of like a medical exam, you can look good all over and have one very serious problem and all of a sudden your overall risk factor might be very high. We look at an insurance company the same way. That final pick of a risk factor gets very, very judgmental. I heard someone say earlier that they estimated that their work was 75% statistical and 25% judgmental. I would say ours is too, and maybe even more emphasis on the judgmental.

To date we've done this on, perhaps sixty or seventy companies. We're trying to keep it a manageable level, and we're not trying to do the whole industry. We would also agree that solvency is an ongoing subject. It's not something you do this year, or at this point in the cycle and forget about it. We at Conning believe that many of the problems of the last underwriting cycle are not behind us. There are still some underestimated reinsurance recoverables in the industry. We think that some of the back years in the liability lines still are developing upward. This is despite the fact that the industry seems to show a pretty good accident year combined ratio. We think that the solvency surveillance is going to be very important, especially if it's true that rates in the marketplace are being cut again. Our surveys of agents and brokers tell us that there is some pretty serious rate cutting going on in the property lines and some modest rate cutting going on in the casualty lines. It seems as though every month we do our survey, which is just a matter of talking to a lot of people,

the rate cutting stories get stronger and stronger. If the industry is in a period of price differentiation, after having walloped the insurers with rate increases for the past two or three years, and now you have a very natural price differentiation mode, I guess that's okay. If the industry is getting into another aggressive pricing cycle, we would be somewhat concerned about the solvency of some companies. We see some companies in a much stronger financial position now going into this cycle than others. Others are just barely licking their wounds and coming out of the past cycle. Because of that they did not really benefit from the profitable business that's been written over the past couple of years, because they didn't have the surplus to do it. They get hurt twice.

I might comment that if you've seen any charts of the relative performance of insurance stocks since the first of the year, the charts look like a ski slope. The insurance stocks have significantly under-performed the other indices, and the main reason is investors see the rate being cut again. They see the growth in premiums slowing down, and despite the fact that we tell them that there are still good earnings ahead in 1987, good earnings in 1988, maybe even 1989. For some companies, the investors don't seem that interested. They see the rate cycle beginning again, and they're essentially saying to us, well, give us a call in a couple of years, and we'll be back.

In closing, I guess I would urge you as actuaries to do what you can in your own companies and in your own assignments to bring pricing responsibility to the industry so that we don't get

into another all out pricing war. Should that happen, this whole business of solvency wouldn't be quite the problem that it is. And for those of us who are doing it, this would be a much happier exercise than it's been over the last couple of years. Thank you.

ROBERT BAILEY: Thank you Bob. The fifth speaker on the panel will be a representative of the Reinsurance and Insurance Brokers. I will take that part. Because reinsurance is not covered by the insurance guaranty funds run by the states, not a single one covers reinsurance, the pain and anguish among companies who have purchased reinsurance has been severe. The demand for more and better information about security of reinsurers has been tremendous. As a result, all of the major reinsurance brokers are providing an informational service to their clients, to the ceding companies. Likewise, the major insurance brokers are also providing informational services to their major plans.

I would like to just briefly outline the kind of information that E.W. Blanch provides to our clients as an example of what many of the reinsurance and insurance brokers are providing to their clients. First of all, we view the information about insurance solvency as a continuous effort, not an annual cycle. We update our reports for each of our reinsurers probably at least eight times a year as quarterly information and other information, stock offerings or whatever, come to play.

One major category of information that we provide is ratings

-- ratings of everybody else. For domestic reinsurers, we provide five sets of ratings for each company. We provide the NAIC early warning score and ratios. That's a widely used indicator. We provide the A.M. Best ratings for five years. We provide the Standard & Poor's and Moody's ratings. If the insurance company itself does not have a claims paying ability rating from Standard & Poor or Moody's, we show the rating for the senior debt of the insurance company or its parent. Finally, we show the stock market rating. We show the number of shares outstanding, the current price per share, and the range in the that price over the past year. If you multiply the price per share times the number of shares, that gives a very interesting evaluation of the stock market for that insurance company or its parent, whichever is traded.

We would like to provide a sixth rating of the Insurance Solvency International Rating. But as of this moment we have not yet received permission to do so. We subscribe to their ratings and find them very helpful. For international insurance companies domiciled outside of the U.S. we provide four ratings. We don't have the NAIC score, and we don't have an A.M. Best rating. In place of the NAIC early warning system we use the Insurance Solvency International ratio system. There are eleven ratios, just like the NAIC, and they have a pass/fail mark for each one, and they count how many passes and fails there are. We provide that score. On some foreign companies there is a Standard & Poor's rating, and we provide that. In addition, we provide our own rating which we call a E.W. Blanch "rank." We

rank all of the reinsurance markets - 150 of them that we do business with into three ranks; roughly 1/3 in each rank.

Finally, the fourth rating that we provide is the stock market rating. The number of shares, the current price, the range. As I said, for foreign companies, this is a much more timely indicator than most of the financial statements that we get and is much less distorted than the statutory accounting rules that are prescribed in many foreign countries. In addition to these ratings -- in effect what we're providing is a convenience service, and trying to provide as many indicators as we can to our client so that if any of these rating indicators indicate a potential problem, we can look into it further and try to find out what is brewing.

The next piece of information that we provide is a page of statistical information -- five years of data up to the latest quarter, showing key data and key ratios.

The third piece that we provide, which is probably the most important, is a narrative report that focuses on four major areas. The first one being ownership, which we regard that and management as being the most important areas. Under ownership, after detailing who the owners are and how much they own and how big the owners are, what we're looking for is commitment. What is the commitment? What is the capability to help the insurance company if it gets into trouble? Of course, if the insurance company has a billion dollars in surplus, then we don't worry so much about who the owner is, but many of them do not have that much in surplus.



The second area that we look at is management -- the people. We're interested in how capable they are in the field in which they are engaged. What is their track record, their experience, their performance? And secondly, that vague question -- how reliable are they?

The third area that we look at is business. What business are they in? How do they do it? How long have they been at it?

Fourthly, performance. How well have they done? How strong are they now?

With that you've had five of us, representing five different areas which are providing a service of ratings and security information about insurance companies to other people. It's obviously a very dynamic field; there have been a lot of problems. There's a strong demand for more and better service in that area. You have seen some of the people who are working hard to improve those services. We do have a few minutes for questions. So at this time we would welcome any questions that you might have for any of the panel members.

■QUESTION, INAUDIBLE■

ROBERT BAILEY: The answer is obviously yes. Does anyone want to speak to that? For example, I'm aware in the case of Mission, while I was responsible for an A+ and an A on Mission, Moody's had a much more dismal rating on Mission. I'm not familiar with what Standard & Poor's rating was on Mission a year or two before it went under.

LAWRENCE HAYES: I can comment that it was within that period of time a single A, which remains a little above the median of our scale.

ROBERT BAILEY: Michael?

MICHAEL MIRON: Bob, I'd like to tell a story that really launched me into the American market was Protective National, an Omaha based company that passed thirty three out of thirty five of the ratios I think that Bob was working on at the time. It passed all of it's IRA tests and got an A or an A+ rating. The real problem was they had ceded off about 90% of their business and the IRA's test were based on net rather than gross. More important, and it goes back to what Bob Bryant was speaking about, the weakness can be so much in one little area it distorts everything. Those two areas that failed tests had to do with ceded reinsurance. But more important than any of the numerical tests was who those reinsurers were. It happened that at that time I was in London and had gotten a copy of Protective National's Schedule F before I left. I walked it around London. There's really some pretty good security people; they've been at it longer in London, and they know the international market. I must have shown it to ten or eleven people, and they all laughed at this company getting an A, because the quality of the names was so bad. I think that it's very important that if you look at a company , it's a cop out to say, "well it's okay

except for this international reinsurance that we don't know about." That's not really not doing the job at all. At least in the case of John Gardner in London, and myself, we can look at an annual statement of any American company and just go down the line of its reinsurers and form a judgment. What's really important is who they are. When Delta-America went under, it had this terrible, it was a 3rd T or American reinsurer and a third T reinsurance from the far east in South America, where they say that dogs that go on the curb get fleas. You can tell a lot about a company's book of business by who its reinsurers are. You don't reinsure garbage business with Triple-A reinsurers; they're too smart to take it. The name and identity of the reinsurer is very important from my standpoint of knowing what's going on.

ROBERT ARVANITIS: I guess our perspective is a bit on the conservative side because in the fixed-income markets a win is you get the coupon, and a loss is you lose the principal. And given the biased nature of that bet, we must be a bit more conservative I suppose.

LAWRENCE HAYES: One of the reasons we don't have more examples is that really not too concerned or interested about what our competitors are doing in the way of coming up with their ratings or even what the market out there is thinking. There's so much in the way of rumor to begin with, that we have a hard enough time dealing with the facts and the information at our

disposal, and once we've analyzed those, that's the best we can do, and we're comfortable with that decision. We really don't try to look around and see what is popular opinion.

QUESTION: You mentioned the commitment of ownership of reinsurers. How do you go about determining what that commitment is, in particular, in the case of non-insurance ownership?

LAWRENCE HAYES: I think there are two basic elements from our perspective. One is, you need to meet with the company as the owner and talk to them directly and ask them that question, etc. Notwithstanding whatever they say, there's one more acid test that has to be looked at. That is, is the company in question, whether it be an insurance company or a non-insurance company, profitable? Not just every other year, but consistently. Nobody disbands or walks away from a profitable company. Nobody in the long-run is going to indefinitely support a company that's not profitable. No matter what somebody tells us about support, if the subsidiary in question is marginally profitable or less so, we're not really going to believe it and won't act on really their best intentions. I think one has to look at, from our point of view, those two elements.

BOB ARVANITIS: As I guess we've all stressed today, that's a very subjective element. There are ways for us to try and gauge the commitment and that's to look at past behavior. It is, again, subjective. But we do have examples where very

unprofitable operations were let drop. And other examples where very unprofitable operations were supported because it was management's feeling that they had a commitment and needed to do whatever was required. So we do find both examples in the marketplace. Of course, many commissioners won't let people walk away from unprofitable operations, but no commissioner could require the sort of effort we've seen in one finance company in particular that really did pony up what was needed to make good on its insurance operation subsidiary's needs.

MICHAEL MIRON: I was going to say it's really an actuarial problem. First, there are two parts to sponsorship. The ability to put in more money if needed. And secondly, the willingness. Ability is pretty much the same as rating of a company; you can make an objective judgment. Willingness is more difficult. You can look at past commitment. The problem that we've had in the last two years, and I'll name the constellation, Mentor, Union Indemnity, Delta America, and Pinetop U.S., all of them had wealthy parents. There was no question they might have put in the money. It was an actuarial problem in each of these companies in determining how big the hole was. If someone had told the parent the hole is \$50 million or \$100 million and it's payable over so many years, they might have put in the money. I think in each of these cases they were involved in long-tail liability business, which is still unsolved in America, and still the problem. And the parents didn't know how much the hole was. We had the laws on directors making good on open-bottom.

That's really where I think the problem is.

ROBERT BAILEY: I can add a little bit there. In the last couple of years both Pru-Re, and Ment-Re had a B+. And in London, some of the reinsurance markets there had a hard time understanding why the Prudential and the Metropolitan reinsurance subsidiaries were only rated B+, since they were treated in the marketplace as being stronger. And that treatment reflected the marketplaces assigning some sort of backup from the commitment from the parent. The commitment was not formal. How do you measure commitment? There are three key ways to measure commitment. Is it the same name? What is the cost of allowing the subsidiary to go under? If it has the same name, if it's 100% owned, and if it's in the same business, then there is material cost to allow the subsidiary to go under because it would affect the business of the parent. If it has a different name, if it's not wholly owned, and if the parent is not in the insurance business, then obviously the commitment is weaker because the penalties on the parent are less.

MICHAEL MIRON: I would like to add that I believe I gave Pru and Ment Re A's last year, following almost your same reasoning. Plus Pru-Re, if I recall, was almost located physically inside the Rock in Newark. I just couldn't conceive anything could let it happen.

LAWRENCE HAYES: I just want to add, in the package of

material that is here, the very last page does include a diagram as to Standard & Poor's position on this very issue, which is basically consistent with the points that the other panel are raising.

ROBERT BAILEY: They would make it so much easier if the parents would give us a written guaranty.

■QUESTION, INAUDIBLE■

ROBERT A. BAILEY: The question had to do with Blanch's ranks, 1, 2, and 3 for the foreign reinsurance markets that we do business with. How do they compare with the ratings of Standard & Poor's or Best's.

■COMMENT, INAUDIBLE■

LAWRENCE A. HAYES: Well you're right in that the Standard & Poor's rating for claims paying ability is voluntary and therefore really does work to the extent of creating a sort of positive selection process in almost every country in which we have a rating. With respect to the United States, both life and non-life, the vast majority of the ratings are in the triple-A, double-A levels. In the property casualty are there is a smattering of single-A's. This is sort of expected from our point of view, and we expect over time that a broader distribution will become evident through market forces

ultimately.

ROBERT A. BAILEY: I want to thank the panel for taking time out during the busiest time of the year to come here and spend this hour with us to discuss this subject.



## TWO NEW TEXTBOOK CHAPTERS

In the first edition of the Actuarial Forum we published the draft textbook chapter "Credibility." In this issue we include two more chapters.

The first chapter is by Charles McClenahan and is titled "Principles Of Ratemaking." Charlie has published papers in the *Proceedings*. He is a former Board member and has participated in many committees.

The second chapter is "Special Issues" by Steve D'Arcy. Steve has also published several papers in the *Proceedings* and has served on several committees.

It is very important that CAS members review these chapters and provide comments to the authors. The Textbook Steering Committee, under the leadership of Irene Bass, has the responsibility for assuring that each chapter addresses its subject matter properly in a way understandable to beginning level actuaries. Each CAS member has the responsibility of providing input to the authors and an opinion as to how well they have succeeded. Address your comments directly to the authors.

We intend to publish draft copies of additional chapters in future issues of the Actuarial Forum. The textbook should be published sometime in 1989.



## Chapter 1

### PRINCIPLES OF RATEMAKING

by Charles L. McClenahan, FCAS, ASA, MAAA

#### Introduction

##### **The Concept of Manual Ratemaking**

From the earliest days of marine insurance, premium charges have been based upon specific characteristics of the individual risk being priced. Lloyd's of London based early hull rates in part upon the design and protection of each specific ship, and the classification assigned to each vessel was written down in a book for use by the individual underwriters. Eighteenth century dwelling fire insurance rates in the U.S. were based upon roof type and basic construction. While these early rate manuals were meant to provide general guidance to the underwriters in setting the specific rates, rather than the actual rates to be charged, they contained many of the elements associated with present-day property and liability rate manuals including recognition of differing loss costs between classifications, expense loading, and provision for adverse deviation and profit.

One of the most persistent misconceptions associated with property and liability insurance is the level of accuracy which actuaries are believed to achieve in the assessment of individual loss propensity. Over the years, as

the doctrine of *caveat emptor* has been eroded and insurance risks have become increasingly complex, rate manuals have evolved to the point that, for many lines of insurance, they provide the exact premium to be charged for providing a specific coverage to a specific risk for a specific period. It is important, however, not to confuse the level of precision inherent in the rate manual with the level of accuracy. The latter will be judged in the cold light of actual loss experience. No matter how refined the classification and rating process may become, manual rates are still *estimates of average costs* based upon a combination of statistical methods and professional judgment.

This chapter will deal with the basic actuarial methods and assumptions underlying the development of manual rates. While a complete treatment of the subject might well fill several books, the key elements will be covered to such an extent that the reader of this chapter will gain an understanding of the basic actuarial concepts and techniques involved in the review and analysis of manual rates for property and liability coverages.

### **Basic Terminology**

While ratemaking is neither pure science nor pure art, both the scientific and artistic elements of the subject demand the use of precise language. Property and casualty insurance is a complicated business which can be best represented and understood in a technical financial context. Many of the misconceptions about property and liability insurance can be directly attributed to either the failure to use precise terminology, or the failure to

understand the terminology in precise terms. This section will introduce some definitions of some of the more important terms used by casualty actuaries.

### *Exposure*

The basic rating unit underlying an insurance premium is called an exposure. The unit of exposure will vary based upon the characteristics of the insurance coverage involved. For automobile insurance, one automobile insured for a period of twelve months is a car year. A single policy providing coverage on three automobiles for a six month term would involve 1.5 car years. The most commonly used exposure statistics are **written exposures**, those units of exposures on policies written during the period in question, **earned exposures**, the exposure units actually exposed to loss during the period, and **in-force exposures**, the exposure units exposed to loss at a given point in time. In order to illustrate these three statistics, consider the following four twelve-month, single-car automobile policies:

Effective Date	Written Exposure		Earned Exposure		In-Force Exposure 12/31/87
	1987	1988	1987	1988	
1/1/87	1.00	0.00	1.00	0.00	0.00
4/1/87	1.00	0.00	0.75	0.25	1.00
7/1/87	1.00	0.00	0.50	0.50	1.00
10/1/87	1.00	0.00	0.25	0.75	1.00
Total	4.00	0.00	2.00	2.00	3.00

Note that the in-force exposure counts a full car year for each twelve-month policy in force at the end of 12/31/87, regardless of the length of the remaining term.

The specific exposure unit used for a given type of insurance depends upon several factors including: reasonableness; ease of determination; responsiveness to change; and historical practice.

**Reasonableness** - it is obvious that the exposure unit should be a reasonable measure of the exposure to loss. While every exposure unit definition represents some level of compromise of this principle, for example a 1988 Rolls Royce and a 1978 Chevrolet might each represent a car year exposure, the selected measure should directly relate to loss potential to the extent possible.

**Ease of Determination** - the most reasonable and responsive exposure definition is of no use if it cannot be accurately determined. While the most appropriate exposure for products liability insurance might be the number of products currently in use, this would generally be impossible to determine. If an exposure base is not subject to determination, then an insurer can never be assured of receiving the proper premium for the actual exposure.

**Responsiveness to Change** - an exposure unit which reflects changes in the exposure to loss is preferable to one which does not. The exposure unit for workers' compensation insurance, which provides benefits which are keyed to average wage

levels, is payroll. This is obviously preferable to number of employees, for example, as the payroll will change with the prevailing wage levels.

**Historical Practice** - where a significant body of historical exposure data is available, any change in the exposure base would render the prior history unusable. Since ratemaking generally depends upon the review of past statistical indications, exposure bases are rarely changed once they have been established.

### *Claim*

A claim is a demand for payment by an insured or allegedly injured third party under the terms and conditions of an insurance contract. The individual making the claim is the claimant, and there can be multiple claimants within a single claim. Claim statistics are key elements in the ratemaking process. Generally insurers maintain claim data based upon **accident date** - the date of the occurrence which gave rise to the claim, and **report date** - the date the insurer receives notice of the claim. Claim data can then be aggregated based upon these dates. For example, the total of all claims with accident dates during 1988 is the **accident year 1988 claim count**.

*Frequency*

Because the number of claims is directly related to the number of exposures, actuaries express claim incidence in terms of **frequency** per exposure unit.

$$F_k = \frac{kC}{E} \quad (1)$$

Where:  $F_k$  = frequency per k exposure units  
 $k$  = scale factor  
 $C$  = claim count  
 $E$  = exposure units

For example, if we earned 32,458 car years of exposure during 1988 and we incur 814 claims with 1988 accident dates, then the 1988 accident year claim frequency per 1,000 earned exposures is 25.08 as follows:

$$F_{1000} = \frac{1000(814)}{32,458} = 25.08$$

Where the context is established by either data or previous exposition it might be appropriate to simply refer to this as the *frequency*. In general, however, the need for precision would require that the more specific language *accident year frequency per 1,000 earned car years* be used.

*Losses and Loss Adjustment Expenses*

Amounts paid or payable to claimants under the terms of insurance policies are referred to as losses. Paid losses are those losses for a particular period



which have actually been paid to claimants. Where there is an expectation that a payment will be made in the future, a claim will have an associated case reserve representing the estimated amount of that payment. The sum of all paid losses and case reserves for a specific accident year at a specific point in time is known as the **accident year case-incurred losses**. The term *case-incurred* is used to distinguish this statistic from **ultimate incurred losses** which include losses which have not yet been reported to the insurance company as of the case-incurred evaluation date.

Over time, as more losses are paid and more information becomes available about unpaid claims, accident year case-incurred losses will tend to approach their ultimate value. Generally, because of the reporting of additional claims which were not included in earlier evaluations, accident year case-incurred losses tend to increase over time. In order to keep track of the individual evaluations of case-incurred losses for an accident year, actuaries use the concept of the **accident year age**. The accident year age is generally expressed in months. By convention, the accident year is age 12 months at the end of the last day of the accident year. Therefore, the 1987 accident year evaluated as of 6/30/88 would be referred to as the age 18 evaluation of the 1987 accident year.

Figure 1 represents a graphical interpretation of a typical case-incurred loss development pattern - in this case for automobile liability.

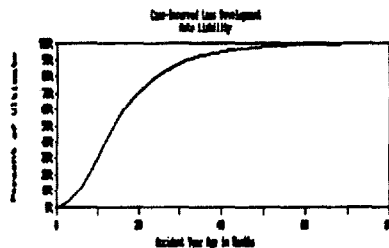


Figure 1

Insurance company expenses associated with the settlement of claims, as opposed to the marketing, investment or general administrative operations, are referred to as **loss adjustment expenses**. Those loss adjustment expenses which can be directly related to a specific claim are called **allocated loss adjustment expenses** and those which cannot are called **unallocated loss adjustment expenses**.

### *Severity*

Average loss per claim is called **severity** by actuaries. Severities can be on a **pure loss** basis, excluding all loss adjustment expenses, or they can include allocated or total loss adjustment expenses. The loss component can be paid, case-incurred or projected ultimate and the claims component can be reported, paid, closed, or projected ultimate. This profusion of available options again requires that the actuary be precise in the references to the components. Note the differences between *accident year case-incurred loss severity per reported claim* and *report year paid loss and allocated severity per closed claim*. However the loss and claim components are defined, the formula for severity is simply:

$$S = \frac{L}{C} \quad (2)$$

Where:    **S** = severity  
              **L** = losses  
              **C** = claim count

*Pure Premium*

Another important statistic is the average loss per unit of exposure or the pure premium. The reader will by now appreciate the need for precise component definition either in terminology or through context, so the various options will not be recited. The formula for the pure premium is:

$$P = \frac{L}{E} \quad (3)$$

Where: **P** = pure premium  
**L** = losses  
**E** = exposure units

Note that the pure premium can also be expressed as:

$$P = \frac{C}{E} \times \frac{L}{C}$$

Where: **C** = claim count

Or, where frequency is per unit of exposure:

$$P = F_1 \times S \quad (4)$$

In other words, *pure premium equals the product of frequency per unit of exposure and severity.*

*Expense, Profit and Contingencies*

In order to determine the price for a specific insurance coverage, appropriate provisions must be made for expenses (other than any loss adjustment expenses included in the pure premium) and profit. Because insurance pricing involves the estimation of the cost of future contingencies, the profit provision is generally termed the **profit and contingencies loading**. This term properly reflects the fact that profits, if any, will be based upon actual results and not expectations or projections. While the topic of expenses will be treated in detail in chapter 7, for the purposes of this discussion we will distinguish between **fixed expenses** per unit of exposure, those expenses which do not depend upon premium, and **variable expenses** which vary directly with price. This treatment gives rise to the following formula for the **rate per unit of exposure**:

$$R = \frac{P+F}{1-V-Q} \quad (5)$$

Where: **R** = rate per unit of exposure  
**P** = pure premium  
**F** = fixed expense per exposure  
**V** = variable expense factor  
**Q** = profit and contingencies factor

As an example, assume the following:

Loss and loss adjustment expense pure premium	\$75.00
Fixed expense per exposure	\$12.50
Variable expense factor	17.50%
Profit and contingencies factor	5.00%

The appropriate rate for this example would be calculated as follows:

$$\text{Rate} = \frac{\$75.00 + \$12.50}{1 - .175 - .050} = \$112.90$$

The individual components of the rate would therefore be as follows:

Pure premium	\$75.00
Fixed expenses	12.50
Variable expenses (\$112.90 x .175)	19.76
Profit and contingencies (\$112.90 x .050)	5.64
Total	<u>\$112.90</u>

### *Premium*

Application of the rate(s) to the individual exposures to be covered by an insurance policy produces the premium for that policy. If, in the above example, the unit of exposure is a commercial vehicle and we are rating a policy for 15 commercial vehicles, the premium would be calculated as follows:

$$\$112.90 \times 15 = \$1,693.50$$

Premium, like exposure, can be either *written*, *earned*, or *in-force*. If the policy in question was written for a twelve month term on 7/1/87 then that policy would have contributed the following amounts as of 12/31/87:

Calendar year 1987 written premium	\$1,693.50
Calendar year 1987 earned premium	846.75
12/31/87 premium in-force	\$1,693.50

### *Loss Ratio*

Probably the single most widely-used statistic in the analysis of insurance losses is the **loss ratio** or losses divided by premium. Again the need for precision cannot be overemphasized. There is a great difference between a loss ratio based upon paid losses as of accident year age 12 and written premium (termed an *age 12 accident year written-paid pure loss ratio*) and one which is based upon ultimate incurred loss and loss adjustment expenses and earned premium (*ultimate accident year earned-incurred loss and loss adjustment expense ratio*) although either can be properly referred to as a loss ratio.

### **The Goal of the Manual Ratemaking Process**

Broadly stated, the goal of the ratemaking process is to determine rates which will, when applied to the exposures underlying the risks being written, provide sufficient funds to pay expected losses and expenses; maintain an adequate margin for adverse deviation; and produce a reasonable return on (any) funds provided by investors. In addition, manual rates are generally subject to regulatory review and, while detailed discussion of regulatory requirements is beyond the scope of this text, this review is often based upon the regulatory standard that *rates shall not be inadequate, excessive, or unfairly discriminatory between risks of like kind and quality.*

Adequately pricing a line of insurance involves substantial judgment. While actuaries are trained in mathematics and statistics, the actuarial process

underlying manual ratemaking also requires substantial understanding of the underwriting, economic, social and political factors which have in the past impacted the insurance results and will impact those results in the future.

If it were sufficient that manual rates be adequate to cover losses and expenses for some past period, then the pricing problem would be basically identical to the reserving problem which is the topic of chapter 3. But rates which were adequate in the past, or even those which are adequate today, may not be adequate when applied to policies providing insurance coverage into the future.

In discussing the goal of the ratemaking process from an actuarial perspective it is important to note that actuarially-determined rates are often subjected to review by others both within and outside the insurance company. Internally, there will generally be a review of the competitiveness of the rate levels in the marketplace. Externally there is the previously mentioned regulatory review, occasionally involving the political acceptability of the proposed rates. While the actuary may be directly involved in both internal and external discussions relating to these reviews, it is the actuary's primary responsibility to recommend rates which can be reasonably expected to be adequate over the period in which they are to be used.

### Structure of the Rating Plan

Up to this point the discussion of manual rates has related to the concept of an identified unit of exposure. In practice, manual rates are based upon a number of factors in addition to the basic exposure unit. For example, the elements involved in the rating of a single private passenger automobile insurance policy might include the following:

- Age of insured(s)
- Sex of insured(s)
- Marital status of insured(s)
- Prior driving record of insured(s)
- Annual mileage driven
- Primary use of vehicle(s)
- Make and model of vehicle(s)
- Age of vehicle(s)
- Garaging location of vehicle(s)

The structure of the various elements involved in the manual rating of a specific risk is known as the **rating plan**. Various specific elements are often referred to as **classifications**, **sub-classifications** or **rating factors**. Rating plans serve to allow the manual rating process to reflect identified differences in loss propensity. To fail to so reflect such known factors gives rise to two separate situations. Where a known positive characteristic is not reflected in the rating plan, the rate applied to risks possessing that positive characteristic will be too high. This would encourage the insuring of these risks to the partial or total exclusion of risks not possessing the positive characteristic, a practice referred to as **skimming the cream**. On the other hand, the failure to reflect a known negative characteristic will result in the application of a rate which is too low. If other companies are reflecting the



negative factor in their rating plans, the result will be a tendency towards insuring risks possessing the negative characteristic, a situation known as adverse selection.

Risk characteristics underlying a manual rating plan can be broadly identified as those generally impacting frequency and those generally impacting severity. Prior driving record is an example of a factor which has been demonstrated to correlate with frequency. Individuals with recent automobile accidents and traffic violations have, *as a class*, higher frequencies of future claims than do those individuals with no recent accidents or violations. Individuals driving high-powered sports cars have, *as a class*, higher frequencies than those driving family sedans. Annual mileage driven has an obvious impact on frequency.

On the severity side, large vehicles tend to do more damage in collisions than do small vehicles. A Rolls Royce costs more to repair than does a Chevrolet. A late model automobile is more valuable than a ten-year-old "clunker" and will therefore, *on average*, have a higher associated severity.

The above examples deal with private passenger automobile insurance; but other lines have identifiable risk characteristics as well. In commercial fire insurance, restaurants generally have a higher frequency than do clothing stores. The presence or absence of a sprinkler system will impact severity as will the value of the building and contents being insured. Workers' compensation statistics detail higher frequencies for manufacturing employees than for clerical workers. For every type of property and casualty

insurance there are identifiable factors which impact upon frequency and severity of losses.

The subject of risk classification will be discussed in detail in chapter 4. In addition the reflection of specific individual risk differences, as opposed to class differences, will be treated in chapter 2. For the purposes of this chapter it is sufficient to be aware of the existence of and need for a rating plan reflecting identifiable risk classification differences.

### **The Ratemaking Process**

In this section we will deal with the basic techniques used by casualty actuaries in the development of manual rates. The reader must bear in mind that this discussion will be general in nature - a complete discussion of the elements involved in a single complex line of insurance might require several hundred pages. Nevertheless, the key elements of manual ratemaking will be addressed to such an extent that a good understanding of the actuarial process of manual ratemaking will result.

### **Basic Manual Ratemaking Methods**

There are two basic approaches to addressing the problem of manual ratemaking; the pure premium method and the loss ratio method. We will

examine the mathematics underlying each method and then develop a relationship between the two.

#### *Pure Premium Method*

The pure premium method develops indicated rates based upon formula (5).

$$R = \frac{P+F}{1-V-Q} \quad (5)$$

Where:

- R** = (indicated) rate per unit of exposure
- P** = pure premium
- F** = fixed expense per exposure
- V** = variable expense factor
- Q** = profit and contingencies factor

The pure premium used in the formula is based upon experience losses, which are trended projected ultimate losses (or losses and loss adjustment expenses) for the experience period under review, and the exposures earned during the experience period. The methods underlying the trending and projection of the losses will be discussed later in this chapter.

#### *Loss Ratio Method*

The loss ratio method develops indicated rate *changes* rather than indicated rates. Indicated rates are determined by application of an adjustment factor, the ratio of the experience loss ratio to a target loss ratio, to the current rates. The experience loss ratio is the ratio of the experience losses to the

**on-level earned premium** - the earned premium which would have resulted for the experience period had the current rates been in effect for the entire period. In mathematical terms the loss ratio method works as follows:

$$R = AR_0 \quad (6)$$

Where:

- R** = indicated rate
- R<sub>0</sub>** = current rate
- A** = adjustment factor
- = **W/T**
- W** = experience loss ratio
- T** = target loss ratio

Looking first at the target loss ratio:

$$T = \frac{1-V-Q}{1+G} \quad (7)$$

Where:

- V** = premium-related expense factor
- Q** = profit and contingencies factor
- G** = ratio of non-premium-related expenses to losses

And then the experience loss ratio:

$$W = \frac{L}{ER_0} \quad (8)$$

Where:  $L$  = experience losses  
 $E$  = experience period earned exposure  
 $R_0$  = current rate

Using (7) and (8) we can see:

$$\begin{aligned} A &= \frac{L/(ER_0)}{(1-V-Q)/(1+G)} \\ &= \frac{L(1+G)}{ER_0(1-V-Q)} \end{aligned} \quad (9)$$

and, substituting (9) into (6):

$$R = \frac{L(1+G)}{E(1-V-Q)} \quad (10)$$

*Relationship Between Pure Premium and Loss Ratio Methods*

It has been emphasized in this chapter that manual rates are *estimates*. Nevertheless, they generally represent *precise* estimates based upon reasonable and consistent assumptions. This being the case, we should be able to demonstrate that the pure premium and loss ratio methods will produce identical rates when applied to identical data and using consistent assumptions. This demonstration is quite simple. It starts with formula (10), the formula for the indicated rate under the loss ratio method:

$$R = \frac{L(1+G)}{E(1-V-Q)} \quad (10)$$

Now, the loss ratio method uses experience losses while the pure premium method is based upon experience pure premium. The relationship between the two comes from (3):

$$P = \frac{L}{E} \quad (3)$$

which can be expressed as:

$$L = EP$$

Also, the loss ratio method relates non-premium-related expenses to losses while the pure premium method uses exposures as the base for these expenses. The relationship can be expressed as follows:

$$\begin{aligned} G &= \frac{EF}{L} \\ &= \frac{F}{P} \end{aligned}$$

Substituting for L and G in formula (10) produces the following:

$$R = \frac{EP[1+(F/P)]}{E(1-V-Q)}$$

Or:

$$R = \frac{P+F}{1-V-Q} \quad (5)$$

Which is the formula for the indicated rate under the pure premium method.  
The equivalence of the two methods is therefore demonstrated.

*Selection of Appropriate Method*

Because the two methods can be expected to produce identical results when consistently applied to a common set of data, the question arises as to which approach is the more appropriate for any given situation. Having dealt with the mathematical aspects of the two methods, let us now look at some of the practical differences.

**Pure Premium Method**

Based on exposure  
Does not require existing rates  
Does not use on-level premium  
Produces indicated rates

**Loss Ratio Method**

Based on premium  
Requires existing rates  
Uses on-level premium  
Produces indicated rate changes

Noting the above differences, the following guidelines would seem to be reasonable:

**Pure premium method requires well-defined, responsive exposures** - the pure premium method is based on losses per unit exposure. Where the exposure unit is not available or is not reasonably consistent between risks, as in the case of commercial fire insurance, the pure premium method cannot be used.

**Loss ratio method cannot be used for a new line** - because the loss ratio method produces indicated rate *changes*, its use requires an established rate and premium history. Where



manual rates are required for a new line of business, where there are loss statistics available, the pure premium method must be used.

**Pure premium method preferable where on-level premium is difficult to calculate** - in some instances, such as commercial lines where individual risk rating adjustments are made to individual policies, it is difficult to determine the on-level earned premium required for the loss ratio method. Where this is the case it is more appropriate to use the pure premium method if possible.

#### **Need for Common Basis**

Whichever ratemaking method is selected, the actuary needs to make certain that the experience losses are on a basis consistent with the exposures and premiums being used. This requires that adjustments be made for observed changes in the data. This section will deal with some of the more common sources of change in the underlying data and will discuss methods for dealing with those changes.

#### ***Selection of Experience Period***

Determination of the loss experience period to be used in the manual ratemaking process involves a combination of statistical and judgmental elements. There is a natural preference for using the most recent incurred

loss experience available since it is generally most representative of the current situation, however this experience will also contain a higher proportion of unpaid losses than will more mature periods and is therefore more subject to loss development projection errors. Where the business involved is subject to catastrophe losses, as in the case of windstorm coverage in hurricane-prone areas, the experience period must be representative of the average catastrophe incidence. Finally, the experience period must contain sufficient loss experience that the resulting indications will have statistical significance or **credibility**.

#### *Reinsurance*

Ceded reinsurance, which is discussed in depth in chapter 5, serves to reduce an insurer's exposure to large losses, either individual or in the aggregate, in exchange for a reinsurance premium. While there may be instances in which a reinsurance program represents such a significant transfer of risk that separate and distinct provision for the reinsurance premium is appropriate, such cases are beyond the scope of this chapter. In general, manual rates should be based upon direct, that is before reflection of reinsurance, premium and loss data.

#### *Differences in Coverage*

Wherever possible, major coverages within a line of insurance should be treated separately. For example, liability experience under homeowners policies should be reviewed separately from the property experience. Auto collision data should be analyzed separately by deductible. Professional liability policies written on a claims-made basis should not be combined with

those written on an occurrence basis for ratemaking purposes. Note that unless the mix has been consistent over the entire experience period these separations will require the segregation of premium and exposure data as well as the loss experience.

#### *Treatment of Increased Limits*

Liability coverage rate manuals generally provide rates for a basic limit of liability along with increased limits factors to be applied to these base rates where higher limits are desired. As will be seen in a later section, these increased limits factors tend to change over time. In addition there will be a general movement toward higher limits as inflation erodes purchasing power. For these reasons premiums and losses used in the manual ratemaking process should be adjusted to a basic limits basis.

#### *On-Level Premium - Adjusting for Prior Rate Changes*

Where, as is the general case, the experience period extends over several years there have typically been changes in manual rate levels between the beginning of the experience period and the date as of which the rates are being reviewed. If the actuary is using the loss ratio method in the development of the indicated rate level changes, the earned premium underlying the loss ratio calculations must be on a current rate level basis.

Where the capability exists, the best method for bringing past premiums to an on-level basis is to re-rate each policy using current rates. Doing this manually is generally far too time-consuming to be practical, but where sufficient detail is available in the computer files and if rating software is

available, the resulting on-level premiums will be quite accurate. This method is referred to as the extension of exposures technique.

When extension of exposures cannot be used, an alternative, called the parallelogram method, is available. This method adjusts calendar year earned premiums to current rate levels based upon simple geometric relationships and an underlying assumption that exposure is uniformly distributed over time.

As an example, assume that the experience period in question consists of the three years 1985, 1986 and 1987. Further assume that each policy has a twelve month term. Finally, assume that rate increases have been taken as follows:

+17.8% effective 7/1/82  
+12.5% effective 7/1/84  
+10.0% effective 7/1/86

Because we are dealing with twelve-month policies, all of the premium earned during the earliest year of the experience period - 1985 - was written at either the 7/1/82 rate level or the 7/1/84 rate level. If we assign the 7/1/82 rate level a relative value of 1.000, then the 7/1/84 rate level has a relative value of 1.125 and the 7/1/86 rate level has a relative value of  $(1.125)(1.100) = 1.2375$ .

Figure 2 provides a representation of these data under the parallelogram method. The x-axis represents the date on which a policy is effective, and the y-axis represents the portion of exposure earned.

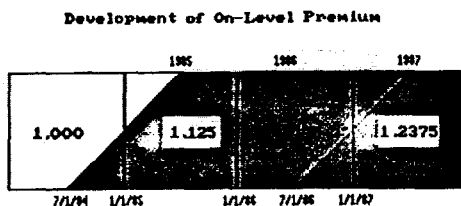


Figure 2

Each calendar year of earned premium can now be viewed as a unit square one year wide and 100% of exposure high. Figure 3 illustrates this treatment of the 1985 year.

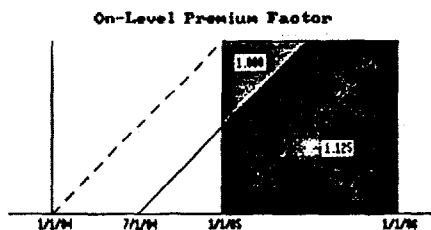


Figure 3

As shown in Figure 4, we can now use simple geometry to determine the portions of 1985 earned exposure written at the 1.000 and 1.125 relative levels.

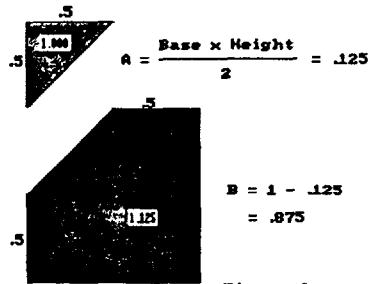


Figure 4

According to the parallelogram model, .125 of the 1985 earned exposure arises from policies written at the 1.000 relative level and .875 of the exposure was written at a relative level of 1.125. The average 1975 relative earned rate level is therefore  $[(.125)(1.000) + (.875)(1.125)] = 1.1094$ . Since the current relative average rate level is 1.2375, the 1985 calendar year earned premium must be multiplied by  $(1.2375/1.1094) = 1.1155$  to reflect current rate levels. The 1.1155 is referred to as the 1985 on-level factor.

We can repeat this process for the 1986 and 1987 years to generate the following:

Calendar Year	Portion of Earned at Relative Level			On-Level Factor
	1.000	1.125	1.2375	
1985	.125	.875	0	1.1155
1986	0	.875	.125	1.0864
1987	0	.125	.875	1.0115

These on-level factors are then applied to the calendar year earned premiums to generate approximate on-level earned premiums. For example:

<b>Calendar Year</b>	<b>Calendar Year Earned Premium</b>	<b>On-Level Factor</b>	<b>Approximate On-Level Earned Premium</b>
1985	\$1,926,981	1.1155	\$2,149,547
1986	\$2,299,865	1.0864	\$2,498,573
1987	\$2,562,996	1.0115	\$2,592,470
Total	\$6,789,842		\$7,240,590

As noted earlier, the parallelogram method is based upon an assumption that exposures are written uniformly over the calendar period. In cases where material changes in exposure level have occurred over the period, or where there is a non-uniform pattern to the written exposures, the parallelogram method may not produce a reasonable approximation of on-level earned premium. While a discussion of adjustments to the simple model underlying the parallelogram method is beyond the scope of this chapter, Miller and Davis<sup>1</sup> have proposed an alternative model which reflects actual exposure patterns.

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<sup>1</sup>Miller, D.L. and Davis, G.E. "A Refined Model for Premium Adjustment." *Proceedings of the Casualty Actuarial Society LXIII*, 1976. p. 117.

### **Trended, Projected Ultimate Losses**

We are now ready to discuss the methodology underlying the development of the trended, projected ultimate losses. This element represents the most significant part of any ratemaking analysis and requires both statistical expertise and actuarial judgment. Whether the pure premium method or the loss ratio method is being used, the accuracy with which losses are projected will determine the adequacy of the resulting manual rates.

### *Inclusion of Loss Adjustment Expenses*

The actuary must determine whether to make projections on a pure loss basis, or whether to include allocated loss adjustment expenses with losses. Unallocated loss adjustment data are rarely available in sufficient detail for inclusion with losses and allocated loss adjustment expenses, and are generally treated as part of the expense loading - frequently as a ratio to loss and allocated loss expenses.

While the decision whether to include allocated loss expense data with losses is generally made based upon data availability, there is one situation in which it is essential that the allocated loss adjustment expenses be combined with the losses. Some liability policies contain limits of liability which apply to both losses and allocated loss adjustment expenses. Where manual rates are being developed for such policies, allocated loss adjustment expenses should be treated as losses.



*Projection to Ultimate - the Loss Development Method*

A significant portion of the entirety of casualty actuarial literature produced in this century deals with the methods and techniques for projecting unpaid, and often unreported, losses to their ultimate settlement values. Even a casual treatment of the subject is beyond the scope of this chapter. Nevertheless, the general concepts discussed in this section will be based upon the use of projected ultimate losses and claim counts. A thorough understanding of the issues involved in manual ratemaking requires that the context of the problem be clear. At least one technique for projection to ultimate is needed and we will use the most common - the loss development method.

The loss development method is based upon the assumption that claims move from unreported to reported-and-unpaid to paid in a pattern which is sufficiently consistent that past experience can be used to predict future development. Claim counts, or losses, are arrayed by accident year (or report year or on some other basis) and accident year age. The resulting data form a triangle of known values. As an example, consider the following accident year reported claim count development data:

<b>Accident Year</b>	<b>Age 12</b>	<b>Age 24</b>	<b>Age 36</b>	<b>Age 48</b>	<b>Age 60</b>	<b>Age 72</b>
1982	1,804	2,173	2,374	2,416	2,416	2,416
1983	1,935	2,379	2,424	2,552	2,552	
1984	2,103	2,384	2,514	2,646		
1985	2,169	2,580	2,722			
1986	2,346	2,783				
1987	2,337					

Remembering the concept of accident year age it can be seen, for example, that as of 12/31/85 there were 2,424 claims reported for accidents occurring during 1983. By 12/31/86 this number had developed to 2,552. Horizontal movement to the right represents *development*, vertical movement downward represents *change in exposure level*, and positive-sloped diagonals represent *evaluation dates*. The lower diagonal represents the latest available evaluation - in this case 12/31/87.

Accident Year	Age 12	Age 24	Age 36	Age 48	Age 60	Age 72
1982	1,804	2,173	2,374	2,416	2,416	2,416
1983	1,935	2,379	2,424	2,552	2,552	
1984	2,103	2,384	2,514	2,646		
1985	2,169	2,580	2,722			
1986	2,346	2,783				
1987	2,337					

12/31/87 Evaluation

The next step in the process is to reflect the development history arithmetically. This involves the division of each evaluation subsequent to the first by the immediately preceding evaluation. The resulting ratio is called an **age-to-age development factor** or, sometimes, a **link ratio**. For example, the *accident year 1982 12-24 reported claim count development factor* from our example is  $2,173/1,804 = 1.2045$ .

Accident Year	Age 12	Age 24	Age 36	Age 48	Age 60	Age 72
1982	1,804	2,173	2,374	2,416	2,416	2,416
1983	1,935	2,379	2,424	2,552	2,552	
1984	2,103	2,384	2,514	2,646		
1985	2,169	2,580	2,722			
1986	2,346	2,783				
1987	2,337					

$2,173/1,804 = 1.2045$

Repeating this process, we can produce a second data triangle consisting of age-to-age development factors.

Accident Year	Age 12	Age 24	Age 36	Age 48	Age 60	Age 72
1982	1,804	2,173	2,374	2,416	2,416	2,416
1983	1,935	2,379	2,424	2,552	2,552	
1984	2,103	2,384	2,514	2,646		
1985	2,169	2,580	2,722			
1986	2,346	2,783				
1987	2,337					

Accident Year	12-24	24-36	36-48	48-60	60-72
1982	1.2045	1.0925	1.0177	1.0000	1.0000
1983	1.2295	1.0189	1.0528	1.0000	
1984	1.1336	1.0545	1.0525		
1985	1.1895	1.0550			
1986	1.1863				

Based upon the observed development factors, age-to-age factors are selected and successively multiplied to generate age-to-ultimate factors. These age-to-ultimate factors are then applied to the latest diagonal of the development data to yield projected ultimate values.

Accident Year	Accident Year Age	Selected Age-to-Age Factor	Age-to-Ultimate Factor	Reported Claims 12/31/87	Projected Ultimate Claims
1982	72		1.0000	2,416	2,416
1983	60	1.0000	1.0000	2,552	2,552
1984	48	1.0000	1.0000	2,646	2,646
1985	36	1.0450	1.0450	2,722	2,844
1986	24	1.0550	1.1025	2,783	3,068
1987	12	1.1900	1.3120	2,337	3,066

An identical process can be applied to either paid or case-incurred losses. Generally case-incurred values are used, especially where the development

period extends over several years. Note that losses tend to take longer to fully develop than do reported claims. This is due to the **settlement lag** - the period between loss reporting and loss payment - which affects losses but not reported claims and represents additional development potential beyond the **reporting lag** - the period between loss occurrence and loss reporting - which affects both claims and losses.

An example of the loss development method applied to case-incurred loss and allocated loss adjustment expense data is contained in the Appendix to this chapter.

In some instances, most notably where premiums are subject to audit adjustments as is often true for workers' compensation insurance, premium data requires projection to ultimate in order that the premium being used in the ratemaking calculations properly reflects the actual exposure level which gave rise to the ultimate losses. One method for handling this situation is to aggregate data on a **policy year**, rather than an accident year, basis. Policy year data is based upon the year in which the policy giving rise to exposures, premiums, claims and losses is effective. Another method involves the projection of written premium to ultimate and the recalculation of earned premium, referred to as **exposure year earned premium**, based upon the projected ultimate written premium. In either case, the projection techniques involved are similar to the loss development method.

### *Identification of Trends*

Once claims and losses have been projected to an ultimate basis it is necessary to adjust the data for any underlying trends which are expected to produce changes in indications between the experience period and the period during which the manual rates will be in effect. For example, if rates are being reviewed as of 12/31/87 based upon 1985 accident year data and the new rates are expected to go into effect on 7/1/88, the projected ultimate losses for the 1985 accident year are representative of loss exposure as of approximately 7/1/85 and the indicated rates must cover loss exposure as of approximately 12/31/88. To the extent that there are identifiable trends in the loss data, the impact of those trends over the 42 months between the midpoint of the experience period and the average exposure date to which the rates will apply.

The most obvious trend affecting the ratemaking data is the trend in severity. Monetary inflation, increases in jury awards, and increases in medical expenses are examples of factors which cause upward trends in loss severities. Frequency is also subject to trend. Court decisions may open new grounds for litigation which would increase liability frequencies. Legal and social pressures might reduce the incidence of driving under the influence of alcohol, thus reducing automobile insurance frequencies.

Some exposure bases also exhibit identifiable trends. Workers' compensation uses payroll as an exposure base and products liability coverage might be based upon dollars of sales. Both of these exposures will reflect some degree of trend. Automobile physical damage rates are based

upon the value of the automobiles being insured. As automobile prices increase the physical damage premiums will reflect the change, even though no rate change has been made. When using the loss ratio method for ratemaking it is important that the effect of such trends on premium be properly reflected.

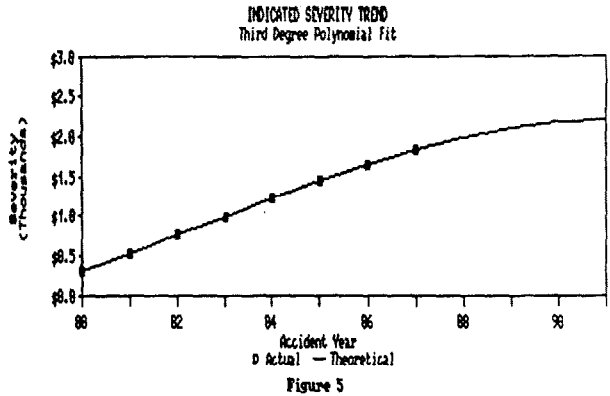
While frequency and severity trends are often analyzed separately, it is sometimes preferable to look at trends in the pure premium, thus combining the impacts of frequency and severity.

#### *Reflection of Trends*

Actuaries generally approach the problem of how to reflect observed trends by fitting an appropriate curve to the observed data. The most important word in the preceding sentence is *appropriate*. Consider the following hypothetical projected accident year severity data:

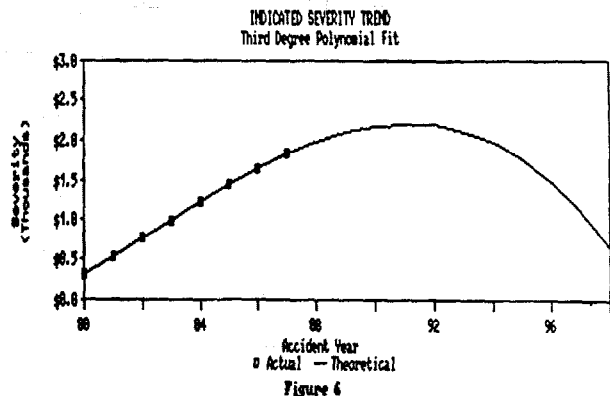
<b>Accident Year</b>	<b>Projected Severity</b>
1980	\$309
1981	532
1982	763
1983	996
1984	1,225
1985	1,444
1986	1,647
1987	1,828

It so happens that the third-degree polynomial  $y = -x^3 + 10x^2 + 200x + 100$  produces a perfect fit to these data where  $x$  is defined as the accident year minus 1979. Figure 5 shows the result of this fit graphically.



Based upon the strength of the fit one might be tempted to use the third-degree polynomial to project future severity changes. But is a third-degree polynomial really *appropriate* for a severity trend model?

If we extend the  $x$  axis out through accident year 1998 we see the following results. Viewed in this manner it is apparent that, regardless of how well it might fit our observations, the third-degree polynomial model is not one which is reasonable for the projection of severity changes.



While other appropriate models are available, most of the trending models used by casualty actuaries in ratemaking take one of two forms:

Linear	$y = ax + b$	, or
Exponential	$y = bc^{ax}$	

Note that the exponential model can be expressed as:

$$\ln(y) = ax + \ln(b)$$

Or, with the substitutions  $y' = \ln(y)$  and  $b' = \ln(b)$ :

$$y' = ax + b'$$

Since either model can therefore be expressed in terms of a linear function, the standard first-degree least-squares regression method can be applied to the observed data to determine the trend model. Note that the linear model will produce a model in which the projection will increase by a constant *amount* ( $a$ ) for each unit change in  $x$ . The exponential model will produce a constant *rate* of change of  $e^a - 1$ , with each value being  $e^a$  times the prior value. Drawing an analogy to the mathematics of finance, the linear model is analogous to *simple* interest while the exponential model is analogous to *compound* interest.

While either linear or exponential models can be used to reflect increasing trends, where the observed trend is decreasing the use of a linear model will



produce negative values at some point in the future. The use of a linear model in such cases is clearly inappropriate since frequency, severity, pure premium and exposure must all be greater than or equal to zero.

Exhibits IV, V, VII and VIII of the Appendix to this chapter provide examples of the application of both linear and exponential trend models using both loss ratio and pure premium methods.

#### *Effects of Limits on Severity Trend*

Where the loss experience under review involves the application of limits of liability, it is important that the effects of those limits on severity trend be properly reflected. In order to understand the interaction between limits and severity trend, consider the hypothetical situation in which individual losses can occur for any amount between \$1 and \$90,000. Assume that insurance coverage against these losses is available at four limits of liability: \$10,000 per occurrence; \$25,000 per occurrence; \$50,000 per occurrence; and \$100,000 per occurrence. Note that, since losses can only be as great as \$90,000 the \$100,000 limit coverage is basically unlimited.

In order to analyze the operation of severity trend on the various limits it will be necessary to look at losses by layer of liability. The following chart illustrates this layering for four different loss amounts.

<u>Loss Amount</u>	<u>Distribution of Loss Amount by Layer</u>			
	<u>First \$10,000</u>	<u>\$15,000 excess of \$10,000</u>	<u>\$25,000 excess of \$25,000</u>	<u>\$50,000 excess of \$50,000</u>
\$5,000	\$5,000			
\$20,000	\$10,000	\$10,000		
\$40,000	\$10,000	\$15,000	\$15,000	
\$70,000	\$10,000	\$15,000	\$25,000	\$20,000
<b>Total</b>	<b>\$35,000</b>	<b>\$40,000</b>	<b>\$40,000</b>	<b>\$20,000</b>

The total line represents the distribution of the \$135,000 of losses by layer, assuming that one claim of each amount occurred. Consider now the effect of a constant 10% increase in each claim amount.

<u>Loss Amount</u>	<u>Distribution of Loss Amount by Layer</u>			
	<u>First \$10,000</u>	<u>\$15,000 excess of \$10,000</u>	<u>\$25,000 excess of \$25,000</u>	<u>\$50,000 excess of \$50,000</u>
\$5,500	\$5,500			
\$22,000	\$10,000	\$12,000		
\$44,000	\$10,000	\$15,000	\$19,000	
\$77,000	\$10,000	\$15,000	\$25,000	\$27,000
<b>Total</b>	<b>\$35,500</b>	<b>\$42,000</b>	<b>\$44,000</b>	<b>\$27,000</b>
<b>Increase</b>	<b>1.43%</b>	<b>5.00%</b>	<b>10.00%</b>	<b>35.00%</b>

While the total losses have increased by 10% from \$135,000 to \$148,500, the rate of increase is not constant across the layers. This is due to the fact that the larger claims have already saturated the lower layers, thus reducing the impact of severity increases on these layers. Figure 7 provides a graphical representation of this effect by claim size.

For each layer let us define  
the following:

L = lower bound of layer

U = upper bound of layer

X = unlimited loss size

T = severity increase rate

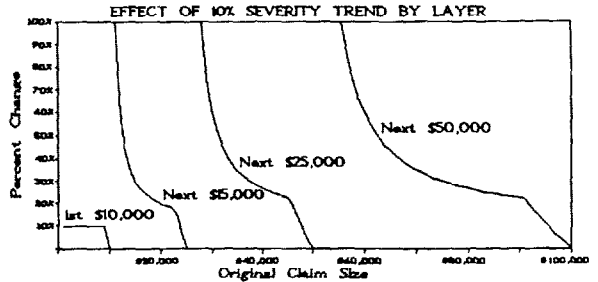


Figure 7

The impact of the severity increase on any given layer can be expressed as follows:

Original  
Loss Size

Rate of Increase in Layer

$$X < \frac{L}{(1+T)}$$

Undefined

$$\frac{L}{(1+T)} < X < \frac{U}{(1+T)}$$

$$\frac{(1+T)(X) - L}{X-L} - 1 = \frac{TX}{X-L}$$

$$\frac{U}{(1+T)} < X < U$$

$$\frac{U-L}{X-L} - 1 = \frac{U-X}{X-L}$$

$$U < X$$

$$0$$

The four-loss distribution used in the illustration of the impact of policy limit on severity trend is not realistic for most liability lines. In general we see frequency decreasing as loss size increases. If we assume a loss distribution

as shown in Figure 8 then the impact of a 10% severity increase on each limit will be as shown in Figure 9.

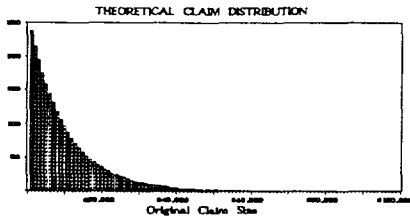


Figure 8

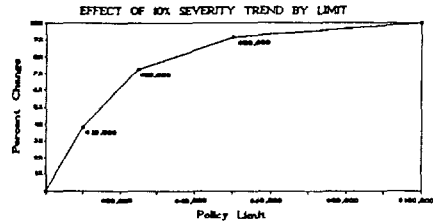


Figure 9

Where severity trend has been analyzed based upon unlimited loss data or loss data including limits higher than the basic level, the resulting indicated severity trend must be adjusted before it is applied to basic limits losses. Because such adjustment will require knowledge of the underlying size-of-loss distribution it is generally preferable to use basic limits data in the severity trend analysis.

#### *Trend Based Upon External Data*

Where sufficient loss or claim experience to produce reliable trend indications is not available the actuary should supplement or supplant the available experience with external data. Insurance trade associations, statistical bureaus and the U.S. Government produce insurance and general economic data regularly. While the appropriate source for the data will, of

course, depend upon the specific ratemaking situation, Masterson<sup>2</sup> provides a good general reference on the subject. Lommele and Sturgis<sup>3</sup> provide an interesting example of the application of economic data to the problem of forecasting workers' compensation insurance results.

*Trend and Loss Development - The "Overlap Fallacy"*

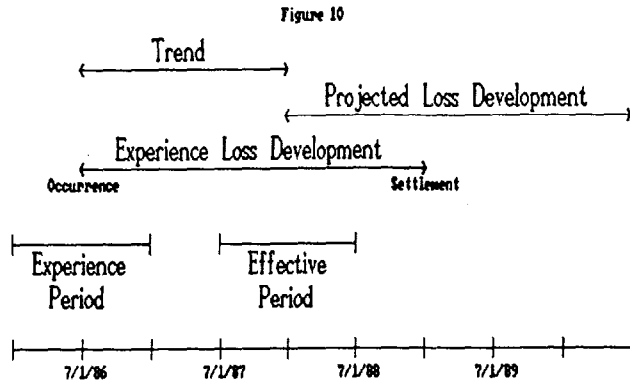
It has occasionally been suggested that there is a double-counting of severity trend in the ratemaking process where both loss development factors - which reflect severity changes as development on unpaid claims - and severity trend factors are applied to losses. Cook dealt with this subject in detail, and with elegance, in a 1970 paper<sup>4</sup>. In order to properly understand the relationship between loss development and trend factors assume a situation in which the experience period is the 1986 accident year and indicated rates are expected to be in effect from 7/1/87 through 6/30/88. Now consider a single claim with accident date 7/1/86 and which will settle on 12/31/88. If a similar claim should occur during the effective period of the indicated rates, say on 1/1/88, we would expect an equivalent settlement lag and would project that the 1/1/88 claim would settle on 6/30/90. Figure 10 illustrates the hypothetical situation graphically.

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<sup>2</sup>Masterson, N.E. "Economic Factors in Liability and Property Insurance Claim Costs, 1935-1967." *Proceedings of the Casualty Actuarial Society* LV, 1968. p. 61.

<sup>3</sup>Lommele, J.A. and Sturgis, R.W. "An Econometric Model of Worker's Compensation." *Proceedings of the Casualty Actuarial Society* LXI, 1974. p. 170.

<sup>4</sup>Cook, C.F. "Trend and Loss Development Factors." *Proceedings of the Casualty Actuarial Society* LVII, 1970. p. 1.



Note that the ratemaking problem, as respects this single hypothetical claim, is to project the ultimate settlement value as of 6/30/90 based upon the single observed claim which occurred on 7/1/86 - a total projection period of 48 months. The loss development factor will, assumedly, reflect the underlying severity trend during the 30 months between occurrence on 1/1/88 and settlement on 6/30/90. The trend factor will reflect the severity trend between the midpoint of the experience period (7/1/86) and the midpoint of the effective period (1/1/88) which accounts for the remaining 18 months of the projection period. Note that while both trend and loss development factors do reflect underlying severity trends there is no overlap between the two, and both are required.

#### *Trended Projected Ultimate Losses*

The application of loss development and trending techniques to the underlying loss data produces the trended projected ultimate losses which are the *experience losses* underlying the application of either the pure

premium or the loss ratio methods to produce the indicated rates or rate changes.

### Expense Loadings

The topic of expenses in ratemaking will be covered in detail in chapter 7, the need for continuity requires at least a limited treatment at this point. For purposes of illustration of the general concepts involved in the reflection of expense loadings in manual rates, assume that the loss ratio method is being used to develop base rate indications for a line of business, and assume further that allocated loss adjustment expenses are being combined with the experience losses. Suppose that for the latest year the line of business produced the following results on a direct basis:

Written Premium	\$11,540,000
Earned Premium	\$10,832,000
Incurred Loss and Allocated Loss Adjustment Expense	\$7,538,000
Incurred Unallocated Loss Adjustment Expenses	\$484,000
Commissions	\$1,731,000
Taxes, Licenses & Fees	\$260,000
Other Acquisition Expenses	\$646,000
General Expenses	\$737,000
Total Loss and Expense	\$11,396,000

Since our losses and expenses exceeded the earned premium \$564,000 for the year it is probably reasonable that we review the adequacy of the underlying rates. Since we are using the loss ratio method we need to develop a target loss ratio. Referring back to formula (7):

$$T = \frac{1-V-Q}{1+G} \quad (7)$$

Where: **T** = target loss ratio  
**V** = premium-related expense factor  
**Q** = profit and contingencies factor  
**G** = ratio of non-premium-related expenses to losses

In order to develop the target loss ratio we therefore need factors for premium-related and for non-premium-related expenses and a profit and contingencies factor. Deferring the discussion of profit and contingencies loadings to the next section we will look at the expense factors.

Traditional application of the loss ratio method assumes that only the loss adjustment expenses are non-premium-related. Using this approach we can determine the value for *G* in formula (7) by dividing the unallocated loss adjustment expenses of \$484,000 by the loss and allocated loss expense of \$7,538,000. *G* is therefore  $(484/7538) = .0642$ .

The determination of *V* in formula (7) is then simply the ratio of the other expenses to premiums. But which premiums - written or earned? Since



commissions and premium taxes are generally paid based upon direct written premium it would seem appropriate to use written premium in the denominator for these expenses. Other acquisition expenses are expended to produce premium so it might be appropriate to relate those to written premium as well. But the general expenses of the insurance operation involve functions unrelated to the production of premium and which could not be immediately eliminated if the company were to cease writing business. For this reason the general expenses are usually related to earned premium.

Based upon the above, we now calculate V as follows:

Ratio of commissions to written	(1,731/11,540)	.1500
Ratio of taxes, licenses & fees to written	(260/11,540)	.0225
Ratio of other acquisition to written	(646/11,540)	.0560
Ratio of general to earned	(737/10,832)	.0680
Total premium-related expense factor		.2965

If, for the moment, we assume that the profit and contingencies factor is zero, we can apply formula (7) and determine our target loss ratio:

$$T = \frac{1 - .2965 - 0}{1 + .0642} = .6611$$

### **Profit and Contingencies**

While generally among the smallest of the elements in any calculation of indicated manual rates, the profit and contingencies loading represents the *essence* of insurance in that it is designed to reflect the basic elements of risk and rewards associated with the transaction of the insurance business. The risk elements are the *contingencies* portion of the provision while the *profit* portion represents the reward elements.

#### *Sources of Insurance Profit*

Highly simplified, the property and casualty insurance operation involves the collection of premium from insureds, the investment of the funds collected, and the payment of expenses and insured losses. If the premiums collected exceed the expenses and losses paid, the insurer makes what is called an **underwriting profit**, if not then there is an **underwriting loss**. In addition, the insurer will generally make an **investment profit** arising out of the investment of funds between premium collection and payment of expenses and losses. In this simplified context, the insurer might be viewed as a leveraged investment operation, with underwriting profits or losses being analogous to (negative or positive) interest expenses on borrowed funds.

#### *Profit Loadings in Manual Rates*

Until the mid 1960s insurance rates would typically include a profit and contingencies loading of approximately 5% of premium. While this practice was rooted more in tradition than in financial analysis, it must be understood that the practice existed in an environment in which property insurance

represented a much greater portion of the insurance business than it does today, and in which inflation and interest rates were generally low. In that environment investment income tended to be viewed as a *lagniappe* rather than the major source of income it has become. The 5% loading produced sufficient underwriting profits to support the growth of the industry, and it was not generally viewed as being excessive.

The growth of the liability lines, increased inflation and higher interest rates resulted in investment profits which dwarfed the underwriting profits. Not only did this change the way insurance management viewed their financial results and plans, but it also focused regulatory attention on the overall rate of return for insurers rather than the underwriting results. This regulatory involvement generally took the form of adjustments of the traditional 5% profit and contingencies loading downward to reflect investment income on funds supplied by policyholders. In some jurisdictions the allowed profit loadings for certain lines became *negative*.

One of the major problems inherent in the development of a general methodology for the reflection of profit in manual rates is that premium may not be the proper benchmark against which profits should be assessed. Going back to our leveraged investment operation analogy, the specific inclusion of a profit loading based upon premium is the analog to the measurement of profit against borrowed funds - the more you borrow, the more you should earn. If, on the other hand, premiums are viewed in the traditional way, as sales, premium-based profit loadings make more sense.

Unfortunately, the obvious alternative to basing profits on premiums - using return-on-equity as the benchmark - has its own disadvantages. From a regulatory standpoint it both rewards highly leveraged operations and discourages entry to the market, both of which run contrary to regulatory desires. In addition, where rates are made by industry or state rating bureaus, the rates cannot be expected to produce equal return on equity for each company using the rates.

The foregoing discussion provides some of the historical and technical factors entering into the problems associated with profit loadings in manual rates. In practice however, one of two situations generally exists. Either the manual rates will be filed for regulatory approval, in which case the allowable profit provision or methodology will be dictated by the regulators, or the rate levels will reflect the perceived market conditions and will be based upon competitive considerations. In either case the operant decision becomes whether to write business at the resulting rate levels, not what the proper profit loading might be.

### *Contingencies*

The contingencies portion of the profit and contingencies loading represents a provision for adverse deviation or a **risk loading**. Like profit loadings, contingencies provisions are of more theoretical than practical interest. The reader should be aware, however, of the two separate and distinct risk elements inherent in the ratemaking function. These risks are generally termed **parameter risk** and **process risk**. *Parameter risk* is simply the risk associated with the selection of the parameters underlying the applicable

model of the process. Selecting the wrong loss development factors, resulting in erroneous experience losses, is an example of parameter risk. *Process risk*, in contrast, is the risk associated with the projection of future contingencies which are inherently variable. Even if we properly evaluate the mean frequency and the mean severity, the actual observed results will generally vary from the underlying means.

From a financial standpoint it is important to understand that the primary protection against adverse deviation is provided by the surplus (equity) of the insurer. If manual rates alone were required to produce sufficient funds to adequately protect the policyholders and claimants from sustaining any economic loss arising out of the policy period in which they were in effect, most property and casualty coverages would be unaffordable. It is more proper to view the contingencies provision as providing sufficient funds to offset the economic costs associated with the net borrowings from the insurer's surplus required to offset the adverse deviations.

One method for determination of an appropriate contingencies provision is the *ruin theory* approach. This method involves the development of a probabilistic model of the insurance operation and then, generally through Monte Carlo simulation, determining the probability of ruin (insolvency) over a fixed period of time. A maximum acceptable probability of ruin is then determined and the rate level assumption underlying the model is adjusted to the minimum rate level producing a ruin probability less than or equal to the acceptable level. The difference between the resultant adjusted

rate level assumption and the rate level assumption with no risk margin is then used as the contingencies loading.

### **Overall Rate Indications**

The determination of the overall average indicated rate change will be made on the basis of the experience losses, expense provisions, profit and contingencies loadings and, in the case of the loss ratio method, on-level earned premium. Each of these components has been discussed at such length that their confluence seems almost anticlimactic. However, as shall be seen, the development of the overall rate change indication is generally only the *beginning* of the manual ratemaking process, not the end.

For illustrative purposes, assume that the loss ratio method is being applied to the following data:

(1) Experience loss and allocated - accident years 1985-87	\$22,562,119
(2) On-level earned premium - calendar years 1985-87	\$31,811,448
(3) Experience loss and allocated ratio [(1)/(2)]	.7092
(4) Target loss and allocated ratio	.6611

The rate change indication follows directly:

(5) Indicated overall rate level change [(3)/(4)] - 1.0	.0728
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*Credibility Considerations*

The concept of *credibility*, the weight to be assigned to an indication relative to one or more alternative indications, is the topic of chapter 6. For the purposes of this chapter it is only necessary to understand that a statistical indication  $I_1$  has an associated credibility  $z$ , between 0 and 1, relative to some other indication  $I_2$ . The resulting **credibility-weighted indication**  $I_{1,2}$  is determined by the formula:

$$I_{1,2} = z(I_1) + (1-z)(I_2)$$

If, for example, the credibility associated with our overall rate level indication of +7.28% is .85, and we have an alternative indication, from some source, of +4.50%, the credibility-weighted indication would be 6.86% as follows:

$$(.85)(.0728) + (.15)(.0450) = .0686$$

In the application of credibility-weighting, the actuary must be careful to use only reasonable alternative indications. For example, the assumption that the complement of the credibility  $(1-z)$  should be applied to an indication of 0 - that is no change in rates - would be clearly inappropriate where there was a consistent upward trend in pure premium. In this case it would be preferable to use the indicated pure premium trend between the effective date of the current rates and the proposed effective date of the new rates as the alternative indication.

### **Classification and Territorial Rates**

If rate manuals contained a single rate for a given state, the overall rate change indication would be all that was required. But a rate manual will generally contain rates based upon individual classification and sub-classification. In addition, where geographical location of the risk is an important factor, rates may also be shown by rating territory. While classification ratemaking will be discussed in chapter 4, the basics of the process will be illustrated in this section.

#### *Base Rates*

In order to facilitate the process of individual rate determination, especially where rates are computer-generated, classification and territorial rates are generally related to some **base rate**. The advantages to this system are apparent when one considers that there may be as many as 200 classifications for as many as 50 territories in a private passenger automobile rate manual for a given state. Determination of 250 classification and territorial relativities is obviously less time-consuming, and more reasonable from a statistical standpoint, than is the determination of 10,000 classification and territorial rates.

#### *Indicated Classification Relativities*

The relationship between the rate for a given classification (or territory) to the base rate is the **classification (or territorial) relativity**. The determination of indicated classification relativities is similar to the process used in the overall rate level analysis. If the pure premium method is used,



the pure premium for the classification is divided by the pure premium for the base classification to generate the indicated relativity.

If the loss ratio method is used, the on-level earned premium for each classification must be adjusted to the base classification level before the experience loss ratios are calculated. Consider the following three-class situation:

(1) <u>Class</u>	(2) <u>Current Relativity to Class 1</u>	(3) <u>On-Level Earned Premium</u>	(4) <u>Class 1 On-Level Earned (3)/(2)</u>	(5) <u>Experience Loss and Allocated</u>	(6) <u>Loss and Allocated Ratio (5)/(4)</u>	(7) <u>Indicated Relativity to Class 1</u>
1	1.0000	\$14,370,968	\$14,370,968	\$10,718,070	0.7458	1.0000
2	1.4500	\$9,438,017	\$6,508,977	\$6,371,919	0.9789	1.3126
3	1.8000	\$8,002,463	\$4,445,813	\$5,472,130	1.2309	1.6503
Total		\$31,811,448	\$25,325,758	\$22,562,119		

In practice, the resulting indicated relativities are generally credibility-weighted with the existing relativities. This prevents the relativities for smaller classifications against short-term fluctuations in experience.

*Correction for Off-Balance*

Assume that the existing base rate is \$160. If we have determined that we need a 7.28% increase overall, the indicated base rate is  $(1.0728)(\$160) = \$171.65$ . The indicated rate changes by classification are therefore:

$$\begin{aligned} \text{Class 1:} & \quad [(\$171.65)(1.0000)/(\$160)(1.0000)] - 1 = +.0728 \\ \text{Class 2:} & \quad [(\$171.65)(1.3126)/(\$160)(1.4500)] - 1 = -.0288 \\ \text{Class 3:} & \quad [(\$171.65)(1.6503)/(\$160)(1.8000)] - 1 = -.0164 \end{aligned}$$

Applying these indicated classification rate changes to the on-level earned premium we get the following:

$$\begin{aligned}\text{Class 1:} & \quad \$14,370,968 \times 1.0728 = \$15,417,174 \\ \text{Class 2:} & \quad \$9,438,017 \times 0.9712 = \$9,166,202 \\ \text{Class 3:} & \quad \$8,002,463 \times 0.9836 = \$7,871,223\end{aligned}$$

The on-level earned premium at these base rates and classification relativities would be  $(\$15,417,174 + \$9,166,202 + \$7,871,223) = \$32,454,599$ . This represents only a 2.02% increase over the \$31,811,448 on-level earned premium at the current rate levels. The difference between this and the 7.28% overall indication is the **off-balance**. The off-balance exists because the indicated classification relativities produce an average classification relativity different from the average classification relativity underlying the current rates. In this case, the Class 1 relativity is unchanged while the relativities for the other two classes are decreased.

We correct for this off balance by increasing the indicated base rate by an off-balance factor of  $(1.0728/1.0202) = 1.0516$ . The corrected indicated base rate is then  $(1.0516)(\$171.65) = \$180.51$ . This will produce the following corrected indicated rate changes by classification:

$$\begin{aligned}\text{Class 1:} & \quad [(\$180.51)(1.0000)/(\$160)(1.0000)] - 1 = +.1282 \\ \text{Class 2:} & \quad [(\$180.51)(1.3126)/(\$160)(1.4500)] - 1 = +.0213 \\ \text{Class 3:} & \quad [(\$180.51)(1.6503)/(\$160)(1.8000)] - 1 = +.0344\end{aligned}$$

Applying these corrected indicated classification rate changes to the on-level earned premium we get the following:

Class 1:	$\$14,370,968 \times 1.1282 = \$16,213,326$
Class 2:	$\$9,438,017 \times 1.0213 = \$9,639,047$
Class 3:	$\$8,002,463 \times 1.0344 = \$8,277,748$

The resulting on-level premium aggregates to \$34,130,121 or 7.29% more than the current on-level earned. The corrected base rate of \$180.51, in conjunction with the revised classification relativities, now provides the overall level of rate increase indicated.

The Appendix to this chapter contains a more complex example involving both classification and territorial relativities.

#### *Limitation of Rate Changes*

Occasionally, due to regulatory requirements or marketing considerations, it is necessary that individual rate changes be limited to a maximum increase or decrease. In the above example, assume that it has been determined that no classification rate may increase or decrease by more than 10%. Since the Class 1 rate change indicated is 12.82% it needs to be limited to 10.00% or a revised rate of  $(\$160)(1.1000) = \$176.00$ .

Reducing the Class 1 rate to \$176.00 has two effects. First, it reduces the indicated on-level earned premium for Class 1 from \$16,213,326 to

\$15,808,065, a reduction of \$405,261. If we are to make up for this loss by increasing the rates for the remaining classes, we need an increase of  $[\$405,261/(\$9,639,047 + \$8,277,748)]$  or .0226 in Class 2 and Class 3 rates. The second effect of the limitation arises because Class 1 is the base rate. Since the base rate is being reduced, the class relativities must be increased by a factor of  $(1.1282/1.1000) = 1.0256$  to compensate for the change. The factor necessary to correct for the off-balance due to the limitation is therefore  $(1.0226)(1.0256) = 1.0488$ . The resulting class relativities are:

$$\text{Class 2: } (1.3126)(1.0488) = 1.3767$$

$$\text{Class 3: } (1.6503)(1.0488) = 1.7308$$

The calculations of the resulting increases by classification and overall increase in on-level premium are left as exercises for the reader.

### Claims Made

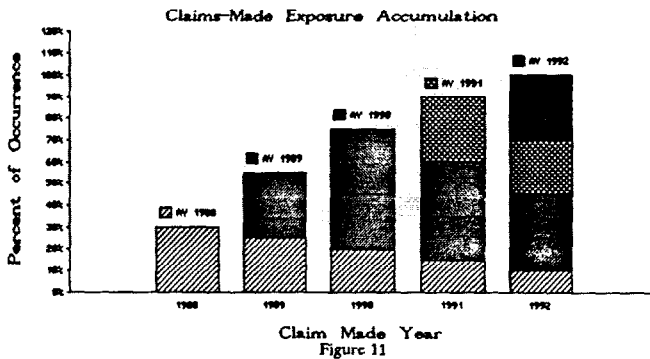
Certain insurance coverages, most notably professional liability, are offered on what is called a **claims-made** basis. Instead of being insured against losses occurring during the policy period, as is the case for most property and casualty lines and is referred to as the **occurrence basis**, the **claims-made** policy insures against all losses for which a claim is first asserted during the policy period. When making rates for claims-made coverages, several factors need to be considered.

*A Simplified Example*

In order to examine the basic aspects of the claims-made coverage let us assume that ultimate losses for actuarial professional liability insurance arise according to the following schedule:

Claims made in year of occurrence	30%
Claims made in first year following occurrence	25%
Claims made in second year following occurrence	20%
Claims made in third year following occurrence	15%
Claims made in fourth year following occurrence	10%

Consider now an actuary who starts a consulting practice on 1/1/88 and takes out a claims-made policy to protect against professional liability losses. Had the coverage been written on an occurrence basis, the first year premium would need to be sufficient to provide for all losses expected to occur during 1988. On a claims-made basis, however, only the 1988 occurrences for which claims are first made during 1988 need to be covered. According to our simple model, this is 30% of the 1988 occurrences. Figure 11 illustrates the growth in exposure to loss over the first five years of claims-made coverage.



Because our model has a five year reporting period, the fifth and subsequent years will contain the equivalent of 100% of occurrences, although each claims-made year will consist of losses from five accident years.

### *Step Rates*

In order to properly reflect the growth in exposure to loss, claims-made rate manuals contain rates which vary according to the number of years the coverage has been in effect. These are referred to as **step rates**. Referring to our simple model, and conveniently ignoring the effect of fixed expenses, trend, investment income and profit and contingencies loadings, the indicated step rates would be as follows:

First year rate (% of occurrence)	30%
Second year rate (% of occurrence)	55%
Third year rate (% of occurrence)	75%
Fourth year rate (% of occurrence)	90%
Mature rate (% of occurrence)	100%

### *Reduced Projection Error under Claims-Made*

Because claims-made policies cover only those losses reported during the policy period, projections of ultimate losses do not need to consider the **incurred-but-not-reported (IBNR)** losses which arise under occurrence-based coverages. This reduces the potential for projection errors in the ratemaking process.

*Reduced Investment Income under Claims-Made*

Because premiums for claims-made coverages contain no provision for losses which will be reported subsequent to the policy period, the loss reserves held on account of claims-made policies are less than those under equivalent occurrence policies. As a result, claims-made coverage produces substantially less investment income than does occurrence coverage. This fact will often require recognition in the profit provision underlying the manual rates.

*Extended Reporting Endorsement*

Returning to our example, suppose that at 12/31/92 our actuary, having made a fortune as a high-priced consultant, decides to retire. While there will be no additional exposure to professional liability claims during retirement, there is the potential for new claims to be reported on 1989 through 1992 occurrences. In order to cover these losses, the actuary must purchase an **extended reporting endorsement** which will cover any claims arising out of occurrences during the claims-made coverage period which are reported subsequent to 12/31/92.

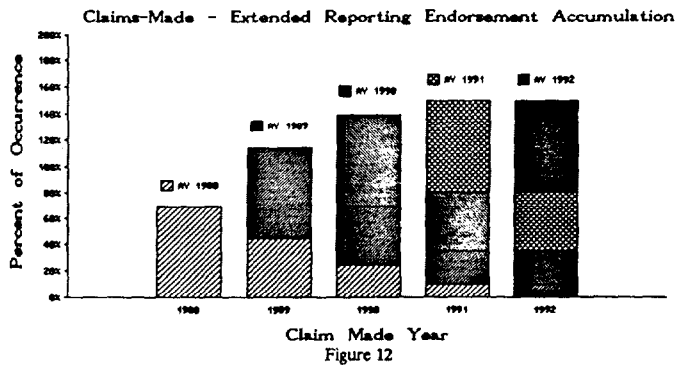


Figure 12 illustrates the growth of the accumulated exposure subject to coverage by the extended reporting endorsement under our simple model.

It is reasonable to assume that every claims-made insured will, at some point, purchase an extended reporting endorsement. Death, disability, retirement or conversion to occurrence-based coverage all produce a need for the extension provided by the endorsement. If we make this assumption, and if we ignore the impact of inflation on limits carried - the policy limits tending to increase over time - then the claims covered under the combination of the successive claims-made policies and the extended reporting endorsement will be the identical claims which would have been covered under successive occurrence-based policies over the same period. Stated differently, the economic value of the total of the pure premiums underlying the combination of the claims-made policies and the extended reporting endorsement must equal the economic value at the same point in time of the pure premiums underlying the equivalent occurrence-based policies.



### *Extended Reporting Guarantees*

Some claims-made policies contain guarantees that extended reporting endorsements will be offered at the end of a continuous claims-made coverage period. In some cases a maximum price, generally stated as a percentage of the mature claims-made rate in effect at the time the extended reporting endorsement is issued, is guaranteed. In a few cases the issuance of the extended reporting endorsement as a result of death or disability (and, occasionally, retirement) is guaranteed at *no additional cost*. When pricing claims-made policies containing the guaranteed offer of extended reporting endorsement endorsements at a maximum price, the actuary needs to examine the need for a specific provision in the claims-made rates for the accrual of any shortfall of the guaranteed maximum price for the endorsement.

### **Increased Limits**

The final topic to be addressed in this section is increased limits ratemaking. While the level of attention to the development of rates for increased limits is generally less than that given the development of basic limits rates, the number of increased limits factors which exceed 2.000 should serve to focus attention on this important element of manual ratemaking. In an earlier discussion we saw how the severity trend in excess layers increases as the lower bound of the layer increases. This effect alone is sufficient to produce a general upward movement in increased limits factors. When combined with the effects of our increased litigiousness as a society, the need for

regular review of increased limits rate adequacy should be apparent. In this section we will provide brief descriptions of three methods available for the review of increased limits experience.

#### *Trending Individual Losses*

This method involves the application of severity trend to a body of individual loss data. Generally closed claim data are used in order to avoid the problems associated with projecting loss development on individual claims. In order to apply the method, an annual severity trend factor is first determined. This trend factor is then applied to each closed claim for the period from date of closure to the applicable effective period for the indicated increased limits factors. The resulting distribution of trended closed claims is then used to determine the appropriate increased limits factors.

Note that the application of this method requires the use of *unlimited* losses as the projection base. Since insurers are frequently unaware of the unlimited loss amounts associated with closed claims, this method is often based upon special data surveys.

#### *Loss Development by Layer*

Another method which can be used to analyze increased limits experience is to look at loss development patterns by layer. This process involves the segregation of case-incurred loss data by policy limit and loss layer and then

tracking the observed loss development factors in each layer. Generally the sparsity of data in the upper limits precludes the use of this method.

#### *Fitted Size-of-Loss Distribution*

The third method is related to the individual loss trending method. In this method, a theoretical size-of-loss distribution is fitted to existing individual loss data. The resulting distribution can then be used to examine the effects of severity trend on various limits and as a basis for the increased limits factors.

#### **Summary**

While this section has covered most of what could be considered the basics of manual ratemaking, every line of insurance will have characteristics requiring specialized treatment. For each method illustrated in this chapter there are situations in which its application would be clearly inappropriate. There is no substitute for informed judgment arising out of a thorough understanding of the characteristics of the insurance coverage being priced. The actuary who becomes a slave to ratemaking methodology rather than a student of the business will, at some point, be led astray.

## Appendix

The following appendix contains a complete, though simplified, example of a manual rate analysis of private passenger automobile bodily injury. The data is totally fictitious but is meant to be reasonably representative of actual data which might be observed in practice. The appendix consists of 16 sheets which are meant to provide an example of the exhibits which might accompany a rate filing with a regulatory body. This section will provide a brief description of each of these sheets.

**Sheet 1** is meant to represent the existing rate manual, effective 7/1/86, for the coverage under review. The manual contains basic limits rates for each of three classifications within each of three territories, along with a single increased limits factor to adjust the rates for basic limits of \$20,000 per person, \$40,000 per occurrence (20/40) to limits of \$100,000 per person, \$300,000 per occurrence (100/300). Territorial and classification rates are keyed to a base rate of \$160 for Territory 2, Class 1.

**Sheet 2** demonstrates the computation of the on-level earned premium based upon the extension of exposures technique. The experience period is the three years 1985-1987 and the earned exposures, by class and territory, for each of those years are multiplied by the appropriate current rate to yield the on-level earned.

**Sheet 3** shows the projection of ultimate loss and allocated loss adjustment expense for accident years 1982-1987 using the case-incurred loss development method.

**Sheet 4** contains the projected ultimate claim counts for accident years 1982-1987 based upon the reported count development method.

**Sheet 5** details the calculation of the severity trend factor based upon the projected incurred losses and ultimate claims for accident years 1982-1987. The trend factor is based upon a linear least-squares fit.

**Sheet 6** addresses the frequency trend factor based upon the earned exposures and projected ultimate claims for accident years 1982-1987 based upon an exponential least-squares fit.

**Sheet 7** contains the calculation of the target loss and allocated loss expense ratio. Note that there is no specific provision for profit and contingencies in this example, the assumption being that the investment profits will be sufficient.

**Sheet 8** presents the calculation of the indicated statewide rate level change using the loss ratio method.

**Sheet 9** contains projections of trended projected ultimate losses and allocated loss expenses by accident year, classification and territory for accident years 1985-1987.

**Sheet 10** demonstrates the calculation of indicated classification and territorial pure premiums and pure premium relativities.

**Sheet 11** shows the calculation of credibility-weighted classification relativities and the selection of relativities to be used.

**Sheet 12** shows the calculation of credibility-weighted territorial relativities and the selection of relativities to be used.

**Sheet 13** details the correction for off-balance resulting from the selected classification and territorial relativities.

**Sheet 14** shows the development of the revised basic limits rates and the calculation of the resulting statewide rate level change.

**Sheet 15** describes the calculation of the revised 100/300 increased limits factor using the individual trended loss approach.

**Sheet 16** is the proposed rate manual to be effective 7/1/88.

EXAMPLE AUTO INSURANCE COMPANY

Rate Manual - 7/1/86

Private Passenger Auto Bodily Injury  
20/40 Basic Limits

Territory	Class 1 Adult Drivers, No Youthful Operators	Class 2 Family with Youthful Drivers Not Principal Op.	Class 3 Youthful Owners or Principal Operators
1 - Central City	\$224	\$325	\$403
2 - Midway Valley	\$160	\$232	\$288
3 - Remainder of State	\$136	\$197	\$245

Increased Limits

Limit	Factor
100/300	1.300

EXHIBIT I  
-----

EXAMPLE AUTO INSURANCE COMPANY

Private Passenger Auto Bodily Injury  
Basic Limits

Development of Indicated Statewide Rate Level Change

A. Earned Premium at Current Rate Level

	Class 1	Class 2	Class 3	Total
	-----	-----	-----	-----
<b>Earned Exposures:</b>				
1985 Territory 1	7,807	3,877	1,553	13,237
Territory 2	11,659	4,976	3,930	20,565
Territory 3	5,760	2,639	3,030	11,429
Total	25,226	11,492	8,513	45,231
1986 Territory 1	8,539	4,181	1,697	14,417
Territory 2	12,957	5,442	4,262	22,661
Territory 3	5,834	2,614	3,057	11,505
Total	27,330	12,237	9,016	48,583
1987 Territory 1	9,366	4,551	1,870	15,787
Territory 2	14,284	5,939	4,669	24,892
Territory 3	5,961	2,591	3,036	11,588
Total	29,611	13,081	9,575	52,267
<b>Current Rate Level:</b>				
Territory 1	\$224	\$325	\$403	
Territory 2	\$160	\$232	\$288	
Territory 3	\$136	\$197	\$245	
<b>On-Level Earned Premium:</b>				
1985 Territory 1	\$1,748,768	\$1,260,025	\$625,859	\$3,634,652
Territory 2	\$1,865,440	\$1,154,432	\$1,131,840	\$4,151,712
Territory 3	\$783,360	\$519,883	\$742,350	\$2,045,593
Total	\$4,397,568	\$2,934,340	\$2,500,049	\$9,831,957
1986 Territory 1	\$1,912,736	\$1,358,825	\$683,891	\$3,955,452
Territory 2	\$2,073,120	\$1,262,544	\$1,227,456	\$4,563,120
Territory 3	\$793,424	\$514,958	\$748,965	\$2,057,347
Total	\$4,779,280	\$3,136,327	\$2,660,312	\$10,575,919
1987 Territory 1	\$2,097,984	\$1,479,075	\$753,610	\$4,330,669
Territory 2	\$2,285,440	\$1,377,848	\$1,344,672	\$5,007,960
Territory 3	\$810,696	\$510,427	\$743,820	\$2,064,943
Total	\$5,194,120	\$3,367,350	\$2,842,102	\$11,403,572



EXHIBIT II

EXAMPLE AUTO INSURANCE COMPANY

Private Passenger Auto Bodily Injury  
Basic Limits

Development of Indicated Statewide Rate Level Change

B. Projected Ultimate Accident Year Loss and Allocated Loss Expense

Acc. Year	Cumulative Basic Limits Case-Incurred Loss and Allocated Loss Expense					
	Age 12	Age 24	Age 36	Age 48	Age 60	Age 72
1982	\$2,116,135	\$3,128,695	\$3,543,445	\$3,707,375	\$3,854,220	\$3,928,805
1983	\$2,315,920	\$3,527,197	\$3,992,805	\$4,182,133	\$4,338,765	
1984	\$2,743,657	\$4,051,950	\$4,593,472	\$4,797,194		
1985	\$3,130,262	\$4,589,430	\$5,230,437			
1986	\$3,625,418	\$5,380,617				
1987	\$3,919,522					

Acc. Year	Incremental Loss Development Factors					
	12-24	24-36	36-48	48-60	60-72	72-Ultimate
1982	1.4785	1.1326	1.0463	1.0396	1.0194	
1983	1.5230	1.1320	1.0474	1.0375		
1984	1.4768	1.1336	1.0444			
1985	1.4661	1.1397				
1986	1.4841					
Selected	1.4800	1.1350	1.0450	1.0385	1.0200	1.0000
Ultimate	1.8595	1.2564	1.1070	1.0593	1.0200	1.0000

Accident Year	Loss & Allocated 12/31/87	Ultimate Factor	Projected Ultimate Loss & Allocated
1982	\$3,928,805	1.0000	\$3,928,805
1983	\$4,338,765	1.0200	\$4,425,540
1984	\$4,797,194	1.0593	\$5,081,668
1985	\$5,230,437	1.1070	\$5,790,094
1986	\$5,380,617	1.2564	\$6,760,207
1987	\$3,919,522	1.8595	\$7,288,351

EXHIBIT III  
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EXAMPLE AUTO INSURANCE COMPANY

Private Passenger Auto Bodily Injury  
Basic Limits

Development of Indicated Statewide Rate Level Change

C. Projected Ultimate Accident Year Claim Counts

Acc. Year	Cumulative Reported Claims					
	Age 12	Age 24	Age 36	Age 48	Age 60	Age 72
1982	1,804	2,173	2,374	2,416	2,416	2,416
1983	1,935	2,379	2,424	2,552	2,552	
1984	2,103	2,384	2,514	2,646		
1985	2,169	2,580	2,722			
1986	2,346	2,783				
1987	2,337					

Acc. Year	Incremental Loss Development Factors					
	12-24	24-36	36-48	48-60	60-72	72-Ultimate
1982	1.2045	1.0925	1.0177	1.0000	1.0000	
1983	1.2295	1.0189	1.0528	1.0000		
1984	1.1336	1.0545	1.0525			
1985	1.1895	1.0550				
1986	1.1863					
Selected	1.1900	1.0550	1.0450	1.0000	1.0000	1.0000
Ultimate	1.3120	1.1025	1.0450	1.0000	1.0000	1.0000

Accident Year	Reported Claims 12/31/87	Ultimate Factor	Projected Ultimate Claims
1982	2,416	1.0000	2,416
1983	2,552	1.0000	2,552
1984	2,646	1.0000	2,646
1985	2,722	1.0450	2,844
1986	2,783	1.1025	3,068
1987	2,337	1.3120	3,066

EXHIBIT IV

EXAMPLE AUTO INSURANCE COMPANY

Private Passenger Auto Bodily Injury  
Basic Limits

Development of Indicated Statewide Rate Level Change

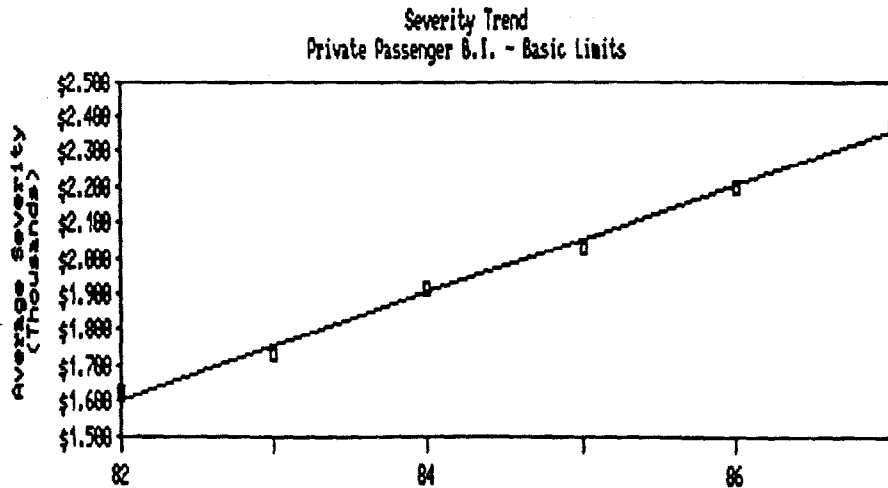
D. Development of Severity Trend Factor - Basic Limits

Accident Year	Projected Loss & Allocated (Exhib. II)	Projected Ultimate Claims (Exhib. III)	Projected Ultimate Average Severity	Linear Least-Squares Fit [1]
1982	\$3,928,805	2,416	\$1,626	\$1,605.90
1983	\$4,425,540	2,552	\$1,734	\$1,756.67
1984	\$5,081,668	2,646	\$1,921	\$1,907.44
1985	\$5,790,094	2,844	\$2,036	\$2,058.21
1986	\$6,760,207	3,068	\$2,203	\$2,208.98
1987	\$7,288,351	3,066	\$2,377	\$2,359.75

Annual Severity Trend Factor (1987/1986 Least-Squares)

1.0683

[1]  $y=mx+b$  where:  $x$  = Accident Year - 1981  
 $m$  = 150.77  
 $b$  = 1455.13



□ Projected — Linear Fit

EXHIBIT V  
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EXAMPLE AUTO INSURANCE COMPANY

Private Passenger Auto Bodily Injury  
Basic Limits

Development of Indicated Statewide Rate Level Change

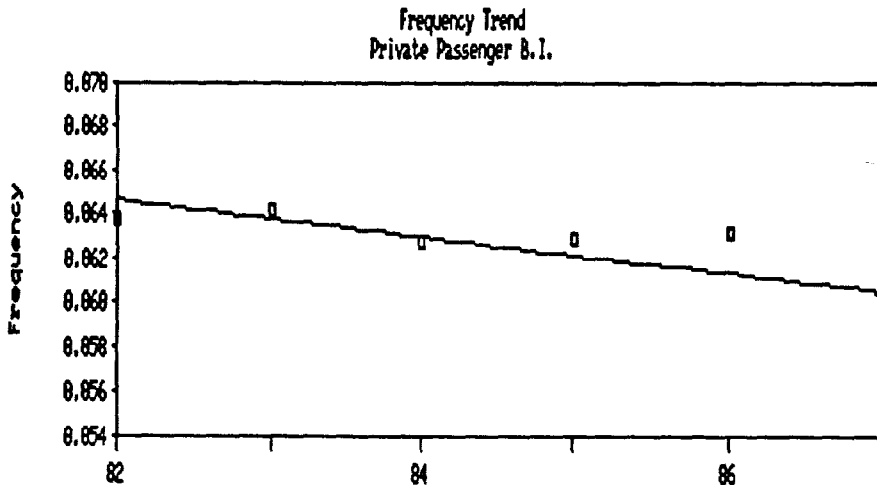
E. Development of Frequency Trend Factor

Accident Year	Projected Ultimate Claims (Exhib. III)	Earned Exposures	Projected Ultimate Frequency	Exponential Least- Squares Fit [2]
1982	2,416	37,846	0.0638	0.0647
1983	2,552	39,771	0.0642	0.0638
1984	2,646	42,135	0.0628	0.0630
1985	2,844	45,231	0.0629	0.0621
1986	3,068	48,583	0.0631	0.0613
1987	3,066	52,267	0.0587	0.0605

Annual Frequency Trend Factor (1987/1986 Least-Squares)

0.9867

[2]  $y = ae^{bx}$  where:  $x$  = Accident Year - 1981  
 $a$  = .065562  
 $b$  = -.013417



□ Projected — Exponential Fit

EXHIBIT VI  
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EXAMPLE AUTO INSURANCE COMPANY

Private Passenger Auto Bodily Injury  
Basic Limits

Development of Indicated Statewide Rate Level Change

F. Development of Target Loss & Allocated Loss Expense Ratio

(1) Commissions as % of Premium	15.00%
(2) Taxes, Licenses, Fees as % of Premium	2.25%
(3) Other Acquisition Expense as % of Premium	5.60%
(4) General Expense as % of Premium	6.80%
(5) Premium-Based Expense [(1)+(2)+(3)+(4)]	29.65%
(6) Unallocated Loss Expense as % of Loss & Allocated Loss Expense	6.42%
(7) Target Loss and Allocated Loss Expense Ratio [1.0 - (5)] / [1.0 + (6)]	66.11%

EXHIBIT VII

EXAMPLE AUTO INSURANCE COMPANY

Private Passenger Auto Bodily Injury  
Basic Limits

Development of Indicated Statewide Rate Level Change

G. Development of Statewide Indication

[1] Accident Year	[2] Projected Loss & Allocated (Exhib. II)	[3] Midpoint Experience Period	[4] Years to 12/31/88	Trend Factor to 12/31/88	
				[5] Severity 1.0683^[4] (Exhib. IV)	[6] Frequency .9867^[4] (Exhib. V)
1985	\$5,790,094	7/1/85	3.5	1.2602	0.9542
1986	\$6,760,207	7/1/86	2.5	1.1796	0.9671
1987	\$7,288,351	7/1/87	1.5	1.1042	0.9801
[7] Accident Year	[8] Trended Loss & Allocated [2]x[5]x[6]	[9] On-Level Earned Premium (Exhib. I)	[10] Trended On-Level Loss & Allocated Ratio [8]/[9]	[11] Target Loss & Allocated Ratio (Exhib. VI)	[12] Indicated Statewide Rate Level Change (( [11] / [10] ) -1.000)
1985	\$6,962,489	\$9,831,957	70.81%		
1986	\$7,711,984	\$10,575,919	72.92%		
1987	\$7,887,646	\$11,403,572	69.17%		
Total	\$22,562,119	\$31,811,448	70.92%	66.11%	7.28%

EXHIBIT VIII  
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EXAMPLE AUTO INSURANCE COMPANY

Private Passenger Auto Bodily Injury  
Basic Limits

Development of Indicated Rate Level Change by Class and Territory

H. Development of Trended Loss & Allocated by Class and Territory

T e r r i t o r y	C l a s s	1 9 8 5  1 9 8 6  1 9 8 7	[1] Loss & Allocated 12/31/87	[2] Ultimate Factor (Exhib. II)	[3] Severity Trend to 12/31/88 (Exh. VII)	[4] Frequency Trend to 12/31/88 (Exh. VII)	[5] Trended Projected Loss & Allocated {[1]x[2]}x {[3]x[4]}
1	1	1985	\$986,617	1.1070	1.2602	0.9542	\$1,313,334
1	1	1986	\$982,778	1.2564	1.1796	0.9671	\$1,408,606
1	1	1987	\$797,650	1.8595	1.1042	0.9801	\$1,605,191
1	2	1985	\$680,769	1.1070	1.2602	0.9542	\$906,205
1	2	1986	\$703,406	1.2564	1.1796	0.9671	\$1,008,185
1	2	1987	\$456,899	1.8595	1.1042	0.9801	\$919,464
1	3	1985	\$325,397	1.1070	1.2602	0.9542	\$433,152
1	3	1986	\$343,738	1.2564	1.1796	0.9671	\$492,676
1	3	1987	\$252,790	1.8595	1.1042	0.9801	\$508,715
2	1	1985	\$1,062,395	1.1070	1.2602	0.9542	\$1,414,206
2	1	1986	\$1,170,978	1.2564	1.1796	0.9671	\$1,678,351
2	1	1987	\$848,551	1.8595	1.1042	0.9801	\$1,707,624
2	2	1985	\$597,044	1.1070	1.2602	0.9542	\$794,754
2	2	1986	\$575,004	1.2564	1.1796	0.9671	\$824,147
2	2	1987	\$449,123	1.8595	1.1042	0.9801	\$903,815
2	3	1985	\$557,332	1.1070	1.2602	0.9542	\$741,892
2	3	1986	\$650,645	1.2564	1.1796	0.9671	\$932,563
2	3	1987	\$469,963	1.8595	1.1042	0.9801	\$945,754
3	1	1985	\$401,622	1.1070	1.2602	0.9542	\$534,619
3	1	1986	\$394,358	1.2564	1.1796	0.9671	\$565,229
3	1	1987	\$243,943	1.8595	1.1042	0.9801	\$490,911
3	2	1985	\$252,439	1.1070	1.2602	0.9542	\$336,034
3	2	1986	\$228,313	1.2564	1.1796	0.9671	\$327,239
3	2	1987	\$174,954	1.8595	1.1042	0.9801	\$352,077
3	3	1985	\$366,822	1.1070	1.2602	0.9542	\$488,295
3	3	1986	\$331,397	1.2564	1.1796	0.9671	\$474,988
3	3	1987	\$225,649	1.8595	1.1042	0.9801	\$454,096

EXHIBIT IX  
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## EXAMPLE AUTO INSURANCE COMPANY

Private Passenger Auto Bodily Injury  
Basic Limits

## Development of Indicated Rate Level Change by Class and Territory

## I. Development of Trended Pure Premium by Class and Territory

T	C	e	r	s	Acc. Year	[1]	[2]	[3]	[4]	[5]
						Trended Projected Loss & Allocated (Exh. VIII)		Earned Exposure (Exhib. I)		
1	1	1	1	1985	\$1,313,334	7,807	\$168.23	1.0000	1.3869	
1	1	1	1	1986	\$1,408,606	8,539	\$164.96	1.0000	1.2735	
1	1	1	1	1987	\$1,605,191	9,366	\$171.38	1.0000	1.4336	
1	2	1	1	1985	\$906,205	3,877	\$233.74	1.3894	1.4635	
1	2	1	1	1986	\$1,008,185	4,181	\$241.13	1.4618	1.5923	
1	2	1	1	1987	\$919,464	4,551	\$202.04	1.1788	1.3276	
1	3	1	1	1985	\$433,152	1,553	\$278.91	1.6580	1.4775	
1	3	1	1	1986	\$492,676	1,697	\$290.32	1.7599	1.3268	
1	3	1	1	1987	\$508,715	1,870	\$272.04	1.5873	1.3430	
2	1	1	1	1985	\$1,414,206	11,659	\$121.30	1.0000	1.0000	
2	1	1	1	1986	\$1,678,351	12,957	\$129.53	1.0000	1.0000	
2	1	1	1	1987	\$1,707,624	14,284	\$119.55	1.0000	1.0000	
2	2	1	1	1985	\$794,754	4,976	\$159.72	1.3167	1.0000	
2	2	1	1	1986	\$824,147	5,442	\$151.44	1.1691	1.0000	
2	2	1	1	1987	\$903,815	5,939	\$152.18	1.2730	1.0000	
2	3	1	1	1985	\$741,892	3,930	\$188.78	1.5563	1.0000	
2	3	1	1	1986	\$932,563	4,262	\$218.81	1.6892	1.0000	
2	3	1	1	1987	\$945,754	4,669	\$202.56	1.6944	1.0000	
3	1	1	1	1985	\$534,619	5,760	\$92.82	1.0000	0.7652	
3	1	1	1	1986	\$565,229	5,834	\$96.89	1.0000	0.7480	
3	1	1	1	1987	\$490,911	5,961	\$82.35	1.0000	0.6889	
3	2	1	1	1985	\$336,034	2,639	\$127.33	1.3719	0.7972	
3	2	1	1	1986	\$327,239	2,614	\$125.19	1.2921	0.8266	
3	2	1	1	1987	\$352,077	2,591	\$135.88	1.6500	0.8929	
3	3	1	1	1985	\$488,295	3,030	\$161.15	1.7363	0.8537	
3	3	1	1	1986	\$474,988	3,057	\$155.38	1.6037	0.7101	
3	3	1	1	1987	\$454,096	3,036	\$149.57	1.8162	0.7384	



EXHIBIT X  
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EXAMPLE AUTO INSURANCE COMPANY

Private Passenger Auto Bodily Injury  
Basic Limits

Development of Indicated Rate Level Change by Class and Territory

J. Development of Indicated Class Relativity to Class 1

Class	Terr.	Acc. Year	[1] Earned Exposure (Exh. IX)	[2] Relativity to Class 1 (Exh. IX)	[3] Weighted Relativity [1]x[2]
2	1	1985	3,877	1.3894	5,386.70
	1	1986	4,181	1.4618	6,111.79
	1	1987	4,551	1.1788	5,364.72
	2	1985	4,976	1.3167	6,551.90
	2	1986	5,442	1.1691	6,362.24
	2	1987	5,939	1.2730	7,560.35
	3	1985	2,639	1.3719	3,620.44
	3	1986	2,614	1.2921	3,377.55
	3	1987	2,591	1.6500	4,275.15
	Total	Total		36,810	1.3206

Current Class 2 Relativity 1.4500  
 Credibility = [Exposure/(Exposure+25,000)] 0.5955  
 Credibility Weighted Indication 1.3729  
 Selected Relativity 1.3700

Class	Terr.	Acc. Year	[1] Earned Exposure (Exh. IX)	[2] Relativity to Class 1 (Exh. IX)	[3] Weighted Relativity [1]x[2]
3	1	1985	1,553	1.6580	2,574.87
	1	1986	1,697	1.7599	2,986.55
	1	1987	1,870	1.5873	2,968.25
	2	1985	3,930	1.5563	6,116.26
	2	1986	4,262	1.6892	7,199.37
	2	1987	4,669	1.6944	7,911.15
	3	1985	3,030	1.7363	5,260.99
	3	1986	3,057	1.6037	4,902.51
	3	1987	3,036	1.8162	5,513.98
	Total	Total		27,104	1.6763

Current Class 3 Relativity 1.8000  
 Credibility = [Exposure/(Exposure+25,000)] 0.5202  
 Credibility Weighted Indication 1.7356  
 Selected Relativity 1.7400

EXHIBIT XI  
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EXAMPLE AUTO INSURANCE COMPANY

Private Passenger Auto Bodily Injury  
Basic Limits

Development of Indicated Rate Level Change by Class and Territory

K. Development of Indicated Territorial Relativity to Territory 2

Territory	Class	Acc. Year	[1] Earned Exposure (Exh. IX)	[2] Relativity to Terr. 2 (Exh. IX)	[3] Weighted Relativity [1]x[2]
1	1	1985	7,807	1.3869	10,827.53
	1	1986	8,539	1.2735	10,874.42
	1	1987	9,366	1.4336	13,427.10
	2	1985	3,877	1.4635	5,673.99
	2	1986	4,181	1.5923	6,657.41
	2	1987	4,551	1.3276	6,041.91
	3	1985	1,553	1.4775	2,294.56
	3	1986	1,697	1.3268	2,251.58
	3	1987	1,870	1.3430	2,511.41
	Total	Total	43,441	1.3941	60,559.89

Current Territory 1 Relativity 1.4000  
 Credibility = [Exposure/(Exposure+25,000)] 0.6347  
 Credibility Weighted Indication 1.3962  
 Selected Relativity 1.4000

Territory	Class	Acc. Year	[1] Earned Exposure (Exh. IX)	[2] Relativity to Terr. 2 (Exh. IX)	[3] Weighted Relativity [1]x[2]
3	1	1985	5,760	0.7652	4,407.55
	1	1986	5,834	0.7480	4,363.83
	1	1987	5,961	0.6889	4,106.53
	2	1985	2,639	0.7972	2,103.81
	2	1986	2,614	0.8266	2,160.73
	2	1987	2,591	0.8929	2,313.50
	3	1985	3,030	0.8537	2,586.71
	3	1986	3,057	0.7101	2,170.78
	3	1987	3,036	0.7384	2,241.78
	Total	Total	34,522	0.7663	26,455.23

Current Territory 3 Relativity 0.8500  
 Credibility = [Exposure/(Exposure+25,000)] 0.5800  
 Credibility Weighted Indication 0.8015  
 Selected Relativity 0.8000

EXHIBIT XII  
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EXAMPLE AUTO INSURANCE COMPANY

Private Passenger Auto Bodily Injury  
Basic Limits

Development of Indicated Rate Level Change by Class and Territory

L. Adjustment of Base Rate Change for Class and Territory Off-Balance

T e r r i t o r y	C l a s s	1 9 8 7	Acc. Year	[1]	[2]	[3]	[4]
				On-Level Earned Premium (Exhib. I)	Current Class Relativity (Exhib. X)	Current Territorial Relativity (Exhib. XI)	Current Relativity to Terr. 2 Class 1 [2]x[3]
1	1	1987		\$2,097,984	1.0000	1.4000	1.4000
1	2	1987		\$1,479,075	1.4500	1.4000	2.0300
1	3	1987		\$753,610	1.8000	1.4000	2.5200
2	1	1987		\$2,285,440	1.0000	1.0000	1.0000
2	2	1987		\$1,377,848	1.4500	1.0000	1.4500
2	3	1987		\$1,344,672	1.8000	1.0000	1.8000
3	1	1987		\$810,696	1.0000	0.8500	0.8500
3	2	1987		\$510,427	1.4500	0.8500	1.2325
3	3	1987		\$743,820	1.8000	0.8500	1.5300

Total \$11,403,572

T e r r i t o r y	C l a s s	1 9 8 7	Acc. Year	[5]	[6]	[7]	[8]	[9]
				Proposed Class Relativity (Exhib. X)	Proposed Territorial Relativity (Exhib. XI)	Proposed Relativity to Terr. 2 Class 1 [5]x[6]	Effect of Relativity Changes ([7]/[4])-1	Premium Effect [1]x[8]
1	1	1987		1.0000	1.4000	1.4000	0.00%	\$0
1	2	1987		1.3700	1.4000	1.9180	-5.52%	(\$81,604)
1	3	1987		1.7400	1.4000	2.4360	-3.33%	(\$25,120)
2	1	1987		1.0000	1.0000	1.0000	0.00%	\$0
2	2	1987		1.3700	1.0000	1.3700	-5.52%	(\$76,019)
2	3	1987		1.7400	1.0000	1.7400	-3.33%	(\$44,822)
3	1	1987		1.0000	0.8000	0.8000	-5.88%	(\$47,688)
3	2	1987		1.3700	0.8000	1.0960	-11.08%	(\$56,530)
3	3	1987		1.7400	0.8000	1.3920	-9.02%	(\$67,090)

Total

-3.50% (\$398,873)

Indicated Statewide Rate Change (Exhibit VII)	7.28%
Indicated Base Rate Change (1.0728/.9650)-1	11.17%
Current Class 1 Territory 2 Rate	\$160
Indicated Class 1 Territory 2 Rate	\$178

EXHIBIT XIII  
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EXAMPLE AUTO INSURANCE COMPANY  
Private Passenger Auto Bodily Injury  
Basic Limits

Development of Indicated Rate Level Change by Class and Territory

M. Development of Basic Limits Rates by Class and Territory

[1] Class	[2] Territory	[3] Class Relativity (Exhib. X)	[4] Territorial Relativity (Exhib. XI)	[5] Base Rate (Exh. XII)	[6] Class & Territory Rate [3]x[4]x[5]
1	1	1.0000	1.4000	\$178	\$249
	2	1.0000	1.0000	\$178	\$178
	3	1.0000	0.8000	\$178	\$142
2	1	1.3700	1.4000	\$178	\$341
	2	1.3700	1.0000	\$178	\$244
	3	1.3700	0.8000	\$178	\$195
3	1	1.7400	1.4000	\$178	\$434
	2	1.7400	1.0000	\$178	\$310
	3	1.7400	0.8000	\$178	\$248

[1] Class	[2] Territory	[7] 1987 Earned Exposures (Exhib. I)	[8] New Level Earned Premium [6]x[7]	[9] Current Level 1987 Earned Premium (Exhib. I)	[10] Statewide Rate Level Change ([8]/[9])-1
1	1	9,366	\$2,332,134	\$2,097,984	
	2	14,284	\$2,542,552	\$2,285,440	
	3	5,961	\$846,462	\$810,696	
2	1	4,551	\$1,551,891	\$1,479,075	
	2	5,939	\$1,449,116	\$1,377,848	
	3	2,591	\$505,245	\$510,427	
3	1	1,870	\$811,580	\$753,610	
	2	4,669	\$1,447,390	\$1,344,672	
	3	3,036	\$752,928	\$743,820	
Total	Total	52,267	\$12,239,298	\$11,403,572	7.33%

EXAMPLE AUTO INSURANCE COMPANY

Private Passenger Auto Bodily Injury

Development of Indicated 100/300 Increased Limits Factor

Unlimited Loss Amount	Claim Count	Distribution of Trended Losses [a]		
		Unlimited	20/40	100/300
\$1 - \$20,000	4,249	\$17,706,594	\$17,706,594	\$17,706,594
\$20,001 - \$30,000	244	\$5,842,632	\$5,340,562	\$5,842,632
\$30,001 - \$40,000	150	\$5,102,257	\$3,884,463	\$5,102,257
\$40,000 - \$50,000	107	\$4,819,591	\$2,902,869	\$4,819,591
\$50,001 - \$60,000	54	\$2,910,399	\$1,436,150	\$2,910,399
\$60,001 - \$70,000	25	\$1,641,237	\$743,278	\$1,641,237
\$70,001 - \$80,000	21	\$1,587,230	\$611,920	\$1,587,230
\$80,001 - \$90,000	20	\$1,660,283	\$588,525	\$1,660,283
\$90,001 - \$100,000	13	\$1,268,376	\$368,077	\$1,268,376
\$100,001 - \$200,000	6	\$681,544	\$193,968	\$660,723
\$200,001 - \$500,000	16	\$4,354,732	\$439,906	\$2,031,077
	4,905	\$47,574,875	\$34,216,312	\$45,230,399

[1] Indicated 100/300 Factor (\$45,230,399/\$34,216,312)	1.3219
[2] 100/300 Factor Indicated as of 12/31/85	1.2683
[3] Annual Trend $[(1.3219/1.2683)^{(1/2)}]-1.0000$	2.09%
[4] Projected 12/31/88 100/300 Factor $\{[1] \times (1+[3])\}$	1.3495
[5] Selected 100/300 Factor	1.3500

[a] Based upon unlimited claims closed from 1975 through 1987 trended to 12/31/87 at an annual rate of 8.5%.

EXAMPLE AUTO INSURANCE COMPANY

Proposed Rate Manual - 7/1/88

Private Passenger Auto Bodily Injury  
20/40 Basic Limits

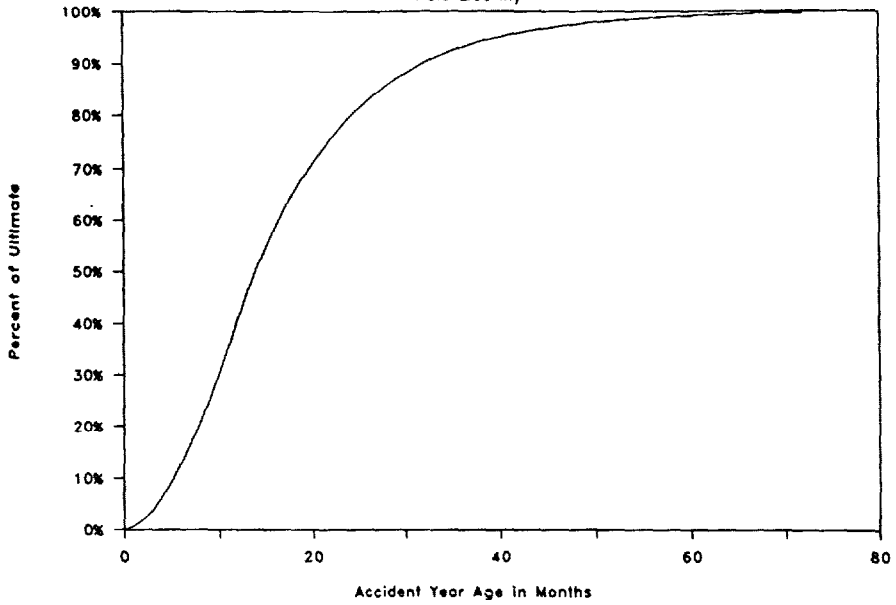
Territory	Class 1 Adult Drivers, No Youthful Operators	Class 2 Family with Youthful Drivers Not Principal Op.	Class 3 Youthful Owners or Principal Operators
1 - Central City	\$249	\$341	\$434
2 - Midway Valley	\$178	\$244	\$310
3 - Remainder of State	\$142	\$195	\$248

Increased Limits

Limit	Factor
100/300	1.35

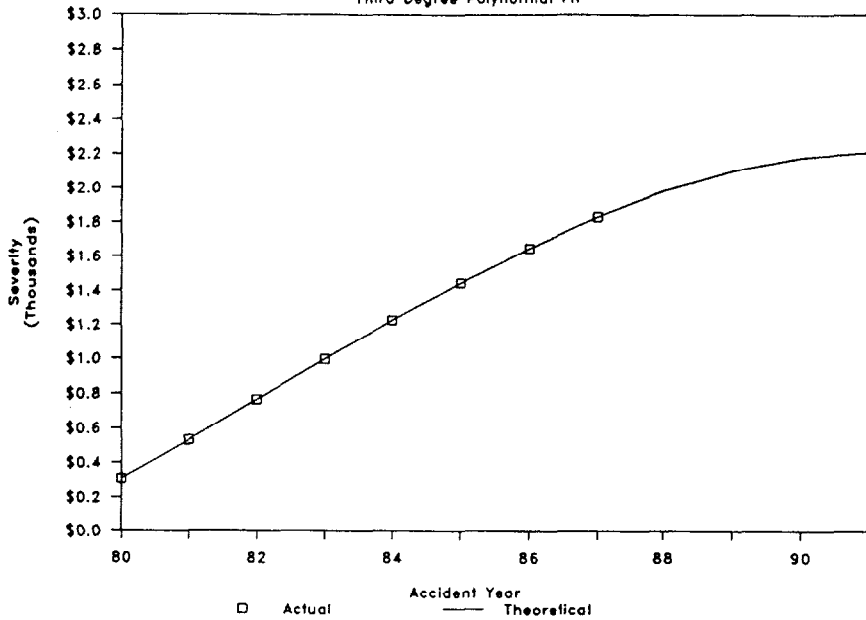
# Case-Incurred Loss Development

Auto Liability



# INDICATED SEVERITY TREND

Third Degree Polynomial Fit

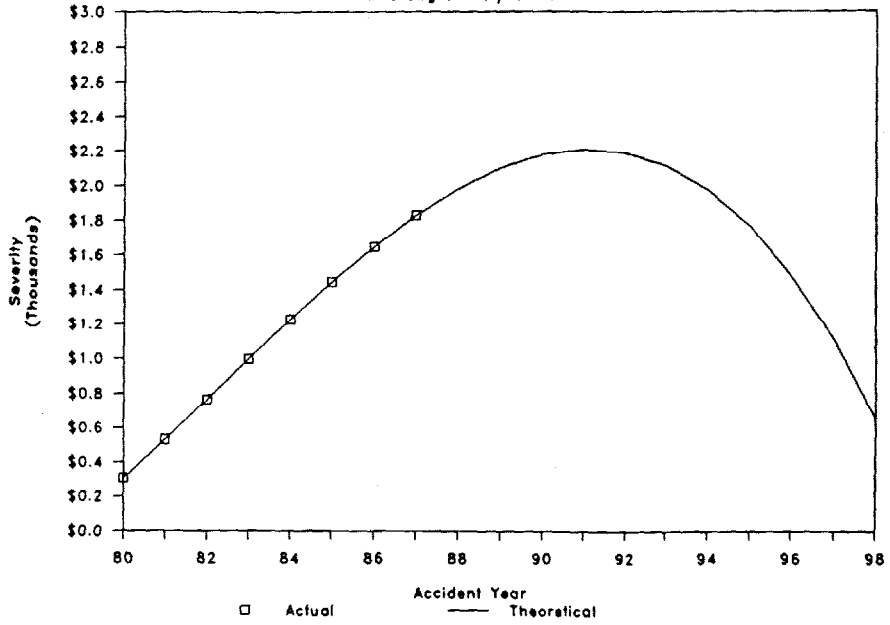


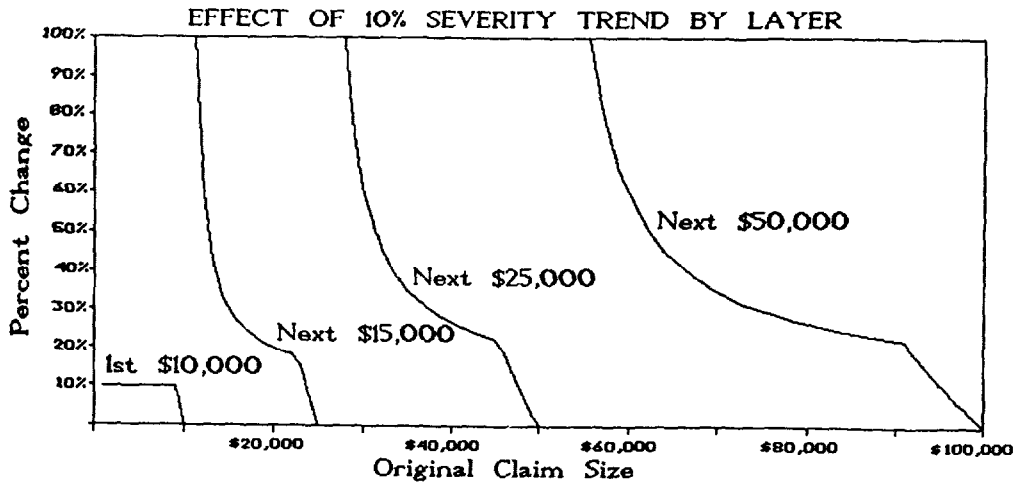
Chapter 1  
Figure 5



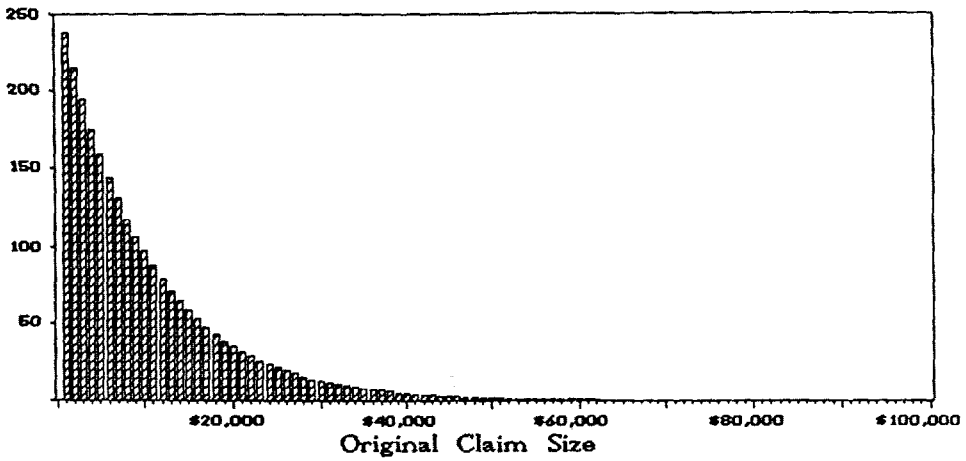
# INDICATED SEVERITY TREND

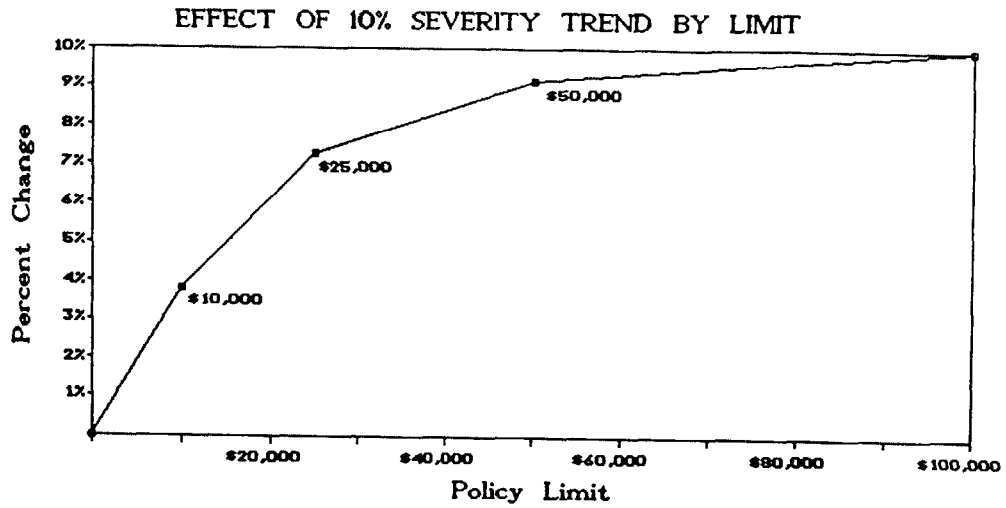
Third Degree Polynomial Fit

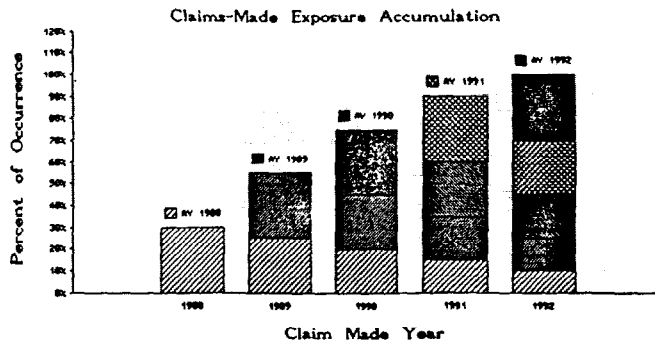




### THEORETICAL CLAIM DISTRIBUTION

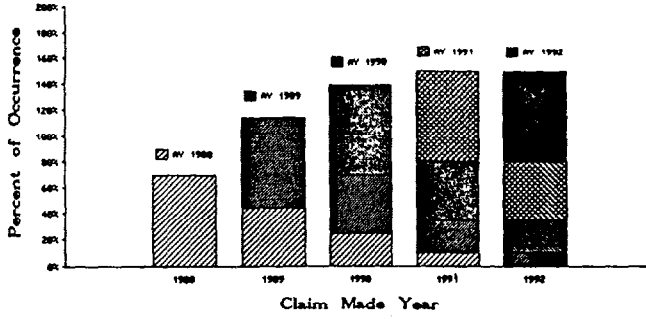






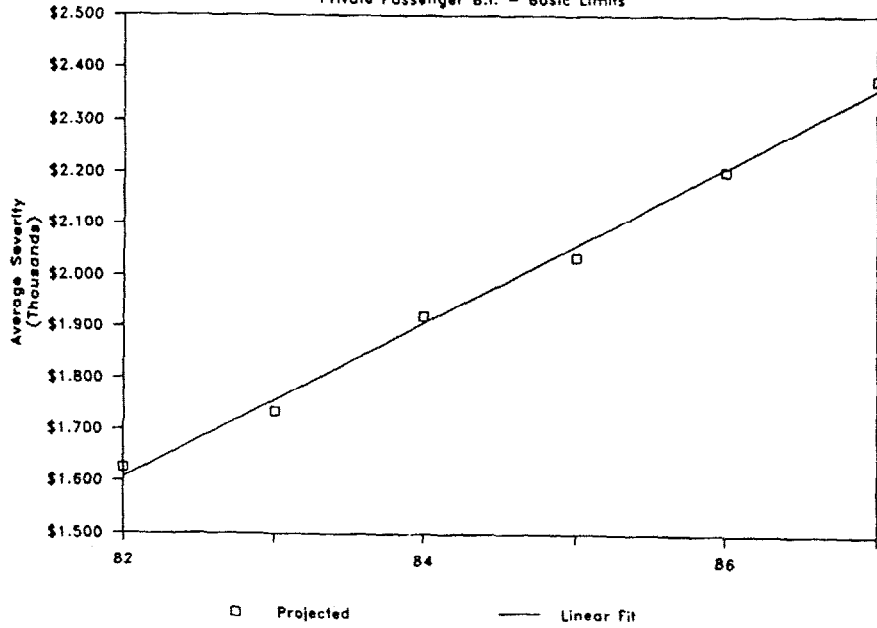
Chapter 1  
Figure 11

Claims-Made - Extended Reporting Endorsement Accumulation



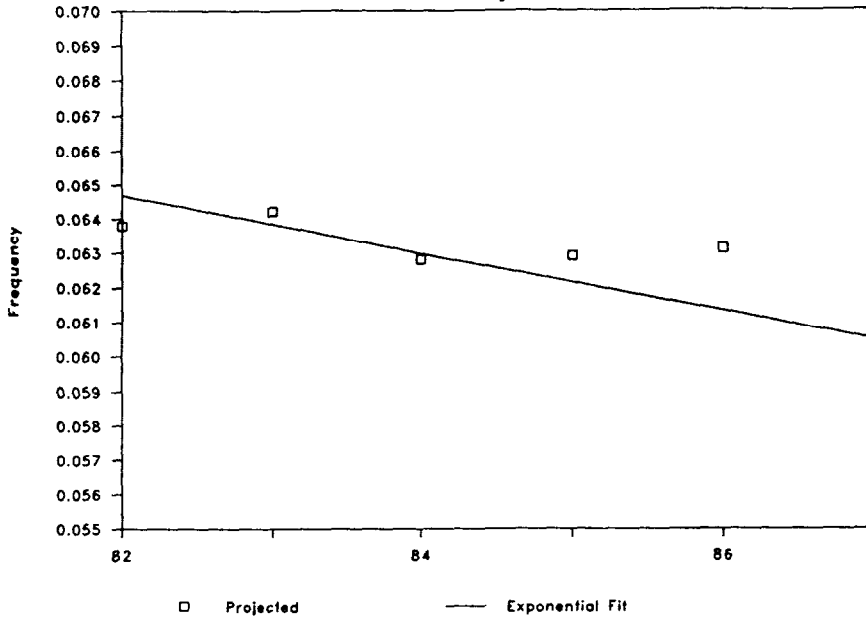
# Severity Trend

Private Passenger B.I. - Basic Limits



# Frequency Trend

Private Passenger B.I.





## FOUNDATIONS OF CASUALTY ACTUARIAL SCIENCE

Steve D'Arcy

## Chapter 8 - Special Issues

## Part 1 - Investment Issues in Property-Liability Insurance

## Section A - Investment Income

The property-liability insurance industry has traditionally segregated operating divisions and returns into two components, underwriting and investments. The concentration of most insurance textbooks, allocation of personnel and management attention has been on the underwriting side of operations. In many cases this emphasis on underwriting has led to neglect of investment operations. Until recently investment income was generally not considered in ratemaking. This neglect has tended to produce an investment strategy for insurers that is often inefficient and uncoordinated with underwriting performance. In insurance companies investment departments tend to be understaffed and investment managers undercompensated relative to other investment organizations such as stockbrokers and pension fund managers.

One reason for the relative neglect of the investment side of property-liability insurance operations was the comparative stability of underwriting profitability and net investment income, the value commonly used by insurers to describe investment performance. Figure 8-1-A-1 illustrates the underwriting profit or loss and net investment income for the period 1926 through 1986 for stock property-liability insurers. As is easily seen, the net investment income is much less volatile than the underwriting profit or loss value. The variability of underwriting profitability led to an emphasis on this aspect of insurance operations as insurance managers concluded, perhaps erroneously, that close attention to the underwriting aspect of operations could minimize the adverse results and increase the likelihood of favorable results. The rapid growth of investment income during the 1970s, resulting from both higher rates of return and longer loss payout patterns, prevented the industry from neglecting investment income any longer. Concurrently with the rapid growth in investment income, some regulatory authorities mandated the inclusion of investment income in the ratemaking methodology. By the mid 1980s investment income has become recognized, by necessity, as an equally important component of insurance operating results as underwriting income. The purpose of this section is to describe the typical investments of property-liability insurers, define investment terminology and discuss the role of investment income in pricing property-liability insurance.

As of the end of 1986, the property-liability insurance industry had a total of \$374 billion in admitted assets. Admitted assets are those recognized by statutory accounting conventions which tend to be conservative in valuing assets. Invested assets at the end of 1986 comprised approximately \$314 billion. The allocation of admitted assets among investment alternatives and other categories is displayed in Figure 8-1-A-2.

**Bonds**

Bonds, including U.S. government, municipal (state and local government

units) and industrial issues, represent the primary investment medium for the property-liability insurance industry. Bond investments have several characteristic attributes. Bonds typically consist of principal, which is the amount paid to the bondholder at the maturity date, and coupons, which are the periodic interest payments to the bondholder. However, bonds that have no maturity date (perpetuities) exist as do bonds that pay no current interest (zero coupon bonds). In most cases, the principal and coupon rate are fixed. However, a very few bonds determine the redemption value of the bond by reference to changes in the value of gold or prices in general. Variable interest rate bonds are available in which the coupon rate changes in line with current interest rates.

If an investor purchases a bond at issuance, the price is usually close to the principal value. The coupon rate produces an income stream that approximates the current interest rate on investments with similar risk and maturity. Any difference between the coupon rate and market interest rates is reflected in a price differential between the cost and principal. After issuance, changes in interest rates affect the market value of the bond. If interest rates were to rise, an investment yielding the prior, lower rate of interest would not be worth as much as it was previously. Thus, the market value of the bond would decline. Conversely, the market value of outstanding bonds rises as interest rates fall. The market value of any fixed income investment can be determined from the present value formula:

$$(1) PV = \sum_{t=1}^n CF_t / (1+r)^t$$

where PV = present value

CF = cash flow from investment (coupon or principal)

r = current rate of return

t = time until cash flow is received

Insurance accounting uses an amortized value for fixed income investments rather than market value accounting. The amortized value is determined by equation (1) with the rate of return applicable at the time the asset was purchased used instead of the current interest rate. Theoretically, equation (1) with the current rate of return used as the interest rate would yield the current market value. The amortized value gradually adjusts the value of the bond from the purchase price to the principal over the maturity of the bond. The justification used for this treatment is that it prevents the value of insurers' assets, and therefore surplus, from fluctuating with changes in interest rates. The major drawback of the use of amortized values is that they do not reflect the current price in the market. If an insurer sold bonds, the market value would determine the proceeds. Although insurers frequently hold bonds until maturity, when an insolvency arises and bonds have to be sold, the market value reflects the proceeds that will be received.

The interest received on corporate and U. S. government bonds is fully taxable under federal income tax regulations. Prior to the Tax Reform Act of 1986 (TRA), interest received on municipal bonds was exempt from federal income taxation. The revised tax law subjects 15 percent of municipal bond interest on bonds purchased after August 7, 1986, to regular income taxation. The Alternative Minimum Tax (discussed later) increases the taxable portion of municipal bond interest, depending on the interaction of underwriting gains or losses, taxable investment income, tax preference items and municipal bond interest. Traditionally, property-liability insurers invested heavily in tax exempt securities, although during the mid 1980s insurers' investment

portfolios shifted more heavily to taxable issues as statutory underwriting losses served as a tax shield for otherwise taxable investment income. The ratio of state and municipal bond investments to total admitted assets for 1986 was 8.7 percent, and the ratio of special revenue bonds, many of which also enjoyed tax exempt status prior to TRA, to admitted assets was 20.9 percent. These percentages are likely to decline as a result of TRA.

In addition to interest income on bonds, investors may also incur gains or losses on the value of the bond itself. Realized gains or losses on fixed income investments, which are the difference between the selling price and the purchase price, are fully taxable for all types of bonds in the year the bond is sold or redeemed. This provision provides for tax deferral on changes in the market values of bonds. The market value of bonds moves inversely to interest rate changes. Thus, depending on recent directions on interest rates, insurers may have a substantial amount on unrealized gains or losses that can be sold as part of a tax minimization strategy. These sales need to be coordinated with expected underwriting results to achieve this objective.

Investors in fixed income securities are accepting investment risk and, as such, require a return commensurate with the level of risk. Investments in low risk debtors, such as the U. S. government, generate lower yields than those in more risky debtors. Corporate bonds yield more than U. S. government bonds, and corporations with a low credit rating pay higher interest rates than more solvent firms. Similarly, the length of time until the debt will be redeemed also reflects different levels of risk. Thus, bonds of the same issuer with different maturities will provide different yields. The plot of yields versus time to maturity is known as the yield curve.

Normally, the yield curve is upward sloping, meaning that longer term securities have higher yields than shorter term ones. However, occasionally the yield curve is inverted, with shorter term debt yielding more than longer term securities. This inverted yield curve usually results from an upward spurt in the rate of inflation that investors expect to subside in the long run or from short term capital shortages from an expanding economy.

In order to take advantage of the usual higher yields on longer term issues, the property-liability insurance industry is normally heavily invested in long term debt. The maturity distribution of bond investments for the industry is shown in Figure 8-1-A-3. The advantage of a long term investment portfolio is that it locks in current interest rates making investment income less volatile and usually higher than the short term securities yield. The major disadvantages are that it locks insurers into historic rates of return when interest rates rise, and that the market values of long term bonds are more volatile than shorter term securities.

The long term fixed income investment strategy highlights one problem with the lack of coordination between underwriting and investments. An unexpected increase in inflation adversely affects underwriting performance by increasing loss costs above the levels anticipated when rates were set. The market values of long term bonds are reduced by an unexpected increase in inflation, which tends to push interest rates up. Thus, both underwriting and investments are adversely affected by increases in inflation. Conversely, both areas are favorably affected by declines in inflation. An investment strategy that hedged the impact of inflation on underwriting could be implemented, which would reduce the total risk of the insurer. Consideration of such a coordinated strategy by increasing actuaries' awareness of investment

operations is one objective of this chapter.

### Equities

The second largest component of insurance company investments is in common and preferred stocks, commonly termed equities. Shares of stock represent ownership interests in the firms, as opposed to the debtor/creditor relationship generated by bonds. Common stock is the primary ownership interest in the firm; preferred stock is a hybrid between a direct ownership interest and a fixed income investment. Preferred stock pays a predetermined dividend rate. The dividend can be omitted or reduced, but, generally, dividends to common stockholders cannot be paid until the preferred stockholders have been paid in full for any back dividends. Some preferred stock is convertible to common stock at a predetermined ratio. Without the convertibility feature, the prices of preferred stock fluctuate in line with bond prices rather than with stock prices. Preferred stock is an outgrowth of tax regulations that exempt a portion of stock dividends from corporate income taxation. Prior to TRA this tax-exempt portion was 85 percent; TRA reduced this value to 80 percent. Dividends on common stocks are subject to more volatility than those of preferred stocks. These dividends can be raised or lowered, or omitted without any obligation to restore prior levels or pay omitted values. The total return on common stocks consists of the dividends, if any, and price changes. In general, the common stock investor expects price appreciation to supplement the dividend income to produce a rate of return in excess of bond yields, as common stocks are more risky investments than fixed income securities. The actual rate of return on common stock investments has been both higher and more volatile than on fixed income securities. The average rates of return and standard deviations for common stocks and bonds by type are displayed in Figure 8-1-A-4 for the period 1926 through 1981.

Although bonds are stated at amortized value for statutory accounting purposes, stocks are stated at market value. Thus, changes in stock prices flow directly into surplus. However, unrealized gains or losses have not been subjected to taxation. Thus, if an insurer were to sell appreciated stock and incur taxes, the actual surplus would be less than the statutory value just prior to the realization of the gains.

### Real Estate

Although insurance companies are allowed considerable leeway in real estate investments, several statutory provisions limit the usefulness of this form of investment. Statutory requirements that vary by state establish upper limits on the amount of real estate holdings that are allowed as admitted assets. Any excess real estate investments are non-admitted, and thus are not included in surplus. Also, real estate investments are valued at the lower of net book value (cost less depreciation) or market value. These restrictions explain the rather low level of real estate investments by the property-liability insurance industry.

Real estate has traditionally been viewed as an inflation hedge for investors. As insurers are adversely impacted by inflation on underwriting operations, real estate investments may serve to reduce overall corporate risk. However, the severe valuation and investment restrictions discourage such investments. Under current regulations, the potential benefits from real estate investments must be weighed against the statutory drawbacks.

Regulations that tend to reduce the desirability of holding a fully diversified portfolio reduce investment flexibility and may prevent the use of optimal portfolio choices. More enlightened regulation may be enacted in the future that allows full utilization of all investment possibilities for insurers to manage risk optimally.

#### Other Investments

A small portion of property-liability insurers' assets are invested in mortgage loans, collateral loans, cash and miscellaneous assets, including oil and gas production payments, transportation equipment, timber deeds, mineral rights and motor vehicle trust certificates. Insurers are now allowed to invest in options and futures based on regulations in some states. Options represent the right, but not the obligation, to buy or sell a financial asset at a predetermined exercise price within a given time period. Financial futures are obligated transactions that will be consummated at a later date. Although the prices of options and futures are extremely volatile by themselves, investment strategies utilizing options and futures can reduce overall investment risk. Insurers are now beginning to adopt some of these approaches.

#### Investment Income

The total investment income of the insurance industry is segregated into several categories and reported separately in financial reports. The net investment income earned category is reported in the Underwriting and Investment Exhibit Part 1 of the Annual Statement. This value consists of all interest, dividend and real estate income earned during the year (adjusting for unpaid accruals) less all investment expenses incurred and less any depreciation on real estate.

Net realized capital gains and losses consists of any difference between the net sale price and the net purchase price of bonds, stocks or any other investment assets and is determined in Part 1A of the Underwriting and Investment Exhibit of the Annual Statement. These gains or losses can be realized as a result of a sale of an asset or upon the maturity of a bond. Net investment gain or loss is the sum of the net investment income earned and the net realized capital gains or losses. This total is displayed in the Annual Statement on line 9A of the Statement of Income on page 4 of the Annual Statement.

Net unrealized capital gains and losses are also determined on Part 1A. These consist of adjustments in book value resulting from market value changes (for equities) or amortized value changes (for bonds) and any gain or loss from changes in the difference between book value and admitted value. Thus, this value is a combination of actual price changes on equities, amortization on bonds and statutory accounting conventions. The entire net unrealized gain or loss flows directly into the surplus determination as listed on line 23 of the Statement of Income in the Annual Statement. The future tax consequences of the eventual realization of these gains or losses is not taken into account.

When investment income is considered in insurance ratemaking, either formally in the regulatory process or informally in company deliberations, the determination of the rate of return on investments must be established. Generally, one of two measures of investment income is used, the portfolio rate or the new money rate. The portfolio rate of return is determined by dividing

the net investment income earned by the statutory value of investable assets, usually determined by averaging the beginning and ending values. This measure ignores capital gains, either realized or unrealized. As statutory, rather than market, values are used for investable assets, this becomes a weighted average of past fixed income investments. If market values were used to determine the portfolio rate of return, the value of the investable assets would change in line with changes in interest rates, so the portfolio rate of return would approximate the new money rate.

New money rates of return reflect the current rate of return only, ignoring historic returns that the insurer may have locked in. The new money rate reflects current market conditions and indicates the rate of return the insurer is likely to obtain on any funds generated for investment purposes by writing policies. This rate of return is for fixed income securities, and does not apply to equity investments.

#### Impact of Investment Income on Pricing

From the promulgation of the 1921 standard profit formula until the mid 1960s, investment income was virtually ignored in insurance ratemaking. In establishing the 5 percent underwriting profit benchmark, the majority report of the Fire Insurance Committee of the National Convention of Insurance Commissioners concluded that "no part of the so-called banking profit (or loss) should be considered in arriving at the underwriting profit (or loss)." The model bill for state rate regulation approved by the National Association of Insurance Commissioners in 1946, in the wake of the McCarran-Ferguson Act's affirmation of the rights of states to regulate insurance, included the provision that "due consideration shall be given ... to a reasonable margin for underwriting profit and contingencies..." All but eight states adopted the model bill including this provision. The other eight states excluded the word "underwriting." Despite the different statutory language, by the early 1960s a 5 percent underwriting profit margin was the normal loading for all lines except workers' compensation.

During the 1960s, Florida, Maryland and Virginia began to require the consideration of investment income in ratemaking. A 1969 New Jersey Supreme Court decision ruled that investment income could not be ignored in setting insurance rates and remanded the case to reconsideration by the insurance commissioner. That ruling led to the New Jersey Remand Decision of 1972 which established a fair rate of return for an insurer and reduced that value by the policyholders' share of investment earnings. The policyholders' share of investment earnings is measured by multiplying the insurer's portfolio rate of return by the unearned premium and loss reserves less deductions for prepaid expenses. Considerable controversy has ranged in New Jersey over both the determination of the fair rate of return for insurers and the application of the specific formula for arriving at the target underwriting profit provision.

Beginning in 1975 rate regulatory hearings in Massachusetts began to require the inclusion of investment income. Protracted hearings led to the introduction of the Capital Asset Pricing Model (CAPM) into insurance ratemaking. The basic formula of the CAPM is:

$$E(r_A) = r_F + \beta (E(r_M) - r_F)$$

where  $r_A$  = return on an asset  
 $r_F$  = risk free rate of return  
 $r_M$  = return on the market portfolio  
 $\beta$  = systematic risk of asset  
 $E$  = expectation operator

Applying the CAPM to insurance pricing leads to the following (for the specific derivation see the Fairley paper included in Cummins and Harrington):

$$E(r_U) = -k(1-x)r_F + \beta_u(E(r_M) - r_F)$$

where  $r_U$  = underwriting profit margin  
 $k$  = investable funds per dollar of written premium  
 $x$  = expense ratio  
 $\beta_u$  = systematic underwriting risk

The theory behind the CAPM is that the equity markets are controlled by well diversified investors that are not concerned about the total risk (volatility of price) of an individual asset any more than an insurer is concerned about the risk of an individual policy. The law of large numbers assures that independent volatility will be of no consequence in the total risk of a portfolio of either individual investments or policies. The factor that does concern investors is the systematic risk, or that risk that cannot be diversified away. Based on the assumption that insurers are owned by such diversified investors (which may not hold for mutual insurers), this theory leads to the conclusion that only systematic underwriting risk needs to be considered in pricing insurance products.

A number of problems arise in applying the CAPM to insurance pricing. Market values of beta cannot be determined for individual lines since no single line insurer is publicly traded. Instead, accounting data is used to generate an assumed beta by measuring the fluctuations in reported underwriting profitability in line with stock market movements. No proof exists that accounting data can be used to determine betas for use in the CAPM. In addition to this problem, the betas calculated from accounting data are not stable over time, so use of a beta determined from historical data is unlikely to be valid for the ratemaking horizon.

Other methods for including investment income in ratemaking have also arisen as alternatives to the New Jersey Remand methodology and the CAPM. One method commonly used by insurers is termed the total rate of return model. The common application of this technique is to select a target rate of return for a given line of insurance either after analyzing its volatility or by use of a company wide standard. The contribution of investment income toward this total return is then projected, usually by multiplying the portfolio rate of return by the expected holding period for premium income, and subtracted from the target total return. The remainder of the target needs to be obtained from underwriting, providing a target underwriting profit margin. The major weaknesses of this approach are determining the proper target return and the use of portfolio rates of return to determine the investment income contribution.

Another approach that has been proposed in regulatory hearings is termed discounted cash flow analysis. Under this technique all of the cash flows

emanating from writing a policy are projected, period by period. The cash flows include premium income, expenses, taxes and loss payments. All cash flows are discounted to the beginning of the policy term by the appropriate discount rate. The primary drawback of this technique is the determination of the appropriate discount rate. One advocate of this technique proposed discounting losses and expenses by the CAPM determined discount rate ( $E(r_A)$ ) and taxes by the risk free rate.

The Florida Insurance Department adopted a ratemaking methodology in 1987 that combines investment income in the determination of the allowable underwriting profit margin by discounting premium income and loss payment patterns. Under this procedure an insurer calculates the investment income opportunities for all sublines and sets the target underwriting profit margin for the subline with the smallest value at a level no larger than 5 percent. The investment income opportunities are determined by multiplying the estimated portfolio rate of return for the insurer by the average length of time the funds will be held before losses are paid. The allowable underwriting profit margin for each subline other than the one with the smallest investment income opportunity is determined by subtracting the investment income differential from the initial target underwriting profit margin.

The various methodologies for including investment income in the determination of an allowable underwriting profit margin have the advantage of producing specific indications which can be used to establish rates. However, each method is subject to criticism for ignoring certain circumstances or requiring a value to be estimated that is difficult or impossible to obtain. An alternative school argues that investment income should be given indirect consideration, rather than be attempted to be included directly in the ratemaking process. The arguments in favor of this position are:

1. no formula approach is recognized as producing the correct results in all situations
2. the effect of competition on insurance prices is ignored in ratemaking formulae, but is crucial to the ability of an insurer to charge a particular rate level
3. if rates in a particular market are producing an excessive rate of return for insurers in total then new entry will drive the price down to the proper level
4. if rate levels are inadequate to produce an acceptable rate of return in total then insurers will exit from the market until price levels increase to the acceptable level
5. analysis of the difference in rate levels in prior approval and open competition states indicates that there are no significant differences in profitability over any extended time

The conclusion of these observations is that financial and insurance markets will work to produce the proper total rate of return for insurers, without the need for complicated formula adjustments. Although this may be true in the long run, the notorious underwriting cycle (the consistent pattern of fluctuation between profitability and losses for underwriting results as depicted in Figure 8-1-A-1) indicates that severe market distortions are caused as the market moves toward equilibrium. Exits and entry take time to affect prices. Thus, the slowness of market adjustments needs to be weighed against the inaccuracies of any rigid formula approach to insurance pricing problems.

Having a valid model is not necessary for the insurance industry to



function, just as stocks were traded for a long time before the CAPM arose to explain security returns. Tests of the validity of the CAPM for pricing financial assets are based on how well it explains historical returns for securities. Similarly, the validity of any insurance pricing model depends on how well it explains the prices actually charged. Using the model to determine regulated prices should be redundant if competitive forces are at play. If the model is correct, then why would it be necessary to force insurers to charge that price? This action is similar to requiring investors to buy and sell securities at prices determined by a theoretical model and not allowing the market to establish prices independently. The model rests on being able to explain prices, and not on prices being set by the model.

However, having an accurate insurance pricing model would be a substantial benefit. Although prices should move toward equilibrium in the long run, a valid model would allow insurers to price accurately in the short run as well. This increase in pricing accuracy would not prevent insurers from periodically undercharging or overcharging the equilibrium price, and thus would not eliminate the underwriting cycle. Nevertheless, a valid pricing model would allow insurers to determine the appropriate price level and might reduce the degree of fluctuations in results.

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Figure 8-1-A-1  
Underwriting Profit or Loss and Net Investment Income  
Stock Property-Liability Insurers  
1926-1986

Figure 8-1-A-2  
Distribution of Admitted Assets-1986

Bonds	
U. S. Government	15.7%
State, Municipal, etc.	8.7
Special Revenue	20.9
Industrials	8.9
Other	<u>3.0</u>
Subtotal-Bonds	57.3
Stocks	
Industrials	7.3
Affiliated Companies	4.2
Other	2.7
Preferred	<u>2.1</u>
Subtotal-Stocks	16.3
Mortgage Loans	1.2
Real Estate	1.0
Cash	1.5
Short Term Investments	6.0
Other Invested Assets	0.6
Premium Balances	8.0
Other Assets	<u>8.1</u>
Total	100.0

Figure 8-1-A-3  
Maturity Distribution of Bond Investments-1986

<u>Maturity</u>	<u>Allocation</u>
1 Year or Less	3.6%
1 to 3 Years	11.4
3 to 5 Years	12.2
5 to 10 Years	24.7
10 to 15 Years	15.6
15 to 20 Years	13.1
Over 20 Years	19.4

Figure 8-1-A-4  
Total Annual Rates of Return: 1926-1981

	Geometric Mean	Arithmetic Mean	Standard Deviation
Common Stocks	9.1	11.4	21.9
Long Term Corporate Bonds	3.6	3.7	5.6
Long Term Government Bonds	3.0	3.1	5.7
U. S. Treasury Bills	3.0	3.1	3.1

Part 1 - Section B  
Investment and Tax Strategies

In a typical property-liability insurance company, the underwriting and investment operations are run separately. Each area attempts to maximize returns independently of the other. Although the two areas are inextricably linked operationally - the underwriting area provides the cash flow for investment and generates the need for cash to pay expenses and claims and the investment area generates investment income from the funds in the interim - prior to the mid 1980s, few insurers actively coordinated the two activities. In this section, several strategies that link underwriting and investment operations will be discussed.

#### Asset-Liability Matching

The investment strategy behind asset-liability matching is to invest funds for exactly as long as they will be held. If a certain amount of funds will be needed in six years to pay claims, then investments would be made that would generate that amount in six years. If longer term bonds were held, then the insurer would have to sell the bonds when the funds are needed, creating the possibility of a gain or loss on the sale depending on interest rate fluctuations. A shorter term investment would be readily available when the funds are needed, but prior to that time the funds would have been continually reinvested at the then available interest rates, exposing the insurer to interest rate risk during the interim. By locking in the current rate of return for the applicable holding period, the insurer eliminates interest rate risk.

Financial institutions such as banks and life insurers utilize asset-liability matching more heavily than property-liability insurers. By matching assets and liabilities banks, for example, avoid the problem of investing long term (fixed rate mortgages), while borrowing short term (passbook savings accounts and short term certificates of deposit). If assets and liabilities were not matched, banks would be exposed to interest rate risk where a rise in interest rates would increase the cost of funds but does not increase the investment income.

If a property-liability insurer were to adopt asset-liability matching, the payout pattern on existing liabilities would be matched by an investment portfolio that produced the cash flow as needed. Changes in interest rates would not affect the availability of cash as the desired flow would be locked in.

Two arguments are raised against the need for property-liability insurers to adopt asset-liability matching. First, in most situations the cash inflow in a given period from new and renewal policies is adequate to pay all losses and expenses. Even if premium receipts were not enough to pay all losses and expenses, they are predictable enough to avoid the need to generate all cash needs from investments. A small margin of liquid assets could prevent an insurer from incurring losses on premature sale of assets.

The second argument against asset-liability matching revolves around the predictability of payout patterns for property-liability insurers. For banks the values of liabilities are fixed and the maturity dates of savings accounts are known. For insurers, the loss costs and payout dates are not certain, but must be estimated. Future inflation rates could affect the value of losses. An investment strategy that generates a predetermined amount of cash at a set

time may not match the need for cash as the loss payouts develop. Since a rise in the rate of inflation would most likely increase the cost of losses while, at the same time, increasing interest rates, a more appropriate hedging strategy for a property-liability insurer might be to invest in maturities shorter than the indicated need for cash in order to reinvest at interest rates that more closely approximate the underlying rate of inflation that affects loss costs.

#### Duration

The commonly used measure of maturity for fixed income investments is inappropriate for analyses of interest rate risk because it focuses on the time when the principal will be repaid. However, during the time until maturity, the asset will be generating interest income which is either used by the asset holder or reinvested at the then current interest rates. The effective yields based on market valuation on two bonds with the same maturity dates but different coupon rates would be the same under stable interest rates but would differ in volatile interest rate times.

The duration of a security is the weighted average of the length of time until payments will be received by the holder. Duration is calculated as follows:

$$D = \frac{\sum_{t=1}^n C_t(t)/(1+r)^t}{\sum_{t=1}^n C_t/(1+r)^t}$$

Where  $C_t$  = interest or principal payment at time  $t$   
 $(t)$  = length of time to payment  
 $n$  = length of time until maturity  
 $r$  = yield to maturity

The denominator of the equation is the present value of the fixed income investment. The numerator is the present value of the payments weighted by the length of time until they are paid. The higher the duration, the longer into the future the payments will, on average, be received.

To illustrate the concept of duration, two \$1000 face value bonds, each with a remaining maturity of five years and annual coupon payments, will be used. The first bond has a coupon rate of 6 percent and the second 12 percent. Each has a yield to maturity of 9 percent, reflecting current interest rates on five year bonds. The duration of the first bond is calculated by:

$$D_1 = \frac{\frac{(60)(1)}{1.09} + \frac{(60)(2)}{(1.09)^2} + \frac{(60)(3)}{(1.09)^3} + \frac{(60)(4)}{(1.09)^4} + \frac{(1060)(5)}{(1.09)^5}}{\frac{60}{1.09} + \frac{60}{(1.09)^2} + \frac{60}{(1.09)^3} + \frac{60}{(1.09)^4} + \frac{1060}{(1.09)^5}}$$

$$D_1 = 3909.70/883.32 = 4.426$$

The duration of the second bond is calculated similarly, except the coupon is 12 percent, or 120 per year, rather than 60 per year.

$$D_2 = \frac{\frac{(120)(1)}{(1.09)} + \frac{(120)(2)}{(1.09)^2} + \frac{(120)(3)}{(1.09)^3} + \frac{(120)(4)}{(1.09)^4} + \frac{(1120)(5)}{(1.09)^5}}{\frac{120}{1.09} + \frac{120}{(1.09)^2} + \frac{120}{(1.09)^3} + \frac{120}{(1.09)^4} + \frac{1120}{(1.09)^5}}$$

$$D_2 = 4569.74/1116.68 = 4.092$$

The duration of the second bond is less than the duration of the first bond because the interim payments are larger. The weighted average of the date of the receipt of cash from the second bond is sooner than that of the first bond.

Duration is commonly calculated on fixed income assets in which the coupon payments and principal are known. For property-liability insurers, the duration of liabilities, particularly loss reserves, can also be determined, although not with certainty. In this context the duration of liabilities would simply be the weighted average of the length of time until the payments will be made.

#### Immunization

Immunization of a portfolio is any strategy that eliminates price risk and coupon reinvestment risk on a fixed income portfolio. Asset-liability matching is one method of immunization, but it requires an exact balancing of income from investments against cash needs. A less restrictive method of immunization is for the duration of the investment portfolio to equal the duration of the cash flow needs, or the duration of the assets to equal the duration of the liabilities.

On an immunized portfolio interest rate changes affect the two investment risks in offsetting ways. A rise in interest rates lowers the market price of outstanding bonds, but allows reinvestment of income to be made at a higher rate, preventing a change in eventual cash flow. A drop in interest rates raises the price of outstanding bonds but reduces the reinvestment rate. Thus, the predicted amount of cash can be available when needed.

The immunization strategy can be thwarted if the yield curve changes shape. If short term interest rates fall proportionately more than long term rates, the reinvestment rate will drop more than the price of outstanding issues will increase. Theoretically, the investment portfolio can be adjusted continually to minimize such distortions, but this increases the cost of this strategy. Also, the liabilities of property-liability insurers can differ from the original forecast, making even an immunized portfolio inadequate to meet the new cash flow needs.

#### Taxation

The Tax Reform Act of 1986 (TRA) dramatically changed the income tax regulations for the property-liability insurance industry. The overall effect of this new law is still uncertain and many of the interpretations of statutory language are in the process of being clarified. The major provisions of TRA will be discussed here, but the reader is urged to refer to more complete and timely sources for a full explanation of this watershed tax legislation.

The stated goal of TRA is to raise \$7.5 billion in tax revenue from the property-liability insurance industry over the five year period 1987-1991. One provision of TRA is the delegation of a study to determine if that revenue goal

is being met and to recommend any necessary changes in the tax law to achieve this target figure. One reason for the concentration on tax revenue is the federal budget deficit, currently running in the \$150-200 billion level annually. The property-liability insurance industry was the target of such a significant change in tax regulations as a result of the failure of the prior tax code to produce any significant revenue from the industry. In fact, during the five year period 1982-1986, the property-liability insurance industry in aggregate recouped \$6.2 billion in taxes previously paid. The sudden shift from recouping an average of \$1.2 billion in taxes per year to paying \$1.5 billion per year is bound to cause severe distortions and market tightening, as well as require price increases industry wide.

In addition to the aggregate negative tax position of the property-liability insurance industry, several other situations called attention to the industry during the 1986 version of tax legislation. Retroactive insurance was becoming a feasible product, fueled in part by tax subsidies and the differential tax treatment of property-liability insurers. After MGM Grand Hotel suffered a major fire loss, it purchased additional coverage for less than the expected losses. The insurers expected that they could profit from this below cost pricing by immediately establishing loss reserves at the expected loss level and reporting an underwriting loss for tax purposes. This loss generated tax savings which, in addition to the net premium, could be invested until the loss were paid. Thus, the tax code was subsidizing insurers in pricing coverage to the extent that known losses could be covered by insurance more inexpensively than if the non-insurance corporation paid the loss itself. The tax regulations for non-insurance firms allow the tax deduction for losses only when the loss is paid, not when it is incurred. In addition to generating a market for retroactive insurance, this differential contributed to the growth in captive insurance companies as they attempted, unsuccessfully it turned out, to qualify for classification as insurers, that would have allowed the firms to utilize the more favorable rules of deducting losses when incurred rather than when paid.

Another aspect of the insurance industry that focussed the tax reformers' attention on the property-liability insurance industry was the growing practice of loss reserve transfers. Insurers were using this strategy to optimize the use of taxable income and tax loss carrybacks. Under this approach an insurer with an excess of tax losses would sell loss reserves to another insurer in a tax paying position through the use of reinsurance. The first insurer would transfer loss reserves to the second insurer and, at the same time, pay the second insurer a premium that was less than the statutory value of the losses, but more than the present value of those losses. The first insurer would immediately book an underwriting gain equal to the difference between the premium and the statutory loss reserve value. The second insurer would book an underwriting loss, which could be used to offset other taxable income.

The primary provision in insurance tax regulations that generated negative tax payments for the prior five years and promoted retroactive insurance, the growth of captives and loss reserve transfers, was the ability of insurers to deduct the total future value of loss and loss adjustment expense payments on incurred losses as opposed to the economic worth, or present value. Discounting loss reserves at an appropriate rate would alleviate this problem. Although discounting of loss reserves was included in TRA, the mandated discount rate is not necessarily the appropriate rate, and several other far more onerous provisions were included in TRA.



The primary provisions of TRA for property-liability insurers are to:

1. Tax previously tax exempt interest and dividends
2. Include a portion of the unearned premium reserve as taxable income
3. Discount loss reserves for tax purposes
4. Eliminate the Protection Against Loss (PAL) account
5. Apply a strict Alternative Minimum Tax (AMT)

#### Tax Exempt Interest and Dividends

Municipal bonds have traditionally been exempt from federal income taxation as a subsidy to state and local government units in raising revenue. The property-liability insurance industry has been a heavy investor in such issues. A common investment strategy has been to invest in taxable bond issues to the extent of offsetting any underwriting losses with the remainder of the investment portfolio invested in municipal bonds. This strategy led to the low effective tax rates on property-liability insurers during the past decade.

Common and preferred stock dividends from domestic corporations have also received favorable tax treatment. In order to avoid double taxation of dividends for corporate investors, an income tax deduction of 85 percent of the dividends received was allowed prior to TRA. Under TRA this deduction is reduced to 80 percent of dividends received.

Thus, all municipal bond income and 80 percent of dividend income is exempt from taxation for corporate investors. However, TRA reduces the loss reserve deduction by 15 percent of this otherwise tax free income on any investment acquired after August 7, 1986, in essence taxing 15 percent of this income.

#### Unearned Premium Reserve

The unearned premium reserve is the prorata portion of premiums that reflect unexpired coverage. As expenses tend to be paid at the beginning of the exposure period and losses generated proportionally over the coverage period, the unearned premium reserve includes a well recognized redundancy to the extent that the reserve reflects previously paid expenses. This redundancy is commonly termed the "equity in the unearned premium reserve." This "equity" varies depending on the individual insurer's expense ratio and expected loss ratio. Accordingly it would be highest for lines of business and insurers with high expense ratios and lowest for lines and insurers with low expense ratios. This distinction is not recognized under the revised tax regulations. Under TRA 20 percent of the change in the unearned premium reserve will be included in taxable income. In addition, 20 percent of the unearned premium reserve as of December 31, 1986, will be included in taxable income ratably over the six year period beginning in 1987. Thus, for 1987 taxable income will include 20 percent of the change in unearned premium reserve from 12/31/86 to 12/31/87 plus 3.33 percent (one-sixth of 20 percent) of the 12/31/86 unearned premium reserve.

#### Loss Reserves

Prior to TRA, statutory loss and loss adjustment expense reserves were used to calculate taxable income. These statutory values are intended to be the total undiscounted value of all loss and loss adjustment expense payments to be made in the future for losses that have occurred prior to the evaluation date. By not adjusting for the present value of these payments, a payout to be

made in ten years is valued equally with an imminent payout.

TRA requires discounting of loss and loss adjustment expense reserves for determining taxable income. The interest rate to be used for discounting is the five year moving average of the Applicable Federal Rate on three to nine year securities, but months prior to August, 1986, are not included in the calculation. For 1987 the average rate for the months August, 1986, through December, 1986, is to be used. This rate is 7.20 percent. For 1988, the average rate for August, 1986, through December, 1987, will be used.

The payment pattern for loss and loss adjustment expense reserves can be either the pattern promulgated by the Treasury Department, based on industry experience through 1985 as reported by A. M. Best, or a company's individual experience. Whichever choice an insurer makes for determining 1987 taxable income will be binding for five years. The payment pattern determined by the Treasury Department will not be updated during that five year period. An insurer selecting to use its own payout pattern must update the values each year, but only with respect to the new accident year. Payout patterns on prior years cannot be changed, even if the loss development pattern differs from the original projection.

A fresh start approach is applied to discounting loss reserves. For 1987 the discounted loss and loss adjustment expense reserves for both beginning and ending reserves will be calculated and the difference included in the taxable income determination. Without the fresh start approach, ending reserves would have been discounted but not beginning reserves, which would have substantially increased taxable income for 1987.

#### Protection Against Loss (PAL) Account

Prior to the TRA, mutual property-liability insurers were allowed a tax deduction for contributions to a fund that could be drawn upon as needed in times of unprofitability. This fund, termed the Protection Against Loss (PAL) fund, was justified based on the inability of mutual insurers to raise capital by issuing equity, as stock insurers could do if additional funding were required. Maximum contributions were related to premiums written. The deduction for PAL accounts is repealed starting in 1987. Amounts in existing PAL accounts can continue to be treated as provided by pre-TRA provisions: 1) the accounts are accumulated until offset by taxable losses, 2) amounts not absorbed by the fifth year are included in taxable income except for one-half of 25 percent of underwriting gains, 3) any continuing amount is included in taxable income when the insurer ceases to qualify as a mutual insurer.

#### Alternative Minimum Tax (AMT)

The more stringent provisions of the Alternative Minimum Tax regulations will entail most property-liability insurers' calculating two sets of taxes and paying the higher. The regular tax is calculated on the regular taxable income; the AMT is calculated from the alternative minimum taxable income (AMTI). The AMTI is determined by adding tax preference items to the regular taxable income. These preference items include:

- 1) book income versus taxable income
- 2) certain tax exempt income
- 3) accelerated depreciation

Book income will normally be the annual statement income after dividends to policyholders but before income taxes. However, if GAAP statements are filed with the Securities and Exchange Commission or audited financial

statements used for other purposes, these income values take precedence over annual statement data. The tax preference item for the years 1987 through 1989 is 50 percent of the difference between the book income and the AMTI excluding this item. After 1989 the preference item will be 75 percent of the difference between adjusted current earnings and AMTI before this adjustment. The definition of adjusted current earnings is not clear at the time this is being written (early 1988).

Tax exempt interest on certain private activity bonds (e.g., industrial development bonds) issued after August 7, 1986, is included as a tax preference item. Also, any depreciation taken in excess of the 150 percent declining balance method for tangible personal property or over 40 year straight-line depreciation for real property will be included as a preference item.

#### Tax and Investment Strategies

An entirely new operating strategy for property-liability insurers emerges as a result of TRA. Insurers will pay the larger of the regular tax or the AMT. Net after tax income is maximized when the two taxes are equal. Thus, insurers should manage their investment portfolios by shifting assets between taxable and tax exempt investments depending on the relative yields and the company's tax calculations. Projected underwriting losses, based on discounted loss reserves and including part of the unearned premium reserve as income, will indicate the optimal investment mix. The need for coordination between underwriting and investment operations will be increased. Actuaries will most likely be involved in developing this strategy as underwriting results must be forecasted and loss reserves discounted. This new role for actuaries increases the need for actuaries to master investment and tax issues.

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Part 1 - Section C  
Rate of Return Measures

In order to quantify the profitability of the property-liability insurance industry, users of financial data have developed a number of measures that are relied upon to provide some insight into current and past operating results. Some of these measures are easy to calculate, and others are more complex. Some measures are widely used, whereas others are applied only in the more complex rate regulatory hearings and in sophisticated company analyses. This section will describe several of these measures, discuss the meaning of the values and analyze the strengths and weaknesses of the measures.

#### Combined Ratio

The combined ratio is determined in two different ways. It can be calculated as the sum of the loss ratio and the expense ratio or as this sum less the policyholders' dividends ratio. The loss ratio is determined by dividing the incurred losses, including loss adjustment expenses, by the earned premium. The expense ratio is calculated by dividing expenses by the written premium. The policyholders' dividend ratio is determined by dividing dividends by earned premium. The combined ratio is thus involves combining ratios with different denominators, in a sense a mixture of apples and oranges.

The combined ratio is calculated in the foregoing manner to make an adjustment for the different rates at which losses and expenses tend to be incurred for property-liability insurers. Losses tend to be incurred evenly over the coverage period for most lines of business. If a policy is for an annual term, then, except for slight seasonal patterns, losses are likely to occur evenly over the year. One-twelfth of the losses are expected to occur in the first month the policy is in force, one-half by the middle of the exposure period, and so forth. Therefore, losses that have been incurred are divided by the earned premium to determine the portion of the premium expended on losses to date.

Conversely, expenses for such items as commissions, premium taxes, policy coding costs and overhead, tend to be incurred as soon as the policy is written. These expenditures are not recurring over the policy term. Thus, the expenses are divided by the premium written to determine the portion of premiums that are used to cover expenses.

For an insurer that is writing a constant premium volume, eventually the written and earned premiums will be equal. Thus, the use of the different denominators in the combined ratio will not have any effect. However, most insurers do not write a constant level of premiums. During inflationary periods, even an insurer not writing any increase in exposures will be experiencing an increase in written premium. In general, the written premium exceeds the earned premium unless an insurer is scaling back operations either in a given state or nationally. The combined ratio adjusts the expenditure pattern to reflect the different rates of payouts for losses and expenses for this normal difference.

The combined ratio is easy to calculate and widely used within companies and in public discussion of insurance profitability. Figure 8-1-C-1 shows the

combined ratio including dividends to policyholders for the period 1939 through 1986 for all stock property-liability insurers. This graph shows that the combined ratio fluctuates considerably and the levels during the mid 1980s were unusually high. Many industry publications concentrate on the combined ratio as a measure of financial health of the insurance industry. Levels below 100 indicate that an insurer, or the industry, is paying out less in losses, expenses and dividends than it is taking in as premium, and therefore is profitable. Levels in excess of 100 indicate that expenditures exceed premium income. Interpretation of the meaning of such values is difficult and often leads to unsupported statements.

The advantage of the combined ratio as a measure of insurance performance is its simplicity. However, this also leads to its major problem. The combined ratio does not include any provision for investment income in the calculation. As insurers generally pay losses after premium is received, they earn investment income prior to payment of claims. If the delay between receipt of premium and payment of losses were stable among lines and over time, and the interest rate on invested funds were constant, then the contribution of investment income to insurer profitability would be consistent and an easy adjustment to the combined ratio could be made. Unfortunately loss payout patterns vary among lines of business and over time and interest rates have been volatile, especially over the past two decades. Thus, a combined ratio of, for example 110, could be acceptable if the loss payout pattern is slow, as in liability lines, and interest rates high. Conversely if the loss payout pattern is rapid, as in a property line, and/or interest rates at the low end of the cycle over the period, then the same 110 combined ratio could indicate a pricing problem.

#### Underwriting Profit Margin

The underwriting profit margin is calculated by subtracting the combined ratio from 100. Conversely, the expected loss ratio is often determined by subtracting the sum of the target underwriting profit margin and the expense ratio from 100. This value suffers from the same basic problem as the combined ratio since the underwriting profit margin is calculated from the same data: investment income is not included. Thus, determining the appropriate underwriting profit margin is difficult.

Historically, the property-liability insurance industry sought to achieve standard underwriting profit margins. The industry standard was 2.5 percent for workers' compensation and 5 percent for all other lines. These standards were derived from the 1920 era of insurance regulation and had no mathematical or economic support. By achieving a 5 percent underwriting profit margin, an insurer was, in the long run, retaining 5 percent of sales, which was argued as being a reasonable proportion. This measure was not equated to a return on equity measure. As investment income was not included, it did not reflect total insurance profitability. Also, as different insurers operated at different premium to surplus ratios, total return on equity would vary among insurers with the same underwriting profit margins.

Fluctuations in the underwriting profit margin occur normally as a result of catastrophic losses and other unpredicted developments. The gradual increasing trend of the combined ratio shown in Figure 8-1-C-1 (and therefore the decreasing trend of the underwriting profit margin) is the result of competitive pressures as longer payout patterns and higher interest rates

developed. Negative underwriting profit margins occurred in almost each year since 1973, which some industry spokespersons claimed indicated inadequate rates. Although the statement about inadequate rates may have been true, negative underwriting profit margins do not, by themselves, lead to this conclusion.

### Operating Ratio

The failure of the combined ratio and the underwriting profit margin to include the effect of investment income has led to the emphasis on the operating ratio as a profitability measure. The operating ratio is calculated by subtracting the ratio of investment income divided by the earned premium from the combined ratio. Thus, investment income is "included" in the profitability measure.

A number of serious problems still exist in the use of the operating ratio as a measure of profitability. The first problem is the definition of investment income. Some users of financial data include only net investment income earned which consists of interest and dividends received. Other users apply the net investment gain or loss value which includes net realized capital gains and losses as well as the investment income earned. A third possible definition of investment income includes net unrealized capital gains and losses in addition to the other components. Thus, three possible operating ratios can be calculated, leading to considerable confusion.

Regardless of which definition of the investment income is used, potential problems result. The most commonly used definition of investment income is net investment income earned. This is not a realistic measure of investment income for any investment other than very short term debt instruments. Longer term bonds pay interest and also experience fluctuations in value as interest rates and credit conditions change. Thus, the actual rate of return differs from simply the interest received. For investments in equities, the dividend income is generally only a small portion of the total investment income expected. Capital gains are expected to occur to provide the required rate of return commensurate with the investment risk accepted. Similarly, investments in real estate are also expected to produce capital gains.

An insurer could intentionally generate zero dollars of net investment income earned by investing in zero coupon bonds and common stock in firms that do not pay dividends. Such an investment strategy would produce a high operating ratio that would not reflect the investment income potential of the insurer. Thus, some reflection of capital gains is necessary to produce a reasonable measure of investment income. Therefore, the second combined ratio measure includes net realized capital gains and losses with net investment income, the total of which is termed the net investment gain or loss.

The problem with using realized gains and losses to measure investment income is the timing factor involved in this determination. Realized gains and losses occur when an asset is sold, and reflect all the change in value that has occurred since the asset was purchased. If an insurer does not sell any capital assets, then, regardless of the change in values of investments, no capital gains or losses would be recorded. When an asset is sold, though, all of the change in value is reflected in that year, even though all or most of

the change may have occurred in prior years. Thus, unless an insurer is experiencing a constant portfolio turnover and consistent appreciation in asset values, the net realized capital gains and losses value will fluctuate considerably and will not necessarily reflect current investment earnings.

The third measure of investment income includes the change in unrealized capital gains and losses in addition to the net investment gain or loss. By including unrealized gains and losses, all investment performance is reflected in this profitability measure. By adding or subtracting the change in unrealized gains and losses to the net realized gains and losses, only the investment gains experienced during the current year are reflected. Changes in asset values that occurred in prior years would not distort the results.

Several problems still exist with this measure of the operating ratio. One problem is the degree of fluctuation that will occur as a result of changes in equity values. A rapidly increasing stock market will inflate the investment income measure and reduce the operating ratio. A falling stock market will reduce the investment income value. This increased volatility is a cost of fully reflecting investment income in the operating results of insurance companies.

Another problem is that insurance accounting conventions value bonds at amortized values rather than market values. Thus, unrealized capital gains and losses for bonds are not representative of market values but are based on the values when the assets were purchased and the time left until maturity. In this regard the investment income value based on reported unrealized capital gains and losses is not a true market measure.

Another major problem with this third combined ratio measure is the mismatch in the asset base that generated the investment income used in this measure and the earned premium that is used as the denominator in the calculation. To a large extent, the investable assets currently generating the investment income were produced by premium writings in prior years. The loss reserve outstanding comes from both current and prior years' writings. However, all the investment income is being credited against the current year's experience. This distortion will most significantly affect rapidly growing or declining insurers. However, even stable insurers will not have the same loss payout pattern occur in the future as has in the past.

The operating ratios for the insurance industry for the period 1983 through 1986 (the only years that the necessary information is available) based on the net investment income earned, net investment gain or loss and the net investment gain or loss including unrealized capital gains or losses, are shown in Figure 8-1-C-2. These values are calculated from the consolidated industry Annual Statement data published by A. M. Best Company.

#### Combined Ratio Based on Discounted Losses

The Tax Reform Act of 1986 instituted discounting property-liability loss reserves for tax purposes. Also in 1986 the NAIC created a Working Group on Discounting Loss Reserves to consider changing statutory accounting provisions. The effect of discounting loss reserves is to reflect the time value of money in the reserving process. Undiscounted reserves value loss payments in future years equally with current loss payments. Statutory reserving requirements currently prohibit discounting loss reserves except for periodic payments for Workers' Compensation, which are in essence annuity type claims. The stated rationale for using undiscounted loss reserves is to instill a level of



conservatism into the reported financial position of insurers.

The level of conservatism included by not discounting property-liability loss reserves depends on the loss payout pattern of the line of business and on the general level of interest rates. As the concentration of the industry moved from primarily property to predominately liability insurance, the loss payout patterns lengthened. Also, over the last several decades the general level of interest rates has increased. Thus, the degree of conservatism engendered by not discounting statutory loss reserves has increased. As taxable income was traditionally based on statutory accounting conventions, the federal government's tax receipts from the property-liability insurance industry eroded. Over the decade 1976 through 1986, the industry as a whole did not pay any federal income taxes. The revenue needs of the federal government led to the adoption of discounting for tax purposes.

Discounting loss reserves at an appropriate rate of interest for the calculation of incurred losses would present the relevant economic value of losses instead of simply the sum of the stream of payments ignoring the time value of money. The primary problem is the determination of the appropriate discount rate. Rates that have been proposed include: the current risk free rate as measured by the return on short term U. S. Treasury bonds, the rate of return earned by the industry over a particular recent time interval, the rate of return achieved by the specific insurer over a particular recent time interval or a selected interest rate based on a specific index over a particular time interval. No general consensus exists as to the proper discount rate.

Basic finance theory suggests that the appropriate discount rate should reflect the relevant risk of the loss payment pattern. The Capital Asset Pricing Model would determine this rate based on the systematic risk of loss payout patterns. The Arbitrage Pricing Model would base the rate on the results of a factor analysis of historical experience. The sparsity of market value information of loss reserves makes the determination of a market driven discount rate difficult. As insurance prices are affected by current, rather than historical, interest rates, the interest rate achievable by the insurer when the policies are written would be a superior measure than the proposals to use moving averages of past interest rates, either general or company specific. Thus, the most valid proposal made to date is to use the current risk free interest rate to discount loss reserves.

Use of the current short term U. S. Treasury bond interest rate to discount the loss payout pattern in the calculation of the incurred loss ratio will have the effect of including the time value of money in the combined ratio. Thus, investment income does not have to be factored in separately, as currently introduced in the operating ratio. The loss payout pattern expected to apply to the current book of business is used. Also, the current market conditions on risk free investments are applied. This measure avoids the distortions caused in the investment income measures when equity and other risky assets experience marked price movements in a given year.

### Return on Equity

Corporate financial analysis commonly uses a value termed the return on equity (ROE) to measure profitability. This value is calculated by dividing the net profit after taxes available to common stockholders (after deducting preferred dividends) by the value of the common equity in the firm. The value of common equity is traditionally a book value either at the beginning of the year or the average of the beginning and ending values. The common equity values are not based on market value, although this may be a more appropriate measure.

Return on equity values can similarly be derived for property-liability insurers, but several adjustments are needed. Initially a determination of net profit must be made. This value can be either on a statutory or GAAP basis. Neither profit figure includes unrealized capital gains or losses incurred during the period. For an insurer with significant values in this category, the ROE value would be distorted. However, if unrealized gains or losses were to be included, they cannot simply be added (or subtracted) from the net profit value. The present value of future taxes associated with realization of these gains or losses must be accounted for before an adjustment to the net profit figure is made.

The primary advantage of a return on equity measure is that it allows a comparison of insurance profitability with other industries. All prior profitability measures discussed are specific to insurance companies. Return on equity measures for other industries are readily available for comparison purposes. However, the comparison of return on equity values must be done with care. Many industries have recognized distortions either in the net profit figure or the book values. For example, loan loss reserves for banks are often well below the level needed to absorb problem loans. Also, natural resource firms often carry assets at purchase price rather than market price. For the property-liability insurance industry, the distortions in net profits and book value must be recognized in order to interpret the ROE results meaningfully. Among the problems with insurance financial statements are:

- 1) the equity in the unearned premium reserve is not recognized
- 2) bonds are valued at amortized rather than market value
- 3) loss and loss adjustment expense reserves are carried at the sum of estimated future payments rather than the present value, and the estimates may be inadequate or redundant
- 4) many assets are not included in statutory surplus, such as nonadmitted reinsurance

### Internal Rate of Return

The internal rate of return of an investment is the mathematically determined discount rate that sets the present value of the total cash flow equal to zero. When discounted at the internal rate of return, the present value of the cash inflows equals the present value of the cash outflows. For standard investment decisions, the initial investment outlay is the cash outflow and the subsequent receipts are the cash inflows. The situation is reversed when the internal rate of return is calculated from the insurer's point of view on an insurance policy. The standard treatment of this transaction is that the insurer receives a cash inflow when the policy is written, pays some expenses immediately and others in future periods, and pays

losses in the future as well. In order for a positive internal rate of return to result, expenses and losses must exceed premium. (This would result in a combined ratio in excess of 100.)

A more realistic description of the cash flows involved for insurance policies would have some expenses incurred prior to writing the policy. These prepaid expenses would include policy development costs and training expenditures. Other expenses would be paid when the policy is actually written. Premium income would be received several months after the policy is written, representing lags in collecting premiums from agents or insureds. Additional expenses and the losses would be paid subsequent to the receipt of premium. Following loss payments, salvage, subrogation and reinsurance payments might be received.

This more representative cash flow model would thus entail cash outflows preceding and following the cash inflow, with the potential for more cash inflows at the end of the sequence. Solving the discount rate that sets the present value of the cash flows to zero may yield multiple values. Mathematically, the number of discount rates that solve the equation equals the number of sign reversals in the cash flow. Selecting the proper internal rate of return from competing values is occasionally a complex endeavor.

Competitive Insurance Company  
Income Statement

Underwriting Income	
Net Written Premium	\$100,000,000
Net Earned Premium	95,000,000
Incurred Losses	68,000,000
Loss Adjustment Expense Incurred	10,000,000
Other Underwriting Expenses	28,000,000
Net Underwriting Gain or Loss	-11,000,000
Investment Income	
Net Investment Income Earned	14,000,000
Net Realized Capital Gains or Losses	2,000,000
Net Investment Gain or Loss	16,000,000
Net Income Determination	
Net Income Before Dividends to Policyholders and Income Taxes	5,000,000
Dividends to Policyholders	2,500,000
Federal and Foreign Income Taxes Incurred	-1,500,000
Net Income	4,000,000
Capital and Surplus Account	
Beginning Surplus	57,000,000
Gains and Losses in Surplus	
Net Income	4,000,000
Net Unrealized Capital Gains or Losses	1,000,000
Ending Surplus	62,000,000
Average Statutory Surplus	59,500,000
Rate Of Return Measures	
Combined Ratio	
Loss and Loss Adjustment Expense Ratio	82.1%
Expense Ratio	28.0
Combined Ratio	110.1
Underwriting Profit Margin	
Underwriting Profit Margin	-10.1
Operating Ratio	
A) Net Investment Income Earned/Earned Premium	14.7
B) Net Investment Gain or Loss/Earned Premium	16.8
C) Net Investment Gain or Loss Including Unrealized Capital Gains or Losses/Earned Premium	17.9
Operating Ratio Based on A	95.4
Operating Ratio Based on B	93.3
Operating Ratio Based on C	92.2

## Discounting

## Accident Year Y Experience

Paid Loss and Loss Adjustment Expenses	35,000,000
Undiscounted Loss and LAE Reserves	45,000,000*
Discounted Loss and LAE Reserves	36,000,000
Loss and LAE Ratio - Undiscounted	84.2%
Accident Year Combined Ratio	112.2
Loss and LAE Ratio - Discounted	74.7
Accident Year Combined Ratio - Discounted	102.7

## Return on Equity Measures

Net Income/Average Statutory Surplus	6.7
Net Income plus Unrealized Capital Gains or Losses/Average Statutory Surplus	8.4

\*Note that the calendar year incurred loss and loss adjustment expenses total \$78 million but the accident year loss and LAE equal \$80 million. This would result if favorable development were experienced on prior years' loss and LAE reserves.

Figure 8-1-C-2  
Industry Operating Ratios

	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Combined Ratio After Dividends	112.0	118.0	116.3	108.0
Net Investment Income/EP	14.9	15.4	14.6	13.2
Operating Ratio I	97.1	102.6	101.7	94.8
Net Investment Gain/EP	16.9	18.0	18.7	17.3
Operating Ratio II	95.1	100.0	97.6	90.7
Net Investment Gain Including Unrealized Gains and Losses/EP	18.1	15.5	22.7	18.5
Operating Ratio III	93.9	102.5	93.6	89.5

Part 1 - Section D  
Measurement, Allocation and Uses of Surplus

The surplus of an insurer is the difference between statutory assets and liabilities. This surplus consists of a number of different categories including capital paid up, gross paid in and contributed surplus, unassigned funds and any special surplus funds. Surplus represents the owners' (stockholders for a stock insurer, policyholders for a mutual or reciprocal) interest in the company and the cushion on which the insurer can rely in adverse situations. An insurer would be considered bankrupt if surplus were negative or zero. Great reliance is placed on the surplus for regulatory purposes. Licensing requirements establish minimum levels of surplus for writing certain lines of business. Premium to surplus ratios are often monitored as an indication of insurer solvency. A well known rule of thumb, termed the Kenney rule, restricts net written premium to no more than twice the surplus. Other regulatory tests establish a level of three to one as acceptable. These levels are applied on a company basis. Industry wide levels of premium to surplus ratios also fluctuate markedly as equity values and market conditions vary. Figure 8-D-1 illustrates the stock property-liability insurance industry aggregate values of the premium to surplus ratio for the period 1926 through 1986. These values are not consolidated to eliminate double counting of some assets for corporate groups. Consolidated figures have been determined only recently.

The degree of reliance placed on the surplus measure is remarkable given the widely recognized distortions in the statutory surplus value. The unearned premium reserve is universally recognized as being redundant as it is calculated based on the entire written premium and most expenses are incurred at the inception of the policy term. The Tax Reform Act of 1986, with the discounting of loss reserve provision, is contributing to the increasing awareness that the statutory loss and loss adjustment expense reserve may be excessive on a true economic valuation. Loss reserves are set at the undiscounted value of future payments ignoring the time value of money. The strongest arguments in favor of overlooking these distortions is that statutory insurance accounting is meant to be conservative and these conventions impart a safety margin to regulatory considerations. However, a safety margin could be included directly if one were needed without reliance on inaccurate measurements. The current procedure imposes a safety margin that decreases from one valuation period to another as loss ratios increase and is a function of interest rates (the time value of money).

Two additional inaccuracies in the measurement of surplus do not have the value of being conservative. The tax liability of an insurer on unrealized gains in equities is ignored in the surplus measure. The market value of equities is included in surplus. However, any difference in the current market price and the purchase price of equities will be taxable when the gain (or loss) is realized. Although the tax liability is inexact, as prices may continue to fluctuate prior to the realization of the gain (or loss), and the timing of the tax liability is unknown, failure to consider this liability distorts the statutory surplus measure and in rising equity markets, overstates surplus.

The final distortion in statutory surplus is the amalgamation of differences between book value of assets and their actual market value, as

discussed in Section A. The largest impact is the treatment of bonds, which are valued at amortized value in the determination of statutory surplus. The amortized value of bonds is the initial purchase price plus or minus the amortization of any discount or premium at the time of the purchase. The amortization occurs over the period between the purchase date and the maturity date of the issue. A bond purchased at par value would continue to be listed at that value as long as the bond is held regardless of fluctuations in interest rates. A bond purchased at a discount from the maturity value would increase in book value each year at the maturity date approached. Market values of bonds move inversely with interest rates. As interest rates rise, the common occurrence from the 1950s through the mid 1970s, outstanding bonds decline in value. These declines were not recognized by statutory accounting conventions as long as the insurer did not sell the bonds. This distortion led to the unintended situation that GEICO, in the early 1970s, could not sell municipal bonds to reinvest in taxable issues, despite the higher after tax income that this would produce, because the use of overstated amortized values on its bonds was providing a level of surplus that would have disappeared if the bonds were sold.

The use of amortized rather than market values for bonds can either increase or decrease surplus depending on the movement of interest rates. Other statutory book value conventions tend to reduce statutory surplus. Reinsurance with nonadmitted reinsurers is excluded from book values. Real estate is valued at the original purchase price less depreciation unless market value is lower. Agents balances over three months due are not admitted. Equipment, furniture and supplies (other than electronic computers) is also not admitted as an asset for statutory purposes. Salvage and subrogation recoveries that are expected but not yet received, are not included as an asset. Any asset that is not specifically allowed by regulatory authorities is considered a non-admitted asset and, as such, excluded from the statutory book value determination.

In addition to the distortions in the value of surplus generated by statutory accounting, other anomalies exist with use of premium to surplus ratios as regulatory tools. A company with a lower expense ratio will have a lower premium to surplus ratio than a similar insurer with a higher expense ratio writing the same volume of expected losses supported by the same surplus. If an insurer raises rates and writes the same number of policies at the new rates, the premium to surplus ratio increases; this insurer is considered more risky even though rate levels are now higher. A potential solution to both of these problems is to substitute incurred losses for written premium when determining allowable levels of insurance writings. However, incurred losses are affected by loss reserve adequacy, which varies among insurers.

#### Allocation of Surplus

The surplus calculation described above determines the total surplus for an insurer. Some ratemaking techniques require surplus to be allocated to individual lines or coverages, whereas other techniques require the investment income earned by an insurer to be allocated to individual lines of business and to the surplus. No consensus exists about the proper allocation of either item.

The Insurance Expense Exhibit includes an allocation of investment income to each line of business and to surplus. Only the net investment income earned is allocated, and this value excludes capital gains whether realized or not.



The net investment income earned on all investments except equities is allocated to individual lines of business based on the share of investable assets generated by the line of business. Investable assets generated by each line are the mean unearned premium reserves reduced by prepaid expenses and the mean loss and loss adjustment expense reserves. All net investment income earned not allocated to individual lines of business, including the dividend income from equities, is assigned to surplus.

The discounted cash flow analysis includes surplus as a cash flow, first being invested by the insurer and later flowing back to the insurer. In order to accomplish this calculation, the surplus contribution must be determined and the length of time it must be invested must be calculated. The amount of surplus required can be determined by use of a rule of thumb about premium to surplus ratios, it can be a prorata allocation of the insurer's surplus to all lines of insurance equally or it can be based on a study of surplus needs by line based on volatility. Surplus needs based on volatility or riskiness will be less for the company as a whole than the sum of the surplus needs for the individual lines of business, as aggregate volatility is lower than the sum of individual lines' volatility as long as the lines are not perfectly correlated.

The timing of the surplus flows back to the insurer also presents a choice. Traditional uses of the premium to surplus ratio imply that once the premium is written or the losses incurred, the surplus is no longer needed to be allocated to that line. However, if the surplus is viewed as a margin of safety for underpricing or underreserving, then some surplus should be allocated to the line of business until all losses are paid. One alternative discounted cash flow model maintains a constant loss reserve to surplus ratio until all losses are settled.

Another alternative surplus allocation is proportional to the total marginal profit of a particular line of business. This allocation approach is based on classical micro-economic theory. Another alternative allocation of surplus is determined by subjectively equating the riskiness of individual lines of business to each other by varying the premium to surplus ratios to equate the less volatile lines with the more volatile lines.

Paul Kneuer has analyzed the methods and considerations in allocating surplus to individual dimensions of insurer operations. The dimensions include type of risk or peril, branch office or producer, and geographic or temporal characteristics. Based on the practical considerations raised in an allocation of surplus, none of the current allocation methods completely achieve the goals of surplus allocation.

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Part 2 - Section A  
Financial Solvency Tests

One of the primary concerns of insurance regulation is to assure the solvency of insurers. The future nature of the financial commitment made by the insurer in exchange for the policy premium creates a concern on the part of the insured that the insurer remain solvent in order to fulfill its part of the obligation. By reducing the likelihood of insurer insolvencies, insurance regulation could increase the demand for insurance.

In 1973 the National Association of Insurance Commissioners (NAIC) developed an Early Warning Test program designed to detect solvency problems soon enough to prevent insolvency or at least to mitigate the damages caused by the insolvency. A series of eleven tests were performed on the annual statement data of insurers. Acceptable ranges for the results of each test were determined and companies whose results were outside the normal range were indicated as failing a particular test. Any insurer failing four or more tests was indicated to be a priority company and regulators were encouraged to give special attention to this insurer. The objective of the program was to assist regulators in selecting and rank ordering those insurers which require further analysis by drawing attention to the approximately 15 percent of those insurers with the greatest financial problems.

The eleven tests included in the program are listed on Table 8-2-A along with the initial acceptable ranges for the results. Each year the acceptable ranges can be adjusted to reflect current conditions in the insurance and investment markets.

Table 8-2-A  
NAIC Early Warning Tests

Number	Test	Acceptable Range
1	Premium To Surplus	Less than 300%
2	Change in Writings	Between + and - 33%
3	Surplus Aid to Surplus	Less than 25%
4	Two Year Operating Ratio*	Less than 100%
5	Investment Yield	Greater than 5.0%
6	Change in Surplus	Between -10 and +50%
7	Liabilities to Liquid Assets	Less than 105%
8	Agents' Balances to Surplus	Less than 40%
9	One Year Reserve Development To Surplus	Less than 25%
10	Two Year Reserve Development to Surplus	Less than 25%
11	Estimated Current Reserve Deficiency to Surplus	Less than 25%

\*This test has shifted from a five year operating ratio to a two year adjusted underwriting ratio (including dividends) and then to a two year operating ratio.

The NAIC Early Warning Tests were first applied to the 1972 Annual

Statement data. The results were provided to the state insurance commissioners approximately six months after the end of the year. In addition to the time lag in compiling results, several other problems exist. Except in a few states, participation in the program is voluntary. Insurers that do not submit their Annual Statements to the NAIC for analysis are not rated. Insurers that realize they will be classified as priority companies can avoid that position by failing to submit data. Also, the analysis is performed on unaudited figures. Unintentional errors in Annual Statement data, as well as intentional misrepresentations, distort the results of the tests. The most crucial problem with the system is the documented failure to provide a valid early warning of potential insolvencies. A study by Thornton and Meador [ ] of eleven insolvencies of Texas insurers subsequent to the development of the NAIC Early Warning system found that only 20 percent of the insolvent insurers would have been classified as priority companies five years prior to insolvency, as opposed to an expected early warning classification rate of 82 percent. Three years prior to insolvency 55 percent of the companies would have been given priority ratings, as opposed to an expected 82 percent. The Annual Statement data of the year prior to the insolvency did classify 91 percent of the insolvent companies as priority companies, but this information would not have been provided to the state insurance commissioners until six months into the year of insolvency, providing little if any time for corrective actions.

After implementing the Early Warning system, the NAIC combined the statistical analysis with an analytical phase conducted by financial examiners and termed the approach Insurance Regulatory Information System (IRIS). This two phase system is considered more discriminating than the initial statistical only program. Financial examiners can quickly determine if the priority rating assigned by the statistical phase is unjustified due to special circumstances. This review helps focus regulatory attention on those insurers in more dire financial condition.

The NAIC has resisted all attempts to make the results of the IRIS system public. In particular, insurance agents have requested access to the priority ratings in order to avoid placing business with insurers most at risk for insolvency. The NAIC fears that public disclosure of priority companies would hamper any attempts to work out the financial difficulties of these insurers. The NAIC has agreed to provide raw statistical data to organizations, but to keep the results of the rating system confidential.

#### Discriminant Analysis

The statistical tests of the IRIS system are termed univariate as they focus on one variable at a time in classifying an insurer. An insurer is classified as either passing or failing each test. The degree with which an insurer passed or failed a given test is not considered. An alternative classification system, termed multiple discriminant analysis, has been found to perform much better at predicting insolvency than a univariate model based on similar data. Multiple discriminant analysis considers the results of financial ratio calculations in combination with each other so that a slightly excessive ratio for one variable can be offset by very favorable results for another ratio. In a sense, the difference between univariate analysis and multiple discriminant analysis is akin to the difference between multiple choice and essay examinations. In two studies by Pinches and Trieschmann [ and ] multiple discriminant analysis was used to predict insurer insolvency.

The six variables found most useful in this type of analysis were:

1. Agents' Balances/Total Assets
2. Stocks Cost/Stocks Market Value
3. Bonds Cost/Bonds Market Value
4. Loss Adjustment and Underwriting Expenses Paid/Net Written Premium
5. Loss and LAE Incurred/Earned Premium
6. Direct Written Premium/Surplus

Results of this analysis were to classify 49 of 52 sample insurers, of which 26 were known to become insolvent, correctly. Although further tests of such a system would be necessary, current indications are that multiple discriminant analysis would be an improvement over the current IRIS system.

#### Other Rating Systems

Although the NAIC IRIS system does not make its results public, the insurance consumer does have access to several insurance rating systems. A. M. Best Company has reported on the financial condition of property-liability insurers since 1900. Standard and Poor's, Conning and Company and Consumers Union also provide ratings of insurers. The Best's ratings are widely cited and will be discussed in some detail.

The objective of Best's rating system is to evaluate each insurer's financial position relative to the rest of the industry and to predict its ability to fulfill its financial obligations. The ratings are based on quantitative and qualitative factors. The quantitative factors, which are published with the individual company reports, include profitability, leverage and liquidity tests. The eight quantitative tests are:

1. Combined Ratio
2. Net Operating Income/Net Earned Premium
3. Return/Prior Year's Surplus
4. Net Written Premium/Surplus
5. Net Leverage
6. Gross Leverage
7. Current Liquidity
8. Investment Leverage

In addition to the financial tests, Best's provides a set of adjusted results that reflect the equity in the unearned premium reserve, present value of loss reserves, market values of bonds, preferred stock and mortgages and a review of conditional reserves. These adjustments in total currently tend to produce an adjusted surplus in excess of the statutory surplus, reducing the return on surplus and leverage ratios.

In addition to the quantitative analysis, Best's also considers several qualitative factors in arriving at the final rating of an insurer. The qualitative analysis, which is not published, covers the reinsurance program of the insurer, to determine the extent of the company's reliance on reinsurance and the soundness of the reinsurers, the adequacy of unearned premium and loss reserves and the competence, experience and integrity of management. The ratings awarded to insurers after consideration of the above factors range from A+ (Superior) to C (Uncertain), or any one of ten reasons for a rating not being assigned.

The Best's ratings are a useful tool for insurance purchasers in evaluating the financial strength of a particular insurer. The public disclosure of these ratings and the significance attached to the ratings serves as a control on insurance management. The ratings do not provide information about some important aspects of an insurance operation for the insurance consumer. For example, the competitiveness of rate levels, the promptness of claim payments and the willingness of the company to resolve customer disputes are all important to the insurance consumer but not included in the rating system. Thus, the Best's rating is only one element in selecting an appropriate insurer.

#### Loss Reserve Certification

The largest liability of property-liability insurers is the loss and loss adjustment expense reserve. Numerous retrospective studies of these reserves on an industry wide basis and for individual companies indicate the inaccuracies of these values. Although notable exceptions occur, cyclical patterns of over and underreserving tend to occur, and the general effect is to understate the degree of volatility in the underwriting cycle.

In 1980 the Fire and Casualty Annual Statement Blank was revised to allow state insurance commissioners the option of requiring insurers to include a loss reserve certification by a qualified loss reserve specialist. For the 1986 Annual Statements 17 states required at least some insurers to provide opinions on loss reserves. The class of insurers requiring certification varied from Ohio, which applied the regulation to medical malpractice insurers only, to Florida, Hawaii, New Jersey, North Carolina and Texas, which required certification of all licensed insurers.

The primary points of debate on the issue of loss reserve certification are the class of individuals allowed to certify and whether independence is required. In general states allow wide latitude in qualifying loss reserve specialists, including actuaries, accountants and others with experience in this area. Independence of the certifier is also not required, so company employees can, if qualified, provide the necessary certification.

Despite the growing popularity of the loss reserve certification program, no evidence yet suggests that reserves are more accurate, or more conservative, when certification is required.

#### State Guaranty Funds

State guaranty funds exist to pay the claims of insolvent insurers so that policyholders do not suffer a financial loss when an insurer becomes insolvent. All states except New York have a post-assessment funding provision under which all insurers are assessed a percentage of net direct premiums written in order to pay the claims of an insolvent insurer. New York has a pre-assessment plan under which funds are accumulated prior to any insolvencies by assessments on all insurers operating in the state. The pre-assessment plan works similarly to the post-assessment basis, except the added political problem of diversion of accumulated assets exists in New York. This fund is often viewed as available for other purposes and can be far more easily diverted from its intended application by political maneuvering.

Insurance guaranty funds operate on a state basis and are intended to cover residents of the particular state or property permanently located within the state. Numerous variations exist in the individual state statutes, but the

general guidelines included in the NAIC Post-Assessment Property and Liability Insurance Guaranty Association Model Act of 1969 provide a measure of similarity among the state statutes. Under the Model Act provisions the guaranty fund is dormant until an insolvency occurs and then a not-for-profit association is established to collect assessments from insurers in proportion to premium writings in the state and to pay the claims as they occur, subject to the availability of funds. The maximum allowable assessments on an insurer in a given year range from 1 to 2 percent of premium. Most states segregate workers' compensation and automobile insurance from other covered lines in determining assessments. The funds generally pay claims subject to a deductible and a maximum limit. Deductibles range from zero to \$200 and limits range from \$50,000 to \$1,000,000. Most states include unearned premium as an allowable claim.

The effect of post-assessment guaranty funds is to force the surviving insurers to fulfill the obligations of an insolvent competitor. Concern about the domino effect of one insolvency on a marginal, but solvent, insurer have been raised, but not resolved. A current problem concerns the inclusion of medical malpractice insurance in the state guaranty funds. Most medical malpractice insurance is now written by health care provider controlled insurers. In many cases physicians are determining the prices to be charged for this coverage with the knowledge that the state guaranty funds will pay claims if the organization becomes insolvent. The lengthy payout pattern on malpractice claims produces a potential major solvency problem. If the premiums charged by a provider owned carrier are inadequate, the providers benefit in the short run by lower insurance costs. If the insurer later becomes insolvent, then insurers in other lines of business will be assessed for any shortages, and these assessments will be passed on to their insureds. Thus, general insurance consumers could in the future pay more for insurance to subsidize lower insurance costs for medical providers now. This link through the guaranty fund system indicates the general concern over the pricing practices of provider owned insurance carriers.

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Part 2 - Section B  
Risk Theory

Risk theory is the use of mathematical models to quantify uncertainty. The primary application of risk theory has been to the insurance industry, but extensions of developments in this area can be made to any enterprise dealing with risk and uncertainty. European actuaries, particularly from Scandinavia, have pioneered this area, with American actuaries only recently addressing risk theory issues.

Typical applications of risk theory involve assuming that loss frequency and loss severity follow standard statistical distributions allowing calculations of insurance pricing, ruin probability and credibility. Such families of distributions as the binomial, Poisson, negative binomial, geometric, lognormal, pareto, Burr, generalized pareto, gamma, transformed gamma, loggamma and Weibull have been used to model insurance losses and arrive at specific risk loadings. As the mean, variance, moment generating functions and derivatives of these distributions can generally be calculated, quantifiable results can be obtained.

The two main areas of application of risk theory have been in ratemaking and in assessing financial solvency. In ratemaking the use of risk theory allows mathematical determination of an appropriate risk loading. In solvency considerations, risk theory leads to measurement of ruin probability given particular premium writings and surplus positions. Confidence intervals, which indicate the likelihood that actual outcomes will fall within prespecified limits, can be determined from the statistical properties of the distributions included in the model.

Insurance ratemaking historically has involved use of the expected value for losses, ignoring the variability around the mean value. Often the selected underwriting profit margin is applied to all lines or coverages without consideration of the degree of volatility of a given coverage. In this situation an insurer would include the same profit loading for lines that have very predictable loss patterns due to the high frequency, low severity nature of losses as it would for a much harder to predict line that has low frequency but high severity, if the expected losses for the two lines were equal. Use of risk theory to model these respective lines would entail using a distribution with a higher variance for the more volatile line. In choosing a rate level that would be adequate to cover losses a specified percentage of the time (eg: 75 or 95 percent), the risk loading in the more volatile line would be higher, reflecting the greater variability of the distribution.

Typical applications of risk theory to ratemaking focus on the total variability of the expected loss distribution. The larger the variability, the higher the risk loading necessary in rates or the greater probability of ruin derived in solvency testing. A different view of risk is taken by the area of financial economics. These theories, including the Capital Asset Pricing Model and the Arbitrage Pricing Model, propose that only nondiversifiable risk should be priced in an insurance contract. Diversifiable risk, although contributing to the total variability of losses, is considered irrelevant to the owner of the insurance company as this risk is offset by other investments in the owner's investment portfolio. Additional research that seeks to resolve these divergent views is required.

Another risk theory topic is utility theory. In utility theory, levels of

satisfaction or utility are established to correspond with various possible outcomes. As individuals, and perhaps corporations, are not necessarily twice as satisfied with twice as much money, mathematical functions are assumed to describe the intangible satisfaction levels of the decision maker. The shape of the describing function corresponds with the individual's or entity's attitude toward risk. A risk neutral decision maker would have a utility function that is linear. A risk averse one would have a utility function that increased at progressively lower rates, or a negative second derivative. A decision maker that favored risk would have a utility function that increased at progressively faster rates, or a positive second derivative. As many individuals both gamble, a characteristic of a risk seeker, and insure, a characteristic of a risk averse entity, then actual utility functions are likely quite complex. Utility theory attempts to approximate the actual satisfaction levels of various outcomes to indicate the optimal strategies to follow in risky situations. Products of this area of research have been the optimal insurance policies to purchase, including deductibles and policy limits, and when to self insure risks.

Another aspect of risk theory is termed the theory of games. Game theory contemplates the involvement of more than one player, each with a set of strategies. The payoffs of the game are dependent on the intersection of the strategies chosen by each player. Each player selects a strategy and the resulting payoff for each player is determined by the selected strategy in combination with the strategies chosen by the other players. Each person attempts to maximize the utility of his or her own payoffs, but, since the player cannot mandate the choices of the remaining players, the optimal strategy often involves anticipating the choices of others, negotiating the individual selection of strategies or randomly selecting a strategy to prevent opponents from correctly anticipating one's selection.

Two branches of risk theory have evolved, individual and collective. Individual risk theory analyzes individual insurance policies to measure the likelihood that losses will exceed premium income. Total company operations are determined by summing the results on individual policies. Collective risk theory disregards individual policies and instead addresses the total gain or loss of the company on the entire book of business.

#### Examples of Risk Theory

Heckman and Meyers apply collective risk theory to describe an algorithm that calculates the cumulative probabilities and excess pure premiums for a book of insurance policies. This technique, although mathematically complex, can be used to determine the pure premium for a policy with an aggregate limit, the pure premium for an aggregate stop-loss policy and the risk loading for a multi-line retrospective rating plan.

Venezian develops a mathematical model of accident proneness that can be used to demonstrate that an upper bound of classification efficiency exists and is below 100 percent and that underwriting can serve to offset weaknesses in any classification system. In his model two types of drivers exist with different accident propensities. Young drivers all initially have a higher loss likelihood, but randomly switch to the lower likelihood category over time. Drivers also can randomly shift from low loss likelihood to the higher category. The constant state of flux in classification, modeled to approximate empirical data, creates the classification problem and allows measurement of

classification error.

Hayne applies risk theory to loss reserving by analyzing the variability of age-to-age and age-to-ultimate loss development patterns. The lognormal distribution is fitted to empirical data. Use of this model provides projections of loss development factors to aid in the standard loss reserving problems facing actuaries. In addition, this model allows the determination of estimates of statistical variability of loss reserves, which are difficult to determine using the current reliance on empirical data.

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Part 2 - Section C  
Planning and Forecasting

Planning and forecasting are two separate, but interrelated, functions. Planning is a multi-step process involving establishing objectives, identifying alternative courses of action, establishing assumptions to evaluate the alternative courses of action, implementing a plan and monitoring the outcome of the plan. Forecasting is the projection of the consequences of a particular course of action or the maintenance of the status quo. Actuarial involvement in the forecasting process is generally invited in order to determine the financial consequences of a set of contingencies. Planning relies on forecasting to evaluate the financial outcomes for potential courses of action. Forecasting of the likely results of the current course of action often inspires planning to avert the shoals sighted dead ahead.

The planning process can be subdivided into financial planning and operational planning. Lowe [ ] describes the centerpiece of financial planning as a financial forecast of operating results over the next one to five years and indicates that this process is currently done by most major property-liability insurers. He defines operational planning as that done by divisions within an insurance company that seek to accomplish area objectives.

Insurers, just as other business enterprises, need to use planning and forecasting in order to improve the decision making process. If operational changes are necessary, any enterprise has more alternatives and more leeway if the time horizon for implementing the decision is further away. Finding out about problems too late provides for little choice in decision making. If these situations are foreseen, then management has time to consider the alternatives and make the most appropriate choice. Thus, the first step in the planning and forecasting process is the financial forecast described by Lowe. The key elements of this forecast are generally direct and net premiums, both written and earned, underwriting expenses, incurred and paid losses and loss adjustment expenses, dividends, investment income and surplus on a total company basis and often subdivisions of this information, where appropriate, to lines of business and geographic areas.

The next step in the process is often to ask "What if?" questions. What would happen if we cut rates to write more business? What would happen if we pulled out of a particular market? What would happen if we changed our underwriting rules? Depending on the answers to these questions, a new course of action may be implemented.

Actuaries, as the recognized resource within the insurer for quantifying future financial contingencies, are usually involved in the planning and forecasting process. In some cases the actuary is "responsible" for the entire planning process, but as the responsibility for establishing corporate objectives and the authority for implementing operational changes is rarely, if ever, included with this assignment, this planning exercise is, in essence, restricted to a forecasting project. The actuary projects trends from available data, makes educated guesses about future developments and calculates the resulting financial situation of the insurer.

A more comprehensive planning and forecasting process would include representatives from all affected divisions within an insurer, including the actuarial department. Management would be responsible for establishing corporate objectives, which could range from maximizing profits over a certain

period to attaining or retaining target market share values or achieving a particular rating from Best's. Marketing, underwriting, claims, accounting, data processing and other operating divisions within the company would be included in developing and implementing the plan. The actuary would at the very least provide information about rate adequacy and reserve development, and may be the one responsible for quantifying the financial results of the alternative courses of action. Some insurers maintain corporate planning departments that regularly produce plans for various aspects of the company's operations. Alternatively, a resource person familiar with the planning process may be called upon to assist the individuals responsible for implementing the plan to devise the plan.

#### Common Problem Areas

The primary problem area in planning and forecasting that appears consistently across firms is the excessive reliance on the forecasted results and the effort expended in explaining why actual results differed from the forecast. Once developed, the forecasted results take on an aura that many managers find difficult to dispel. The forecasted results become the goal and any divergence from those values creates a hunt for what area is at fault. If the actual results are worse than forecasted, the search for a scapegoat begins. If the actual results are better than the forecast, then the area responsible for the erroneous projection is sought. As the actuary is usually involved in developing the forecast, any deviation of results from the forecast tends to reduce the credibility of the entire actuarial process.

The common defense against the over reliance on forecasted results is to produce so many forecasts that the actual results are bound to fall in the projected range. One notable application of this strategy is the set of four actuarial projections produced by the Social Security Administration: optimistic, intermediate, intermediate with optimistic economic assumptions and pessimistic. As long as the actual results fall within the range of the forecasts, the producer of the forecast can deflect criticism. A more mathematically valid, albeit more difficult to explain, defense is to produce confidence intervals for the projected results based on the statistical properties of the distributions used in modeling the forecast. When producing such a forecast, the actuary should concentrate on the interval within which results should fall the selected percentage of the time and avoid use of the mathematical expression "expected value" which carries a different meaning for non mathematicians. This problem is generally only overcome when, after long experience with planning and forecasting, managers learn that the forecasted results are only estimates of future results and not inviolate goals.

Another common problem in planning and forecasting is to implement shifts in operations that were not contemplated by the plan, but to still expect the forecasted results to be valid. Such operational shifts could include negotiating a new reinsurance treaty, offering a new compensation package to producers, implementing a new claims payment procedure, expanding or curtailing operations in a given area or line or any of a number of changes that could affect the company's financial position. The need for planning to be a continual process, constantly updated to include operational changes and revised assumptions must be stressed to avoid this pitfall.

For actuaries, a major drawback of planning and forecasting is the tendency of forecasts to be, to invent a term, "self unfulfilling." This

tendency expresses itself in the ratemaking process through input from the other divisions involved in establishing rate levels. If the forecasted results are favorable, then pressure to avoid or minimize rate increases develops. As the adequacy of the rate levels falls, the favorable results forecasted cannot be attained. Conversely, if the forecast is dire, then normal opposition to rate increases disappears and the rate levels adjust more quickly than would be expected. Thus, results are often better than the forecast. Projecting the psychological effects of a particular forecast on the internal operations of an insurer and revising the forecast to reflect this feedback is rarely, if ever, taken into account.

#### Forecasting Techniques

A large number of mathematical techniques are available for use in forecasting results. These techniques depend on the validity of past data to predict future results. Despite the apparent sophistication of these techniques, any change that affects the usefulness of historical data for predictive purposes negates the value of these techniques.

One common technique for fitting a time series model is termed simple linear regression. In this procedure past data are used to fit the model:

$$1) \quad y_t = a + b x_t$$

where  $y_t$  = observation of the dependent variable at time  $t$   
 $a$  = intercept  
 $b$  = slope  
 $x_t$  = observation of the independent variable at time  $t$

The estimates of  $a$  and  $b$  are usually chosen to minimize the squared value of the difference between the actual and fitted data, which is called the least squares estimate.

Two special cases of simple linear regression are deserving of note. In some cases the independent variable is simply the time period. In this case,  $x_t = t$ . Under the exponential trend model, the dependent variable is a function of an exponential expression:

$$2) \quad y_t = e^{a+bt}$$

or  $\ln y_t = a + b t$

Multiple linear regression is similar to simple linear regression, except that the dependent variable is assumed to be a function of more than one independent variable. A time series example of this model would be:

$$3) \quad y_t = a + b x_t + c w_t + d z_t$$

where  $w$ ,  $x$  and  $z$  are independent variables  
 $b$ ,  $c$  and  $d$  are unknown parameters  
 $t$  is the time period

Again, the estimates of the parameters are generally chosen based on the least squares criteria. The validity of all regression models is dependent on the assumption that the observations of the independent variables are themselves independent of each other. For most time series, this assumption is violated. This technique also assumes that the errors from the model (the difference

between actual and forecasted values) are normally distributed.

A time series could also be generated by a constant process that reflects a moving average. Such a model would be:

$$3) \quad x_t = a$$

where  $a$  = mean of the last  $T$  observations

A moving average can also have a linear trend process such as:

$$4) \quad x_t = a + b t$$

Under a process termed simple exponential smoothing, the dependent variable is assumed to be a function of one independent variable. The model could be similar to the moving average shown in equation (3) except the parameter is chosen not on the least squares basis but is selected to minimize the errors with a greater weight given to recent data. The weights assigned to each error term is  $k^{T-t}$  where  $T$  is the total number of observations used to project the dependent variable and  $k$  is a selected weighting factor between zero and one. The weights of the error terms decrease geometrically with the age of the data. Similar smoothing calculations can be made for linear trend processes and for multiple independent variables.

The most sophisticated class of forecasting models currently available is known as Box-Jenkins. Many computer statistical packages include this modeling process. The Box-Jenkins model is a three step iterative process in which a tentative model is identified through an analysis of the historical data, the unknown parameters are estimated and then diagnostic tests are performed to determine the adequacy of the model. The class of models used in the Box-Jenkins procedure are termed autoregressive integrated moving average (ARIMA) and the process allows for any combination of these characteristics (autoregression and moving averages) to be included in the final model. Choice of the initial model is made after analyzing the autocorrelation and partial autocorrelation functions of the historical data.

The major drawbacks of the Box-Jenkins approach are the requirement of at least 50 historical observations, the need to completely refit the model periodically as no convenient way to update the parameters is available and the time and expense involved in developing a Box-Jenkins model when the final forecast involves numerous individual time series variables.



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Part 2 - Section D  
Data Sources

Industry Data

The insurance industry generates massive volumes of information in the process of its operations. The entire business of insurance is dependent on the statistics generated by the insurance process. Although much of the data generated is kept confidential as it has proprietary value, the regulatory process requires the promulgation of a significant portion of insurance data. Much of this information is available for applications of actuarial problems. Also, other non insurance information sources can be utilized by actuaries. The purpose of this section is to increase the awareness of available information that can be used to improve actuarial applications.

Annual Statement

The Annual Statement is the primary source of public information about insurers. This document is required to be filed with each state insurance department in which the insurer is licensed by March 1 of the subsequent year. The exhibits included in the Annual Statement are summarized in Table 8-2-D-1.

Table 8-2-D-1  
Annual Statement Exhibits

Balance Sheet

Assets by Type of Investment or Non-invested Category  
Liabilities, Surplus and Other Funds

Income Statement

Underwriting and Investment Income Exhibit  
Analysis of Change in Capital and Surplus Account  
Reconciliation of Funds Provided and Funds Applied  
Investment Income by Type of Investment  
Capital Gains and Losses by Type of Investment  
Premiums Earned, In Force and Written by Line  
Losses Paid and Incurred by Line  
Unpaid Losses and Loss Adjustment Expense by Line  
Expenses Paid by Category  
Analysis of Admitted and Non-Admitted Assets by Type  
Reconciliation of Ledger Assets  
Premiums and Losses for the Particular State  
Five-Year Historical Data on:  
Gross and Net Premium  
Underwriting, Investment and Net Income  
Selected Balance Sheet Items  
Allocation of Investments  
Gross and Net Paid Losses  
Operating Ratios  
One and Two Year Loss Development  
Investments Owned, Acquired and Sold by Type  
Investments Owned by Type and by Country  
Maturity Distribution of Bond Investments

Ceded and Assumed Reinsurance  
Analysis of Loss Development by Line  
Premiums and Losses by State

Insurance Expense Exhibit  
Premiums, Losses, Expenses and Net Income by Line

#### A. M. Best, National Underwriter

A. M. Best collects and disseminates reams of statistical information on the insurance industry, with much of the data gleaned from Annual Statement data. Industry figures for premiums, expenses, losses and investment income, including an aggregate Annual Statement, are promulgated in a publication entitled Best's Aggregates and Averages. Experience in total and by line is shown for the industry and for stock, mutual and reciprocal insurers. Each annual volume includes both the most recent data as well as historical data to facilitate long term and trend analysis. This publication is generally the first source of analysis for comparative studies of industry performance.

Another A. M. Best publication is Best's Insurance Reports, which is a voluminous listing of detailed information on individual insurers. For each insurer, financial information is summarized, the history, management, operations and reinsurance program are described, and the Best's Rating and comparative financial and operating exhibits displayed. The financial information shown for each insurer includes a summary of assets, liabilities and surplus for the current and prior year and investment data.

In addition to published data, A. M. Best can provide databases in computer readable form on tape or diskette. This information is taken directly from the Annual Statement and provides the detail necessary to fully analyze each insurer. The user can obtain the data for the industry or for selected companies. The availability of this data enables the user to custom design any research.

The major competitor to A. M. Best in providing insurance information is the National Underwriter company which publishes the Argus FC&S Chart. This more compact reference source provides information on the assets, liabilities, surplus, written and earned premiums, net income, investment income earned, underwriting gain or loss, premiums by line and loss, expense and combined ratio, each for the current and prior year.

#### GAAP Financials

The Annual Statement, A. M. Best and Argus data are all based on statutory financial data, except for the items displayed by Best's as adjusted in the rating analysis section. Statutory data does not necessarily represent the true financial position of the insurer. The use of amortized values for bonds and the lower of cost or market values for real estate, the unrecognized equity in the unearned premium reserve, the dismissal of non-admitted assets and the failure to consider the present value of loss reserves all distort the statutory values. When financial statements are required to be produced by auditors for shareholders, adjustments to financial data are required by Generally Accepted Accounting Principles (GAAP). GAAP accounting recognizes the equity in the unearned premium reserve, the deferral of federal income taxes, salvage and subrogation recoverable and some non-admitted assets.

Stockholder owned insurers are required to file annual reports, form 10-Ks

and other documents with the Securities and Exchange Commission (SEC), similarly to publicly-held companies in other industries. These data are on a Generally Accepted Accounting Principles (GAAP) basis, as opposed to a statutory basis. In addition, companies with significant (as defined by the SEC) property-liability insurance operations are required to submit additional data and discussion.

SEC regulations require stockholder owned insurers to submit a Loss Reserve Disclosure report that displays historical loss development of the ten prior years' loss and loss adjustment expense reserves on a cumulative, rather than accident year, basis. Additional information required includes a three year reserve reconciliation and an historical summary of various balance sheet and income statement items, and discussions regarding the differences between GAAP and statutory loss reserves, loss reserve discounting, the effect of inflation on loss reserves, loss portfolio transfers and other significant reinsurance transactions, significant line of business mix changes and significant adjustments to prior years' reserves.

#### External Data

As the insurance industry shifts to a total rate of return pricing structure, investment data assume an increasingly important role in the actuarial functions of pricing, reserving and forecasting. Current and projected rates of interest, inflation and stock market returns are needed to incorporate into actuarial models.

Data on current interest rates are available from the Treasury Department, Moody's Investors Service, Standard & Poor's Corporation and business publications such as the Wall Street Journal. Two useful compilations of aggregate data are Standard & Poor's Trade and Security Statistics, which is updated monthly, and the Economic Report of the President, published annually. Both references include historical as well as current values to facilitate trend analysis. Interest rate levels on short, intermediate and long term securities issued by the U. S. Government, states and municipalities, and corporations are included.

Government data may also be used for the underwriting, as opposed to investment income, component of insurance pricing. For example, the Highway Loss Data Institute (HLDI) publishes crash statistics for each automobile model by year, for possible use in pricing automobile collision coverage. The Department of Labor and the Bureau of Labor Statistics also publish statistical information that may be useful in particular ratemaking situations.

Price level volatility has become an important aspect of insurance ratemaking, requiring consideration of general inflation rates in the pricing process. The Consumer Price Index, promulgated monthly by the Commerce Department, provides the most widely based inflation measure. Current and historical levels are published in Standard & Poor's Trade and Security Statistics. In recognition of the inadequacy of a general price index for insurance purposes, Norton Masterson has developed a series of specific cost indices for insurance values that was first published in 1968 in the Proceedings of the Casualty Actuarial Society. These indices are periodically updated in Best's Insurance Management Reports.

Investment results on stocks are both more variable than returns on bonds, but also are more difficult to measure. The commonly reported barometer of the stock market, the Dow Jones Industrial Average (DJIA), is the arithmetic

average of current prices of a portfolio of 30 individual issues. This is a price weighted index, so changes in the levels of higher priced stocks carry more weight than changes in lower priced issues. The composition of the portfolio is also periodically revised to reflect shifts in the industrial sector. As a price index, it is not useful in measuring the total return on securities, which would include dividends.

A broader market index that is value rather than price weighted is the Standard & Poor's 500. This index includes 425 industrial stocks, 50 utilities and 25 transportation securities. Although this index avoids some of the DJIA problems, it does not allow for a total rate of return measure. However, several publications compile dividend calculations for the securities included in the S&P 500 to allow such a calculation.

Numerous other market indices are available to reflect the investment performance of broader or more specialized issues. The Wilshire 5000 is the broadest based U. S. stock index, encompassing securities on the New York Stock Exchange, American Stock Exchange as well as the OTC (which traditionally stood for Over The Counter) Exchange. Stock indices for individual foreign countries are published, as is a composite world index, both in local currencies and denominated in dollars to account for currency fluctuations. Specialized indices including insurance, utilities and banks are reported daily in business publications.

#### Commercial Forecasting Services

Current and historical values of financial and economic data are readily available, but actuarial calculations often require forecasted values of these items. Actuaries can either generate their own forecasts or pass the responsibility for any forecast errors off on someone else by utilizing the services of an econometric service bureau. The business of selling economic data has developed over the last two decades, propelled by increasing computer power, enhanced mathematical tools and increased economic volatility. The three basic services provided by econometric service bureaus are forecasts, data base access and economic consultation. Three firms dominate the industry, Chase Econometrics, Data Resources, Inc. and Wharton Econometrics, but numerous smaller and more specialized firms exist.

The specific econometric techniques used by the different bureaus differ, but the overall operations are similar. All utilize government sources supplemented by their own surveys to compile the data base. The forecasting techniques all involve econometric models, judgement, time series analysis and current data analysis. The number of equations used in the overall macro economic model ranges from 455 to over 1000 and the number of variables forecasted range from 700 to 10,000. Each of the major firms provides monthly updates of the forecasts which predict from two to ten years ahead. Each firm has made infamous inaccurate forecasts, but the overall track records of the forecasts are reasonably good. The specific costs of the forecasts depend on the extent of the services requested, but some major firms expend in excess of \$100,000 per year for econometric forecasts.

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## **COMMITTEE WORK PRODUCT**

Attached is a discussion draft of a Statement of Guidance Regarding Management Data and Information. This document is a work product of the Committee on Management Data and Information. It is being distributed to provide full participation from the CAS membership in comments, discussion, and analysis of these guidelines.

The purpose of the document is to begin to address the educational needs of actuaries that are involved in non-traditional actuarial work, i.e. underwriting, claims, computer systems, marketing, etc. The collection and reporting of management information crosses the boundaries of the various insurance company functions, and a significant void currently exists in CAS literature in this area.

Please review this discussion draft carefully. It is important to raise comments about any items which are not covered within the statement, items which require further clarification, or any areas of disagreement. Comments and questions should be addressed to:

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## DISCUSSION DRAFT

### Statement of Guidance Regarding Management Data and Information

The purpose of this statement is to provide guidelines to be used by actuaries in designing 1) data collection systems and 2) management information systems in the following areas: ratemaking, reserving, underwriting/marketing, claims, financial analysis and investments. It is a statement of the Casualty Actuarial Society's Committee on Management Data and Information.

The insurance system relies on the quality and timeliness of its information for its internal management needs and to fulfill its many public reporting requirements. Because of their training and background, actuaries have a responsibility to help develop quality procedures for collecting data and reporting useful and accurate management information to serve as the basis for sound decision making.

The statement consists of four parts:

- I. Data Collection Principles
  - II. Data Access Principles
  - III. Management Information Considerations
  - IV. Conclusions
- I. Data Collection Principles

Before it can be decided what data elements should be captured in a data collection system, the end use of the data must be specified. Actuaries traditionally are responsible for defining information needs for ratemaking and reserving. In some cases, they are involved in

designing management information for other disciplines: underwriting, marketing, claims, financial analysis and investments. While each of these areas has different needs for management information, the system used to collect the underlying data should be designed with all of the users' needs in mind.

The principles of data collection are separated into the principles of data capture and the principles of data quality control. Data gathering should follow certain principles, in order to develop an accurate and timely data collection system. In addition, a data quality control system should be implemented to ensure that the data being captured, processed and reported is accurate and complete.

#### A. Data Capture Principles

1. Data requirements should be compatible and consistent, regardless of line of business or policy form, to the extent possible. Monoline and multiline data should have similar requirements to facilitate combination. Common data elements should be defined similarly, regardless of line of business or function supported.
2. Data requirements and instructions for capture and storage should be conducive to acceptable data quality. Definitions and rules should be understandable at the support staff level and updated promptly when changes occur. Clear, explicit directions for data entry, including default values, should exist to eliminate judgmental assignment of values at the data entry level.
3. Statistical coding should follow usage. For example, rating manual and statistical plan codes and definitions must be compatible.
4. Technical parameters (field sizes and values) should be flexible in anticipation of future needs.

5. Meaningful values instead of codes should be used.
6. Statistical coding should be positive and absent of specific alpha codes that may be misinterpreted.
7. Statistical coding should be sufficiently detailed to meet possible future reporting requirements.

#### B. Data Quality Control Principles

1. A data quality control function should be established, and standards of data quality should be established and monitored within and across operational areas.
2. Critical processing points should be identified. Control procedures at these points should be developed and documented to assure that data which is transferred, translated or reproduced is done completely and accurately, with appropriate backup and audit trails.
3. Edits should be installed to check accuracy, validity and reasonableness. These edits should be performed as closely as possible to the data entry source.
4. Balancing or reconciliation procedures and standards should be established in the initial project description. Special reports and techniques should be developed to test data accuracy on a selected basis.

#### II. Data Access Principles

While numerous data elements can be captured, they are of limited value unless the data is efficiently organized in a way to maximize the use and value of the information. In a dynamic, ever-changing environment, every information system must be designed with flexibility in mind. The following concepts should be considered in the design of a data base (the repository of data elements).

- A. Central Data Base - The ideal repository of data collected is a central data base. Here, all the detail collected would be stored and accessible to all report systems. Thus updates, corrections, and controls are maintained at one location. Multiple locations of the same data elements, on the other hand, make it more likely that updates are not applied to all data bases uniformly.
- B. Detailed Data Base - The data base should contain sufficiently broad and detailed data elements to satisfy the needs of all end users.
- C. Data Dictionary - Definitions of data elements should be commonly understood by all suppliers and end users of data. These definitions should be maintained in a single source.
- D. Data Base Design - The design or organization of the data should address the following considerations:
1. Run time, storage costs, or volume restrictions may necessitate the creation of multiple, summarized data bases to fulfill different end user needs. For example, a data base containing only loss information can be extracted from the central data base in order to review loss developments. Ideally, a summarized data base should support all routine corporate reporting for that specific data at that particular level of detail. This smaller data base enables the various report generation systems to execute or run faster, since there are many less records to be accessed. Also, a summarized subset of the central data base would likely incur lower storage (hardware) costs. These advantages must be weighed against the potential control problems outlined in Section A. Central Data Base.

2. Segmentation, if necessary, is an important facet of data base design. The central data base may need to be organized into smaller units because of volume considerations. Data may need to be grouped by line of business or by state, for example, depending again on the needs of the users.
  3. The file structure, sequential versus random access, becomes an important consideration as the size of the data base increases. Multiple passes of a sequential data base to extract the same or different data elements may be costly and inefficient. In this situation a random access file with a data base management system may be preferable.
- E. Ad-Hoc Capabilities - While many pre-programmed reports may be specified to extract information routinely, data bases should be flexible and organized to facilitate the use of higher level languages by end users for special ad-hoc reports.
- F. Storage - The retention period of data in the data base depends on the number of years of data needed for meaningful analysis, and legal and regulatory requirements.

### III. Management Information Considerations

There are several different types of management information systems necessary in a property/casualty insurance system, including ratemaking, reserving, underwriting/marketing, claims, financial analysis and investments.

The types of data outlined below are fundamental requirements within each discipline and are not meant to be an exhaustive list of every possible piece of information.

## A. Ratemaking

Historical premium, exposure, loss and expense experience is usually the starting point of ratemaking. There are several acceptable methods of summarizing data for ratemaking purposes including calendar year, calendar/accident year, or policy year. The nature of the coverage being provided and data availability will affect the choice of the system used. There are three general types of data needed in any ratemaking process:

1. Premium and Exposure Information should include actual collected written and earned premium, written and earned exposures, including the effect of audit adjustments, and premium at present manual rates (where applicable). Information should be organized to monitor growth rates and changes in the mix of business and therefore should be available by class, by territory, by policy limit and by state within each line or subline of business. Information about historical rate changes and exposure trends should also be available.
2. Loss and Loss Adjustment Expense Information is needed in greater detail than premium and exposure information because of the greater number of variables that can affect loss estimates developed in the ratemaking process. Historical loss development patterns of paid and incurred loss amounts, claim counts and loss adjustment expenses should be available to properly estimate the ultimate value of currently outstanding claims. The impact of changes in the frequency and severity of claims should be measured with appropriate reports. Possible changes in the underlying loss distribution should be analyzed by reviewing data segregated by size of claim.

3. Expense Information should be available to determine the appropriate provisions for various categories of expenses: unallocated loss adjustment expenses, commissions, other acquisition expenses, taxes, licenses and fees, general administrative expenses and dividends.

Insurance ratemaking takes place in the broad economic environment that effects every business. The ratemaker may supplement internal information with external economic data or industry-wide ratemaking data that may be relevant.

#### B. Reserving

Information produced for the loss reserving function must be sufficient to analyze the essential characteristics of the claim reporting and settlement process. Information is usually organized in a two dimensional matrix that reflects the historical claim process in some way. The correct matching of the matrix to the reserving task is critical to the effectiveness of the reserving function.

Each loss reserving matrix is defined by: 1) the characteristics of its two dimensions, which are usually time units, 2) its data groupings, and 3) the statistics displayed.

##### 1. Dimensions

One dimension is usually accident periods or report periods. In other words, losses are grouped according to the date of loss or the date of reporting. Accident date configurations are normally used to estimate total loss reserve needs (for both known and unknown claims), while report date configurations are used to estimate known claim reserves.

The second dimension usually reflects development or maturity levels thereby showing a particular accident or report period's history.

## 2. Data Groupings

Groupings can reflect line of business, class, type of loss or geographical location. Data can be configured on a gross, direct or net basis. The degree of refinement should reflect a balancing of the possibly conflicting goals of homogeneity and credibility.

## 3. Statistics

The following are some common statistics that are useful in the reserving process:

- i. The number of open claims
- ii. The number of claims closed with payment
- iii. The number of claims closed without payment
- iv. The number of reported claims
- v. The amount of paid losses
- vi. The amount of paid allocated loss adjustment expenses
- vii. The amount of outstanding losses
- viii. The amount of outstanding allocated loss adjustment expenses
- ix. The amount of incurred losses
- x. The amount of incurred allocated loss adjustment expense

Combinations of these statistics, such as the amount of paid losses divided by the number of claims closed with payment, i.e., paid severity, or ratios of these statistics to exposure bases are also useful to review.

## C. Underwriting/Marketing

Whether the underwriting and marketing functions are handled in one or many departments, their management information needs are similar:

Information is needed 1) to monitor and reevaluate marketing objectives and underwriting policy, and 2) to monitor and appraise the performance



of individual producers and underwriters.

Areas that should be monitored include the following:

1. Distribution of the current book of business by branch or region, by line, by class, by territory, etc. with comparisons to prior time periods.
2. Trends in premium and loss experience by branch, by line, by class (reflecting demographic and or industrial breakdowns) and by territory (for individual producers or for the company as a whole).
3. Analysis of underwriting results by type of distribution system (agency vs. brokerage vs. direct mail), if applicable.
4. Analysis of amounts of new business, non-renewed business and renewal increases by line of business, by class and by territory.
5. Monitoring of experience modifications, schedule modifications and other individual risk rating modifications.

In each case, the reporting categories should include information on production source (agent, underwriter, branch), line of business, territory, coverage, and class. Amounts to be analyzed should include in force policy count, written and earned premiums, paid and incurred losses, IBNR estimates, commission expenses (flat and contingent) and other assignable underwriting expenses.

#### D. Claims

Management information required by the claims function generally falls into three areas: 1) claim count transactional data, 2) information on pending claims, and 3) information on closed claims.

The level of detail required depends on the level of management using the data, and ranges from data by individual claim adjuster to data by unit, branch, region, company, or national. Time periods covered can be weekly, monthly, quarterly, year-to-date or the latest 12 months. Data generally should be summarized by type of claim, i.e. line of business, coverage, cause of loss, etc., with identification of catastrophe losses.

1. Claim count information includes the number of claims opened, the number of claims closed with payment, the number closed without payment, the number of claims reopened and the number reclosed. Appropriate ratios between the various claim counts should be calculated. The average lag between initial reporting, establishment of a reserve, and final payment should be monitored.
2. Information on pending claims should include the number of pending claims, the number of pending law suits, the amount of reserves and average reserve on open claims by age since opened, the amount of reserves and average reserve on open claims by size of reserve, paid and reserved amounts for allocated loss adjustment expenses, and partial payments on pending claims.
3. Information on closed claims should include average paid claim cost (with comparisons by unit within a branch or region or state), claims closed by size of loss, analysis of salvage and subrogation recoveries, and analysis of paid allocated loss adjustment expenses (by type, by adjuster, by law firm, etc.). Loss development should be monitored by reviewing report year data.

#### E. Financial Analysis/Investments

Management information needed to support the financial analysis and investment function generally breaks down into two areas: short run cash flow analysis and long term profit maximization analysis.

1. In the short run, the immediate concern is to be able to meet current period obligations with current assets. Reports should be available to summarize current income items such as net premiums written, net investment income received, cash on hand and on deposit and the value of bonds maturing. Current liabilities should be estimated, including expected loss and loss adjustment expense payments, commissions, salaries, other expenses, stockholders and policyholders dividends, and interest payable.

The short run should be defined as the next month or the next quarter. Besides displaying the above dollar amounts, management reports should provide analysis of trends in the various items.

2. In order to maximize long run operating profit, management information is needed which summarizes all the financial activities of the company in a logical and useful manner. Each company will have its own particular style in which they conduct this analysis, but the general goal is to maximize total return, while maintaining an adequate cash flow to meet expected liabilities. All this should be done with an awareness of the tax consequences of various portfolio structures. The types of information that should be available include the following:

- i. Mix of current investments and the related interest and dividend income, including bonds (amortized and cash value), preferred stocks, common stocks, real estate, cash, etc.
- ii. Premium income by line of business.
- iii. Loss and loss adjustment expense payments, projected by calendar year.
- iv. Stockholders and policyholder dividend requirements.
- v. Tax liabilities - Federal and State.
- vi. Expense requirements - commissions, salaries, overhead, etc.
- vii. Projected underwriting results by line of business.
- viii. Projected surplus growth in comparison to projected written premium volume.

**F. Financial Reporting**

Information is required to meet financial reporting obligations. The information normally includes calendar period premiums, losses, expenses and investment income. The major obligations are:

1. Statutory reporting
2. Shareholder reporting
3. Income tax reporting
4. Internal profitability/planning

**IV. Conclusion**

The actuary, by applying the above principles, will encourage the existence of adequate, quality information to better manage the major disciplines of the insurance system.

AN ACTUARIAL ANALYSIS OF  
SIMPLIFIED EXPERIENCE RATING  
ADJUSTMENT (SERA)  
by Howard C. Mahler

Recently the National Council on Compensation Insurance has significantly revised the Experience Rating Plan for Workers' Compensation. This followed a detailed actuarial study of the performance of the current plan and possible alternatives. The new plan that is the result of this study has been given the acronym SERA (Simplified Experience Rating Adjustment).

This note compares SERA to the current experience rating plan. While the NCCI study is mentioned in passing, the details of that interesting study are beyond the scope of this note.

While the tables at the end are based on the SRP for one state (Massachusetts) the overall pattern and conclusions should follow in general.

Comparison of Workers' Compensation  
Experience Rating Plans

<u>Current</u>	<u>SERA</u>
<p>Primary and Excess Losses</p> <p>Multi-split Plan: Primary portion of a loss is determined via formula<sup>1</sup> or from a table.</p> <p>Experience Modification depends on a comparison of actual losses to expected losses, taking into account credibilities.</p> <p>Users of the plan look up W and B values in a table.</p> <p>The table of W and B values depends on a state specific value, the Self-Rating Point.</p>	<p>Primary and Excess Losses</p> <p>Single Split Plan: Primary portion of a loss is the first \$5000.</p> <p>Experience Modification depends on a comparison of actual losses to expected losses, taking into account credibilities.</p> <p>Users of the plan look up W and B values in a table.</p> <p>The table of W and B values depends on a state specific value, the State Reference Point.</p>

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1

$A_p = \frac{A \cdot 10000}{A + 8000}$ . For losses less than 2000, the whole loss is considered primary.

Credibilities, Current vs. SERA

Under SERA the credibilities differ from the current plan. As can be seen in the attached table:

1. For small risks, Primary Credibilities are larger.
2. For large risks, Primary Credibilities are smaller. The maximum Primary Credibility is 91%, rather than 100% as under the current plan.
3. For small risks, Excess Credibilities are a little larger. Even very small risks have a small non-zero Excess Credibility, as opposed to zero under the current plan.
4. For large risks, Excess Credibilities are much smaller. The maximum Excess Credibility is 57%, rather than 100% as under the current plan.

Thus one important change is that under SERA there are no longer self-rated risks. The primary losses are assigned a maximum credibility of 91%, while the excess losses are assigned a maximum credibility of 57%.

Under SERA, as a function of the size of risk the credibilities are of the form  $\frac{\text{linear}}{\text{linear}}$ . This can be written as:

$$Z = \frac{E + I}{JE + K}$$

with one formula for primary credibility and one excess credibility, each with different constants I, J, and K. The particular parameters in SERA satisfy  $0 \leq I \leq K$  and  $J \leq 1$ . This is the form of credibility one expects if both parameter uncertainty and risk homogeneity are important.<sup>2</sup> The more usual formula for credibility is a special case of this above formula, with  $I = 0$  and  $J = 1$ .

The formulas for  $Z_p$  and  $Z_e$  are:

$$Z_p = \frac{E + .0228S}{1.1E + .01308S}$$

$$Z_e = \frac{E + .0204S}{1.75E + .8357S}$$

where S is the State Reference Point. The actual values for the credibilities may differ slightly due to the rounding process involved in establishing a table of W and B values.

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<sup>2</sup> See Equation 1.6 in Howard Mahler's discussion of "An Analysis of Experience Rating" by Glenn Meyers, PCAS 1987.

Actuarial Formulas Underlying Experience Rating

The following formula is used in both the current plan and SERA in order to get the experience modification.

$$M = \frac{A_p + B + WA_e + (1-W)E_e}{E_p + B + WE_e + (1-W)E_e}$$

Where M = Experience Modification

$A_p$  = Actual Primary Losses

$A_e$  = Actual Excess Losses

$E_p$  = Expected Primary Losses

$E_e$  = Expected Excess Losses

B = Ballast Value

W = Weighting Value

Under both plans the W and B values vary with the expected losses and are displayed in a table. However, the formulas used to determine W and B are significantly different under the two plans. In order to compare the plans, it is useful to reframe the formulas in terms of credibilities. Following the development in "Fundamentals of Individual Risk Rating and Related Topics" by Richard Snader:

$$\text{Let } Z_p = \frac{E}{E + B}$$

$$Z_e = \frac{E}{E + B + \frac{(1-W)E}{W}} = \frac{WE}{E + B} = WZ_p$$

This can also be written in terms of the usual Bayesian formula for credibility as:

$$Z_p = \frac{E}{E + K_p}$$

$$Z_e = \frac{E}{E + K_e}$$



with the credibility parameters  $K_p$  and  $K_e$  depending on the expected losses  $E$ ; through  $W$  and  $B$ :

$$K_p = B$$

$$K_e = \frac{B + (1-W) E}{W}$$

Then the modification formula becomes in terms of the credibilities:

$$M = \frac{(1-Z_p) E_p + Z_p A_p + (1-Z_e) E_e + Z_e A_e}{E}$$

under the current plan:

$$B = (1-W) 20000$$

$$W = \begin{cases} 0 & E \leq 25000 \\ \frac{E-25000}{S-25000} & S \geq E \geq 25000 \\ 1 & E \geq S \end{cases}$$

Where  $S$  is the self-rating point.

Under SERA the values of the credibility parameters  $K_p$  and  $K_e$  are given via formula<sup>3</sup>, and then  $B$  and  $W$  follow from them:

$$K_p = E \left[ \frac{E + .1028S}{10E + .028S} \right]$$

$K_p$  is subject to a minimum of 7500.

$$K_e = E \left[ \frac{.75E + .8153S}{E + .0204S} \right]$$

<sup>3</sup> The NCCI calls  $K_p = B$  and  $K_e = C$ . Also they introduce a parameter

$$s = \frac{S}{250000}$$

$K_e$  is subject to a minimum of 150,000.

Where S is the State Reference Point.<sup>4</sup>

Thus under SERA, the credibility parameters have the form  $E \frac{\text{Linear}}{\text{Linear}}$ .

This is the form that is expected when the phenomena of Parameter Undertainty and Risk Homogeneity are important.<sup>5</sup> The NCCI determined the particular coefficients by empirical testing.

Then one can determine W and B from  $K_p$  and  $K_e$  using the solution of the set of equations that expressed  $K_p$  and  $K_e$  in terms of  $e^W$  and B:

$$B = K_p$$

$$W = \frac{E + K_p}{E + K_e}$$

W is subject to minimum of .07.

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<sup>4</sup> The State Reference Point will be determined as 250 times the average claim cost in that state.

<sup>5</sup> See Howard Mahler's discussion of "An Analysis of Experience Rating" by Glenn Meyers, PCAS 1987. In Appendix VII the result for a split plan is given as  $E \frac{\text{Quadratic}}{\text{Quadratic}}$ . However, when the covariance of excess and primary losses is not extremely important, the no-split plan result of  $E \frac{\text{Linear}}{\text{Linear}}$  is a sufficiently close approximation.

Workers' Compensation Experience Rating

Credibilities

<u>Expected Losses (\$000)</u>	<u>Primary</u>		<u>Excess</u>	
	<u>Current*</u>	<u>SERA**</u>	<u>Current*</u>	<u>SERA**</u>
5	20%	39%	0%	3%
10	33	49	0	3
15	43	56	0	4
20	50	61	0	4
25	56	65	0	5
50	72	75	2	7
75	80	79	5	9
100	85	82	8	11
125	88	84	11	12
150	90	85	13	14
200	93	86	19	16
300	96	88	32	21
400	97	88	43	25
500	98	89	55	28
750	100	90	86	33
1000	100	90	100	37
2000	100	90	100	44
3000	100	91	100	48
4000	100	91	100	50
5000	100	91	100	52
7500	100	91	100	54
10000	100	91	100	54
∞	100	91	100	57

\* Current NCCI Experience Rating Plan, using Self-Rating Point of \$870,000 (assumes average serious case of \$87,000)

\*\* Simplified Experience Rating Adjustment (SERA), using State Reference point of \$1,250,000 (assumes average case of \$5,000)

Workers' Compensation Experience RatingW and B Values

<u>Expected Losses (\$000)</u>	<u>B (\$00)</u>		<u>W</u>	
	<u>Current*</u>	<u>SERA**</u>	<u>Current*</u>	<u>SERA**</u>
5	200	79	0	.07
10	200	103	0	.07
15	200	116	0	.07
20	200	126	0	.07
25	200	135	0	.07
50	194	167	.03	.09
75	188	194	.06	.11
100	182	221	.09	.13
125	176	247	.12	.14
150	170	272	.15	.16
200	158	323	.21	.19
300	134	424	.33	.24
400	112	524	.44	.28
500	88	624	.56	.31
750	28	874	.86	.37
1000	0	1125	1.00	.41
2000	0	2125	1.00	.49
3000	0	3125	1.00	.53
4000	0	4125	1.00	.55
5000	0	5125	1.00	.57
7500	0	7625	1.00	.59
10000	0	10125	1.00	.60

\* Current NCCI Experience Rating Plan using Self-Rating Point of \$870,000 (assumes average serious case of \$87,000).

\*\* Simplified Experience Rating Adjustment (SERA), using State Reference Point of \$1,250,000 (assumes average case of \$5,000).

## BEWARE OF MISMATCH!

by Charles H. Berry, III

### Introduction

To pique your interest and get your mind involved in the ideas to be discussed in this paper, let's start off with a short true/false quiz:

<u>True</u>	<u>False</u>	<u>Statement</u>
<input type="checkbox"/>	<input type="checkbox"/>	1. Suppose an insurance company writes a \$1,000 policy, invests the cash at a risk-free 4% yield rate, and pays \$990 of losses and expenses exactly one year later. There is no way the company can lose money on the deal.
<input type="checkbox"/>	<input type="checkbox"/>	2. Suppose the company in the previous question can buy a one-year 4% bond or a five-year 6% bond of the same quality. It will always be better off buying the longer bond, because this will maximize its average portfolio yield.
<input type="checkbox"/>	<input type="checkbox"/>	3. Suppose the company in the previous question is also guaranteed that it will have enough new premiums during the five-year period that its cash flow will be positive. It can thus hold the long bond to maturity. With this guarantee, the five-year bond is always the better investment.

The obvious answer is "True" in every case, right? Therefore, even if you don't know much about mismatch, you can probably guess that the correct answer is "False". (Otherwise, why would these questions have been included here?)

If you are interested in learning more about mismatch and in understanding why these statements are false, read on.

### Definition

In general, the three statements above are false because of asset/liability mismatch. Mismatch exists when the timing of the cash flows needed to settle liabilities is not equal to the timing of the cash flows generated by the assets backing these liabilities.

Of course, if a company simply doesn't have enough assets to cover all its liabilities, it is in trouble no matter how you look at it. Because of mismatch, however, even a company with enough assets (in a true economic net value sense as well as a statutory accounting sense) may still not be safe if the maturities are different.

The characteristics and significance of asset/liability mismatch, and the falsity of the three quiz statements, will be illustrated using the simple numerical examples shown in attached Exhibits A through E.

Assumptions Underlying the Examples

The assumptions used to generate these examples are shown on the sheet immediately preceding Example A. A few additional remarks about some of the assumptions may also be helpful.

In each example, a new company begins operations on 1/1/2001. Thus, all balance sheet entries are \$0 just before then. Thereafter, all earnings are retained and reinvested, so that the net worth of the company at subsequent dates shows the true, cumulative profit from the business it has written.

Losses were rigged so that all policies should yield the same 5% profit. That is, for every example, Line (3) is 5% of Line (2). Thus, all business has the same inherent profit potential, irrespective of the volume of business written or the year in which it was written.

How these assumptions operate can best be seen by working through the simplest case, Example A.

Example A

First consider the 2001 column. On 1/1/2001, the company writes a premium of \$1,000, which was priced to produce a profit of 5%. Because interest rates are 4%, and the premium will be invested for one year before the loss is paid, the company expects \$40 of investment income. Losses are \$990, generating an underwriting profit of \$10, for a total Expected Net Profit of \$50 on Line (3).

On Line (13) of Example A, the \$1,000 premium actually is invested at 4%. In this example, the maturity of the bond is matched to the timing of the loss payment; that is, the company buys a bond which will mature on 1/1/2002, the date on which the \$990 loss must be paid.

Line (12) of the 2002 column shows that the company did in fact earn the expected \$50 on this policy. It now invests this for one more year, this time at 6% because interest rates have increased. The principal of \$50 plus the \$3 of earned investment income are 1/1/2003 cash flows. This process continues until the company has a net worth of \$71 in 1/1/2006.

Example B

Example B is identical to Example A except that the bond purchased on 1/1/2001 has a maturity of five years rather than one year.

This means that all cash flows in the 2001 column are the same. However, in Example B, on 1/1/2002, only \$40 of investment income is available to pay the \$990 loss. Thus, \$950 must be borrowed, at the 2002 new money rate of 6%.

The company continues borrowing the needed cash for one year at a time until 1/1/2006 when the bond matures. But by then, the bond is not large enough to pay off the loan which has accumulated. Instead of making \$71 on the policy, the company loses \$152.

This total difference of \$223 is due entirely to asset/liability mismatch; all other parts of Examples A and B are identical. In Example B, just as in Example A, the pricing assumptions were perfect. The amount and timing of the loss payments were exactly as expected. The company actually did earn 4% on its investment; no asset default occurred. The only reason the result in Example B is worse than that in Example A is the fact that the asset and liability maturities were not the same.

Example B demonstrates that the first quiz statement is false. This company would actually have been better off to have put the \$1,000 premium in a shoe box rather than investing it for five years; at least it would have ended up with a \$10 underwriting profit.

The \$223 difference between Examples A and B is huge! This impact is so great, in fact, that it provides an illustration that quiz statement 2 is false. You might like to take a few minutes and play with Example B yourself and prove that even a 6% five-year bond (which a company might be tempted to buy rather than a 1-year bond with a lower, 4% yield rate) produces a net loss of \$31 by 2006.

OBSERVATION: Mismatch risk can have a significant impact in addition to all of the risks inherent in pricing uncertainties, potential reserve shortages, asset defaults, etc.

Example C

This example is the same as Example A except that a new policy is written in each of five years. Not writing a sixth policy in 2006 enables us to run off the first five policies and reduce the company to a cash position of \$305 as of 1/1/2006 for comparison with other examples.

Note on Line (3) that the five policies are all priced to produce the same 5% Expected Net Profit. Incurred losses increase over time, but higher investment income can be earned on the premium.

Example D

All the assumptions in Examples C and D are identical except that the original \$1,000 4% bond purchased on 1/1/2001 matures in five years in Example D as opposed to one year in Example C. All other differences in the results are caused by this one change.

Observe in this case that the company did not have to borrow as in Example B. Instead, the new premiums coming in were used to pay the old claims. This ongoing book of business makes the mismatch risk less apparent than in Example B.

Nevertheless, the cost of the mismatch has not changed, as can be seen from a comparison of the net worth as of 1/1/2006:

<u>1/1/2006 Net Worth</u>	
Example A: (Single 2001 Policy, Matched)	+\$71
Example B: (Single 2001 Policy, Mismatched)	<u>-152</u>
Net Mismatch Cost	\$223
Example C: (Five Policies, 2001 Matched)	+\$305
Example D: (Five Policies, 2001 Mismatched)	<u>-82</u>
Net Mismatch Cost	\$223

The net cost of mismatch in both pairs of examples is identical. The actual fact of whether or not the company actually borrowed cash rather than using new premiums to pay old losses does not make any difference.

OBSERVATION: Mismatch risk is not eliminated, nor even reduced, for a company which continues producing enough business to avoid borrowing or forced asset sales.

These examples demonstrate the falsity of quiz statement 3. Using new premiums to pay old losses simply obscures any mismatch situation which may exist, thereby making mismatch even more dangerous. A company can get into deep trouble for reasons it perceives as loss of premium volume, poor cash flow, or inability to price competitively due to a low portfolio yield rate. These are just the symptoms; mismatch is the real cause.

Example E

This example is the same as Example D with three exceptions. First, this company invests all cash (as opposed to 2001 cash) for five years.

Second, a total of six policies are written, and a total of eleven years of data are shown in order to allow time for all bonds and loans to become liquid so that a net worth position can more easily be determined.



Third, premiums grow at 10% per year during the ten years. This helps to cover up the mismatch in the short run, but of course cannot avoid the ultimate cost.

Observe that even though premiums continue to grow and all new business is priced on a basis which should make it profitable (Line (3) is still 5% of Line (2) as in the other examples), the company gets into a negative cash flow position in 2007. By 2011, instead of accumulating a large profit (as it would have if it had been matched), it ends up with a net loss of \$7.

OBSERVATION: Even with a growing volume of business which "should be" profitable, a company investing its assets without giving appropriate consideration to the maturities of the corresponding liabilities may bear a substantial risk.

#### Relevance of These Examples

These examples are greatly simplified, and the scenario of interest rates rising continuously over a long period of time may be extreme.

On the other hand, it is a fact that interest rates were generally increasing from 1965 to 1981, and the average rate of increase from 1977 to 1981 did approximate 2% per year. In addition, companies commonly purchase assets with maturities of 15, 20, or 30 years rather than 5 years, which greatly increases mismatch risk for most property/casualty companies.

The examples, therefore, show not only the direction in which mismatch can operate but also give a rough feel for the magnitude of the impacts which are possible.

#### Does Mismatch Ever Help?

Mismatch risk is a true "risk" in a mathematical sense; "risk" implies variability and uncertainty, but the impact of the variation can be favorable as well as unfavorable.

In Examples A through E, for instance, if interest rates were decreasing rather than increasing, the company would benefit from being mismatched. Conversely, a company with 5-year liabilities and 1-year assets would be hurt by interest rate decreases and helped by increases.

Thus, on the average, mismatch impacts may balance out over time, provided the average can be taken over an extremely long period. In practice, however, companies must survive every year of a long period; the fact that some benefits were "just around the corner" is of little consolation to a company that never gets to the end of the current block.

For this reason, it may be appropriate for a company to forgo the possible benefits of being mismatched. That is, it may conclude that it already has enough risk due to its insurance underwriting business without voluntarily taking on additional risk through its investment operation by implicitly speculating in future interest rates.

#### Summary

Asset/liability mismatch can add a significant amount of risk to the earnings, and even to the solvency, of any property/casualty insurance company which has assets and liabilities with significantly different maturities.

Mismatch is insidious. Its cost is present even if a company does not literally have to sell assets or borrow cash; using current premiums from a growing volume of business to pay old claims does not eliminate mismatch. It is prudent for a company to make itself aware of its level of mismatch and to manage this risk as carefully and as consciously as it does any other risk associated with the insurance business.

ASSUMPTIONS COMMON TO ALL EXAMPLES

1. All balance sheet items are \$0 as of 12/31/2000, just before the first premium is written.
2. All cash flows occur on January 1.
3. Premiums (written and earned) are \$1,000 for 2001, the first year in which a policy is written.
4. Expenses are \$0.
5. Losses are paid exactly 1 year after policy issue, and are such that each policy will yield a profit of 5% of premium, assuming investment income is earned at the new money rate in effect at the time the policy is issued.
6. Bonds purchased 1/1/2001 yield 4% interest. Yield rates increase 2% per year thereafter. Coupon interest on bonds is paid annually.
7. Loans are made for a period of one year, and interest is paid annually. Loan rates are the same as bond new money rates available at the same time.
8. FIT is ignored.
9. All earnings are retained and reinvested; no dividends are paid, no capital contributions are added to the company, etc.

ASSUMPTIONS WHICH VARY BY EXAMPLE

<u>Example</u>	<u>Number of Policies</u>	<u>Premium Growth</u>	<u>Asset Life</u>
A	1	0%	1 year
B	1	0	5 years
C	5	0	1 year
D	5	0	5 years *
E	6	10	5 years

\* Initial 5-year bond; subsequent reinvestment for 1 year

EXAMPLE A  
SINGLE POLICY--MATCHED

ASSUMPTIONS:	2001 ----	2002 ----	2003 ----	2004 ----	2005 ----	2006 ----
1) New Money Rate	4%	6%	8%	10%	12%	14%
2) Premium	1000	0	0	0	0	0
3) Expected Net Profit	50	0	0	0	0	0
4) Expected Inv. Income	40	0	0	0	0	0
5) Loss Incurred	990	0	0	0	0	0
CASH FLOWS (JAN 1):						
6) Premium	1000	0	0	0	0	0
7) Asset Maturity	0	1000	50	53	57	63
8) Investment Income	0	40	3	4	6	8
9) Losses Paid	0	-990	0	0	0	0
10) Loan Principal Due	0	0	0	0	0	0
11) Interest Paid	0	0	0	0	0	0
12) Cash Avail. for Inv.	1000	50	53	57	63	71
BONDS PURCHASED (JAN 1):						
13) Amount	1000	50	53	57	63	
14) Yield Rate	4%	6%	8%	10%	12%	
15) Annual Inv. Income	40	3	4	6	8	
16) Maturity Date	1/02	1/03	1/04	1/05	1/06	
MONEY BORROWED (JAN 1):						
17) Amount	0	0	0	0	0	
18) Interest Rate						
19) Annual Interest						
20) Loan Due						
21) NET WORTH ON 1/1/06						71 ==

EXAMPLE B  
SINGLE POLICY--MISMATCHED

ASSUMPTIONS:	2001 ----	2002 ----	2003 ----	2004 ----	2005 ----	2006 ----
1) New Money Rate	4%	6%	8%	10%	12%	14%
2) Premium	1000	0	0	0	0	0
3) Expected Net Profit	50	0	0	0	0	0
4) Expected Inv. Income	40	0	0	0	0	0
5) Loss Incurred	990	0	0	0	0	0
<b>CASH FLOWS (JAN 1):</b>						
6) Premium	1000	0	0	0	0	0
7) Asset Maturity	0	0	0	0	0	1000
8) Investment Income	0	40	40	40	40	40
9) Losses Paid	0	-990	0	0	0	0
10) Loan Principal Due	0	0	-950	-967	-1004	-1064
11) Interest Paid	0	0	-57	-77	-100	-128
12) Cash Avail. for Inv.	1000	-950	-967	-1004	-1064	-152
<b>BONDS PURCHASED (JAN 1):</b>						
13) Amount	1000	0	0	0	0	
14) Yield Rate	4%					
15) Annual Inv. Income	40					
16) Maturity Date	1/06					
<b>MONEY BORROWED (JAN 1):</b>						
17) Amount	0	950	967	1004	1064	
18) Interest Rate		6%	8%	10%	12%	
19) Annual Interest		57	77	100	128	
20) Loan Due		1/03	1/04	1/05	1/06	
21) NET WORTH ON 1/1/06						-152

EXAMPLE C  
ANNUAL POLICIES--MATCHED

ASSUMPTIONS:	2001 ----	2002 ----	2003 ----	2004 ----	2005 ----	2006 ----
1) New Money Rate	4%	6%	8%	10%	12%	14%
2) Premium	1000	1000	1000	1000	1000	0
3) Expected Net Profit	50	50	50	50	50	0
4) Expected Inv. Income	40	60	80	100	120	0
5) Loss Incurred	990	1010	1030	1050	1070	0
<b>CASH FLOWS (JAN 1):</b>						
6) Premium	1000	1000	1000	1000	1000	0
7) Asset Maturity	0	1000	1050	1103	1161	1227
8) Investment Income	0	40	63	88	116	148
9) Losses Paid	0	-990	-1010	-1030	-1050	-1070
10) Loan Principal Due	0	0	0	0	0	0
11) Interest Paid	0	0	0	0	0	0
12) Cash Avail. for Inv.	1000	1050	1103	1161	1227	305
<b>BONDS PURCHASED (JAN 1):</b>						
13) Amount	1000	1050	1103	1161	1227	
14) Yield Rate	4%	6%	8%	10%	12%	
15) Annual Inv. Income	40	63	88	116	148	
16) Maturity Date	1/02	1/03	1/04	1/05	1/06	
<b>MONEY BORROWED (JAN 1):</b>						
17) Amount	0	0	0	0	0	
18) Interest Rate						
19) Annual Interest						
20) Loan Due						
21) NET WORTH ON 1/1/06						305 ===

EXAMPLE D  
ANNUAL POLICIES--MISMATCHED

ASSUMPTIONS:	2001 ----	2002 ----	2003 ----	2004 ----	2005 ----	2006 ----
1) New Money Rate	4%	6%	8%	10%	12%	14%
2) Premium	1000	1000	1000	1000	1000	0
3) Expected Net Profit	50	50	50	50	50	0
4) Expected Inv. Income	40	60	80	100	120	0
5) Loss Incurred	990	1010	1030	1050	1070	0
CASH FLOWS (JAN 1):						
6) Premium	1000	1000	1000	1000	1000	0
7) Asset Maturity	0	0	50	83	100	1100
8) Investment Income	0	40	43	47	50	52
9) Losses Paid	0	-990	-1010	-1030	-1050	-1070
10) Loan Principal Due	0	0	0	0	0	0
11) Interest Paid	0	0	0	0	0	0
12) Cash Avail. for Inv.	1000	50	83	100	100	82
BONDS PURCHASED (JAN 1):						
13) Amount	1000	50	83	100	100	
14) Yield Rate	4%	6%	8%	10%	12%	
15) Annual Inv. Income	40	3	7	10	12	
16) Maturity Date	1/06	1/03	1/04	1/05	1/06	
MONEY BORROWED (JAN 1):						
17) Amount	0	0	0	0	0	
18) Interest Rate						
19) Annual Interest						
20) Loan Due						
21) NET WORTH ON 1/1/06						82

EXAMPLE E  
ANNUAL POLICIES--MISMATCHED--10% PREMIUM GROWTH

ASSUMPTIONS:	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
	----	----	-----	----	----	----	----	----	-----	----	----
1) New Money Rate	4%	6%	8%	10%	12%	14%	16%	18%	20%	22%	24%
2) Premium	1000	1100	1210	1331	1464	1610	0	0	0	0	0
3) Exp. Net Profit	50	55	61	67	73	81	0	0	0	0	0
4) Exp. Inv. Inc.	40	66	97	133	176	225	0	0	0	0	0
5) Loss Incurred	990	1111	1246	1397	1567	1754	0	0	0	0	0
CASH FLOWS (JAN 1):											
6) Premium	1000	1100	1210	1331	1464	1610	0	0	0	0	0
7) Asset Maturity	0	0	0	0	0	1000	150	148	146	143	1136
8) Inv. Income	0	40	49	61	76	93	212	203	191	176	159
9) Losses Paid	0	-990	-1111	-1246	-1397	-1567	-1754	0	0	0	0
10) Loan Princ. Due	0	0	0	0	0	0	0	-1392	-1264	-1155	-1067
11) Interest Paid	0	0	0	0	0	0	0	-223	-228	-231	-235
12) Cash for Inv.	1000	150	148	146	143	1136	-1392	-1264	-1155	-1067	-7
BONDS PURCHASED (JAN 1):											
13) Amount	1000	150	148	146	143	1136	0	0	0	0	
14) Yield Rate	4%	6%	8%	10%	12%	14%					
15) Annual Inv. Inc	40	9	12	15	17	159					
16) Maturity Date	1/06	1/07	1/08	1/09	1/10	1/11					
MONEY BORROWED (JAN 1):											
17) Amount	0	0	0	0	0	0	1392	1264	1155	1067	
18) Interest Rate							16%	18%	20%	22%	
19) Annual Interest							223	228	231	235	
20) Loan Due							1/08	1/09	1/10	1/11	
21) NET WORTH ON 1/1/13											-7

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## **REPRINT OF AN OLD PLAY**

In the interest of resurrecting classic documents, this issue of the Actuarial Forum reprints the script from a play presented in 1974 entitled "How To Succeed As An Actuary." We hope that you enjoy this light-hearted look at the world of the "big time" corporate actuary. With the 1989 anniversary meeting coming up, perhaps someone would have the talent and interest to adapt another play to an actuarial setting. How about it, all you creative actuaries?



HOW TO SUCCEED AS AN ACTUARY

Adapted by

Matthew Rodermund

from

HOW TO SUCCEED IN BUSINESS  
WITHOUT REALLY TRYING

by

Frank Loesser and Abe Burrows

Additional words and music by

Sir Arthur Sullivan, Ira Levin, Milton Schafer,  
Henry Russell, Vick Knight, Teddy Randazzo,  
Bobby Weinstein, Bob Crewe, Bob Gaudia,  
and Sharus O'Connor

CAST OF CHARACTERS

(in the order of their appearance)

Narrator ..... John Muettterties

J. Daniel McNary,  
aspiring actuary ..... Bob Hunter

J. B. Biggley,  
President,  
Global Insurance Company ..... Paul Liscord

Rosemary,  
a secretary ..... Ginny Hunter

Bud Frump,  
the President's nephew ..... Bob Foster

Alexander Twimble,  
statistician ..... Norman Bennett

Mister Bratt,  
chief actuary ..... Lou Tarbell

Other actuaries ..... Charlie Cook  
Barry Jorve  
Matt Roderrund  
Adger Williams

Other secretaries ..... Barbara Cook  
Sharon Faber  
Nancy Kochanski  
Ann Phillins

SCENE

Home office of the Global Insurance Company

## HOW TO SUCCEED AS AN ACTUARY

by Matthew Rodermund

### PART I

NARRATOR: J. Daniel McNary wanted to get ahead in the world. He had a pretty good education, and some talent in mathematics. He was ready to work hard, but also he wanted to avoid making mistakes. If other people made mistakes he was willing to accept any backlash benefits that came his way. And he had figured out that it was desirable to be noticed by the proper people at proper times. He heard about a book entitled "How To Succeed in Business Without Really Trying" and he bought a copy:

#### HOW TO SUCCEED

McNary

How to apply for a job,  
How to advance from the mail room,  
How to sit down at a desk,  
How to dictate memorandums,  
How to develop executive style,  
How to commute in a three-button suit,  
With that weary executive smile --

This book is all that I need,  
"How to, how to succeed."

How to observe personnel,  
How to select whom to lunch with,  
How to avoid petty friends,  
How to begin making contacts,  
How to walk into a conference room  
With an idea, brilliant business idea,  
That will rake your expense account zoom --

NARRATOR: Then he landed a job as an actuarial trainee in the Global Insurance Company, a medium-size multiple line company that was part of a holding company operation. He determined to study hard and take his actuarial examinations. He realized he had found the right company, but he referred to his book frequently:

HOW TO SUCCEED (reprise)

McNary

This book is all that I need,  
"How to, how to succeed."

NARRATOR: One day, book in hand, J. Daniel bumped into  
J. B. Biggley, President of the company:

BIGGLEY: What are you reading, young man?

McNARY: Oh, I'm just trying to learn more about  
successful people in the business world.

BIGGLEY [nods approvingly]: Keep it up, young man.  
It's nice to see our employees interested in  
something other than girls and sports. What's  
your name?

McNARY: J. Daniel McNary.

BIGGLEY: I must remember that.

[McNARY looks at audience and grins.]

NARRATOR: Mr. Biggley was a proud president, with  
great confidence in his ability:

SMART INSURANCE PRESIDENT

Biggley, Boys and Girls

1.

BIGGLELY:

I am the very model of a smart insurance president;  
I'm eloquent and diligent and properly benevolent;  
I know the Lloyds of London and insurance facts  
    historical;  
From Venice to America in order categorical.  
I'm very well acquainted, too, with matters  
    arithmetical;  
I understand accounting, both applied and  
    theoretical;  
On problems of the risk of loss I'm teeming with  
    a lot of views;  
But I don't know a thing about the square on the  
    hypotenuse.

BOYS AND GIRLS:

He doesn't know a thing about the square on the  
    hypotenuse;  
He doesn't know a thing about the square on the  
    hypotenuse;  
He doesn't know a thing about the square on the  
    hynot-e-pot-enuse.

BIGGLELY:

I'm very poor at integral and differential calculus,  
But I'm aware when actuaries tell me things  
    ridiculous;  
In short on matters pertinent to forward-looking  
    management  
I am the very model of a smart insurance president.

BOYS AND GIRLS:

In short on matters pertinent to forward-looking  
    management  
He is the very model of a smart insurance president.



2.

RIGGLELY:

I've learned our business history, the mutuals and  
reciprocals;  
I know the Market's mystery, the railroads, the  
municipals.  
I cite the imperfections of my principal  
competitors;  
I pay employees well enough to keep away their  
creditors.  
I've built enough capacity to guard against  
catastrophe,  
And analyzed a bond to every comma and apostrophe:  
I know the reinsurance game as if it were the  
alphabet;  
But I don't know why I haven't made an underwriting  
profit yet.

BOYS AND GIRLS:

He don't know why he hasn't made an underwriting  
profit yet;  
He don't know why he hasn't made an underwriting  
profit yet;  
He don't know why he hasn't made a lousy underwriting  
profit yet.

BIGGLELY:

I can tell authentic businessmen from cocky  
mediocrities,  
But I don't expect executives to be as wise as  
Socrates;  
In short on matters pertinent to forward-looking  
management  
I am the very model of a smart insurance president.

BOYS AND GIRLS:

In short on matters pertinent to forward-looking  
management  
He is the very model of a smart insurance president.

3.

BIGGLEY:

In fact when I know what is meant by "analog" and  
"digital,"  
When "COBOL" is a word that I no longer view as  
cryptical,  
When "random access" doesn't mean a scheme of  
things erotical,  
And when "binary systems" make computers seem  
methodical,  
When I have learned which meetings and conventions  
are the weariest,  
And which of the commissioners are apt to be the  
dreariest,  
In short when I've been dipped in the experience  
I'd like to get,  
I'll be the greatest president who never made a  
profit yet.

BOYS AND GIRLS:

He'll be the greatest president who never made a  
profit yet;  
He'll be the greatest president who never made a  
profit yet;  
He'll be the greatest president who never made a  
lousy profit yet.

BIGGLEY:

But now my vaunted competence, though industry may  
honor it,  
Is just another asset in the hands of a conglomerate;  
And still on matters pertinent to forward-looking  
management  
I am the very model of a smart insurance president.

BOYS AND GIRLS:

And still on matters pertinent to forward-looking  
management  
He is the very model of a smart insurance president.

NARRATOR: Not long after J. Daniel had arrived, he had been noticed by Rosemary, a secretary in the actuarial department. She liked what she saw. She dreamed a little:

HAPPY TO KEEP HIS DINNER WARM

Rosemary

New Rochelle, New Rochelle,  
That's the place where the mansion will be  
For me and the darling bright young man I've  
picked out for marrying me.  
He'll do well, I can tell,  
So it isn't a moment too soon to plan on my  
life in New Rochelle,  
The wife of my darling tycoon.

GIRL: Are you willing to spend a lot of nights alone while he says he's working late?

ROSEMARY: I'm prepared for exactly that sort of thing.

[She sings:]

I'll be so happy to keep his dinner warm  
While he goes onward and upward.  
Happy to keep his dinner warm  
Till he comes wearily home from downtown.  
I'll be there waiting until his mind is  
clear.  
While he looks through me, right through  
me.  
Waiting to say: "Good evening, dear, I'm  
pregnant;  
What's new with you from downtown?"

Oh, to be loved by a man I respect,  
To bask in the glow of his perfectly  
understandable neglect.  
Oh, to belong in the aura of his frown,  
darling busy frown.  
Such heaven wearing the wifely uniform  
While he goes onward and upward.  
Happy to keep his dinner warm  
Till he comes wearily home from downtown.

NARRATOR: One of the first things J. Daniel learned in his new job was that the most important office ritual was the coffee break. But one morning shortly after he arrived at work, he saw that something was ariss. He overheard a couple of the girls talking to the assistant office manager, Bud Frump, who was the President's nephew:

FIRST GIRL: There's no coffee today!

SECOND GIRL: No coffee! Ye gods, I need coffee!

I need it to get the lead out of my --

FRUMP [interrupting just in time]: No coffee?

FIRST GIRL: Nope.

FRUMP [shrieking]: There's no coffee!

COFFEE BREAK

Frump, Boys and Girls

FRUMP:

If I can't take my coffee break, my coffee break,  
my coffee break,  
If I can't take my coffee break,  
Something within me dies.

If I can't make three daily trips  
Where shining shrine benignly drips,  
And taste cardboard between my lips.  
Something within me dies.

BOYS AND GIRLS [spoken -- individually]:

No coffee,  
No coffee,  
No coffee,  
No coffee,

No coffee,  
No coffee,  
No coffee,  
No coffee.

GIRL:

That office light doesn't have to be fluorescent.  
I'll get no pains in the head.

ROSEMARY:

That office chair doesn't have to be foam rubber,  
So if I spread, so I spread.  
But only one chemical substance gets out the lead!

FRUMP, BOYS AND GIRLS:

Like she said!

If I can't take my coffee break, my coffee break,  
my coffee break,  
If I can't take my coffee break,  
Gone is the sense of enterprise.

BOYS AND GIRLS [spoken -- individually]:

No coffee,  
No coffee,  
No coffee,  
No coffee,  
No coffee,

No coffee,  
No coffee,  
No coffee,  
No coffee,  
No coffee.

[All together -- scream!]

FRUMP, BOYS AND GIRLS:

If I can't take my coffee break,  
Somehow the soul no longer tries,  
Somewhere I don't metabolize,

FRUMP:

Something within me dies!

FRUMP, BOYS AND GIRLS:

Coffee or otherwise,  
Coffee or otherwise,  
Coffee or otherwise,  
Something inside of me dies!

NARRATOR: One of the men J. Daniel talked to a lot  
was Alexander Twimble, the statistician, who had  
worked in the office a long time and looked as if  
he was going to stay much longer.

McNARY: What's your formula for longevity in the  
Global Insurance Company?

TWIMBLE [slowly and convincingly]: Bold caution.

THE COMPANY WAY

Twimble and McNary

TWIMBLE:

When I joined this firm as a brash young man,  
Well, I said to myself, "Now, brash young man,  
don't get any ideas."

[Spoken] Well, I stuck to that and I haven't had  
one in years!

McNARY [spoken]:

You play it safe!

TWIMBLE:

I play it the company way;  
Wherever the company puts me, there I'll stay.

McNARY:

But what is your point of view?

TWIMBLE:

I have no point of view.

McNARY:

Supposing the company thinks --



TWIMBLE:

I think so too!

McNARY [spoken]:

What would you say if --

TWIMBLE [spoken]:

I wouldn't say!

McNARY:

Your face is a company face.

TWIMBLE:

It smiles at executives, then goes back in place.

McNARY:

The company furniture?

TWIMBLE:

Oh, it suits me fine.

McNARY:

The company letterhead is so --

TWIMBLE:

A valentine!

McNARY [spoken]:

Is there anything you're against?

TWIMBLE [spoken]:

Unemployment!

McNARY:

When they want brilliant thinking from employees --

TWIMBLE:

That is no concern of mine.

McNARY:

Suppose a man of genius makes suggestions --

TWIMBLE:

Watch that genius get suggested to resign!

McNARY:

So you play it the company way --

TWIMBLE:

All company policy is by me okay!

McNARY:

You'll never rise to the top --

TWIMBLE:

But there's one thing clear;  
Whoever the company fires, I will still be here!

McNARY [spoken]:

You certainly found a home!

TWIMBLE [spoken]:

It's cozy!

McNARY:

Your brain is a company brain --

TWIMBLE:

The company washed it and now I can't complain.

McNARY:

The company magazine?

TWIMBLE:

Boy, what style, what punch!

McNARY:

The company restaurant?

TWIMBLE:

Ev'ry day same lunch!

[Spoken:] Their haddock sandwich, it's delicious!

McNARY [spoken]:

I must try it.

TWIMBLE [spoken]:

Early in the week!

McNARY:

Do you have any hobbies?

TWIMBLE:

I've a hobby;  
I play "gin" with Mister Bratt.

McNARY:

And do you play it nicely?

TWIMBLE:

Play it nicely.  
Still he blitzes me in ev'ry game, like that!

[Snaps fingers.]

'Cause I play it the company way,  
Executive policy is by me okay!

McNARY:

How can you get anywhere in the --

TWIMBLE:

Junior, have no fear;  
Whoever the company fires, I will still be here!

McNARY:

You will still be here.

TWIMBLE:

Year after year after fiscal --

TWIMBLE AND McNARY:

-- never take a risk-al year!

NARRATOR: Mr. Bratt, the chief actuary, had reported to Mr. Biggley the fuss Frump had made about the coffee, and Mr. Biggley told his nephew not to go around stirring up trouble.

FRUMP: From now on --

THE COMPANY WAY (reprise)

Frump, Boys and Girls

FRUMP:

I'll play it the company way;  
Wherever the company puts me there I'll stay.

BOYS AND GIRLS:

Whatever the company tells him, that he'll do.

FRUMP:

Whatever my uncle may think, I think so too.

BOYS AND GIRLS:

Oo-oo-oo,  
He's beaming with company pride.

FRUMP:

I've conquered that over-ambitious rat inside.

BOYS AND GIRLS:

Old Bud is no longer the Frump he used to be.

FRUMP:

I pledge to the company sweet conformity.

BOYS AND GIRLS:

Hooray!  
Hooray!

FRUMP:

I will some day earn my medal,  
Twenty-five year employee.  
I'll see to it that the medal  
Is the only thing they'll ever pin on me.

BOYS AND GIRLS:

The Frump way is the company way;  
Executive policy is by him okay!

FRUMP:

I'll never be president but there's one thing  
clear;  
As long as my uncle can stand me, I will still  
be here.

BOYS AND GIRLS:

We know the company may like or lump any man --

FRUMP [spoken]:

I'm so proud!

BOYS AND GIRLS:

And if they choose to, the company may dump any  
man --

FRUMP [spoken]:

I'm happy!

BOYS AND GIRLS:

But they will never dump Frump, the company man.

FRUMP, BOYS AND GIRLS:

Frump will play it the company,  
Frump will play it the company,  
Frump will play it the company way,  
Frump!

NARRATOR: J. Daniel had observed that the actuaries in Global Insurance were not really appreciated by employees in underwriting, claims, and accounting, or by members of middle management. Nevertheless, he believed that for him the surest way to success was to perform well as an actuary. He believed the company would learn to value him. But one day, after a series of company policy moves that seemed to discriminate against actuaries, even the secretaries in the actuarial department joined Mr. Bratt in a loud protest:

AN ACTUARY IS NOT A TOY

Bratt and Secretaries

BRATT:

An actuary is not a toy  
To enjoy, or destroy,  
To heckle and wheedle  
And shamefully needle  
In search of some puerile joy.  
No, an actuary is not,  
Definitely not, a toy.

FIRST ACTUARY [spoken]: You're absolutely right,  
Mr. Bratt.

FRUMP [spoken]: We wouldn't have it any other way,  
Mr. Bratt.

SECOND ACTUARY [spoken]: It should be a company rule,  
Mr. Bratt.

SECRETARIES:

An actuary is not a toy,  
No, my boy, not a toy,  
Don't fool with the one you employ, boy,  
An actuary is not, an actuary is not, an actuary  
is not a toy.

An actuary is not a re-  
specter of idiocy.  
Avoid the ridiculous ploy, boy,  
Remember no matter what  
Neurotic trouble you've got,  
An actuary is not a toy.

He's a highly specialized key component of  
Operational unity,  
A fine and sensitive mechanism to  
Serve the office community,

With a family at home he supports.



FIRST ACTUARY [spoken]:

And you'll find nothing like him at F. A. C. Schwarz.

BRATT:

An actuary can testify  
Where the dead bodies lie.  
It happened to Charlie McCoy, boy,  
They fired him like a shot,  
He never should have forgot  
An actuary is not a toy.

SECRETARIES [whistle a chorus, leaving third line for  
accompaniment, but sing last line -- see page 52  
of score]:

An actuary is not a toy.

And when you put him to use  
You don't just turn on the juice.

GIRL [spoken]:

The name IBM is not stamped on his caboose.

SECRETARIES:

An actuary is not a thing  
Wound by key, pulled by string.  
His desk is to think at,  
And not tiddlywink at,  
His game is for men, not for boys! So!

The actuary y'got  
Is definitely not  
A cookie to be forgot -- I'll tell you what,  
Your work you will enjoy,  
If you remember, boy,  
An actuary is not -- a tinker toy!

NARRATOR: Although J. Daniel had noticed Rosemary,  
and was aware of her efforts to be friendly, he  
had been so busy trying to get ahead that he had  
not thought to ask her for a date. But Rosemary  
kept hoping. One evening at closing when  
J. Daniel happened to be walking out of the  
building with her, he touched her hand as he said  
good night. Rosemary held that hand all the way  
home, and that night her delight knew no bounds:

HE TOUCHED ME

Rosemary

He touched me,  
He put his hand near mine and then he touched me,  
I felt a sudden tingle when he touched me,  
A sparkle, a glow!

He knew it,  
It wasn't accidental, no, he knew it,  
He smiled and seemed to tell me so all through it,  
He knew it, I know.

He's real  
And the world is alive and shining,  
I feel  
Such a wonderful drive toward valentining.

He touched me,  
I simply have to face the fact,  
He touched me,  
Control myself and try to act as if I remember my  
name.

But he touched me,  
He touched me,  
And suddenly nothing is the same!  
He touched me,  
He touched me,  
And suddenly nothing, nothing, nothing is the same!

NARRATOR: J. Daniel learned that Mr. Biggley was a graduate of Old Ivy College, and he made it a point to find out a little about the school. Trivial information, he thought, that might one day be useful. For example, he took care to learn some of the college songs, because he knew of Mr. Biggley's emotional attachment and nostalgia for his alma mater, and he knew how active Mr. Biggley was in alumni matters. One day when he went into Mr. Biggley's office to present a report, he noticed the President looking fondly at a colored brochure of the college.

McNARY: Are those pictures of Old Ivy? Is that your college, Mr. Biggley?

BIGGLEY: Sure is. These are great pictures. They sure stir up memories.

McNARY: I've driven through their campus. It's beautiful. And they have one of the best college songs I've ever heard.

BIGGLEY [smiling with pleasure]: You mean this one?

THE HALLS OF IVY

Biggley and McNary

BIGGLEY:

Oh, we love the halls of Ivy  
That surround us here today.  
And we will not forget  
Tho' we be far far away.

McNARY [joining in] AND BIGGLEY:

To the hallow'd halls of Ivy  
Ev'ry voice will bid farewell,  
And shimmer off in twilight  
Like the old vesper bell.

One day a hush will fall,  
The footsteps of us all  
Will echo down the hall  
And disappear.

But as we sadly start  
Our journeys far apart,  
A part of ev'ry heart  
Will linger here

In the sacred halls of Ivy  
Where we've lived and learned to know  
That thru' the years we'll see you  
In the sweet afterglow.

BIGGLEY [happily]: Let's do it again. You take the melody. I'll try to harmonize. Go ahead, start.

McNARY [singing]:

Oh, we love the halls of Ivy

BIGGLEY AND McNARY:

That surround us here today.  
And we will not forget  
Tho' we be far far away.

To the hallow'd halls of Ivy  
Ev'ry voice will bid farewell,  
And shimmer off in twilight  
Like the old vesper bell.

One day a hush will fall,  
The footsteps of us all  
Will echo down the hall  
And disappear.

But as we sadly start  
Our journeys far apart,  
A part of ev'ry heart  
Will linger here

In the sacred halls of Ivy  
Where we've lived and learned to know  
That thru' the years we'll see you  
In the sweet afterglow.

BIGGLEY [spoken]: That's great! I enjoyed that!

How'd you ever learn that song?

McNARY: Well, I heard it a few times, and I liked it.

It was easy to pick up the words. Great song!

BIGGLEY: Young man, how'd you like to come to an Ivy  
football game with me some Saturday? It's only  
a four-hour drive. We could go over there some  
Saturday morning.

McNARY: I'd love it!

BIGGLEY: So would I. McNary, you're all right!

McNARY [big grin at audience].

Five-minute break  
(More jollity to come)

PART II

NARRATOR: J. Daniel McNary continued to work hard, kept his nose clean, and made progress. In a relatively short time he had passed the examinations for Associate of the Casualty Actuarial Society and had a couple of legs up on the Fellowship exams. He saw more of Rosemary now, but was not minded to do anything serious about her. He was too busy getting ahead. Rosemary, however, still carried a torch.

Meanwhile, the Global Insurance Company was planning to launch a new form of coverage, and to make an initial investment of ten million dollars in the venture. The actuarial department was committed to setting rates for the new policies. Mr. Bratt, the chief actuary, had what he thought was a brilliant rating idea, and sold it to Mr. Biggley, the President:

GLOBAL ORIGINAL (one chorus)

Bratt

I've worked out a rating plan that's just  
like loss insurance,  
A most ingenious scheme you will agree;  
It's sleek and chic, and magnifique with  
stretch beyond endurance,  
It's me! It's me! It's absolutely me!

[Almost spoken] And why?  
They'll all buy!

This irresistible Global original  
We're filing this week, I'm filing this week;  
We're sure to win!

This irresistible Global original,  
Clean faultless design, facts clearly in line,  
Programmed to win!

Presently they will read it,  
And never will they impede it,  
Acknowledging all my sure technical skill,  
Realizing that  
This irresistible Global original  
Shall thrive in the light,  
So gloriously right!  
Programmed to win -- to win -- to win.

NARRATOR: J. Daniel McNary was critical of Mr. Bratt's  
idea and voiced his criticism at a meeting that  
was attended by Mr. Biggley:



GLOBAL ORIGINAL (reprise)

McNary and Actuaries

McNARY:

This most resistible Global original  
We're filing this week, HE'S filing this week;  
'T's not worth a lick!

This irresponsible un-actuarial  
Rate filing faux pas! God dammit voila!  
It makes me sick!

Ten million bucks we'll hand out  
For something to make us stand out,  
But everyone soon will join in a belly-laugh,

[Spoken] Some joke!

This most resistible Global original,  
This lunk-headed crime,

ACTUARIES:

We're filing this week for the first and last  
time!

NARRATOR: But McNary's arguments were overridden and the decision was made to go ahead.

Well, a year went by, J. Daniel managed to achieve his Fellowship, and Mr. Bratt's brilliant rating idea bombed. The company lost its shirt on the new coverage. Meanwhile, competitors of Global Insurance, who were offering a similar new coverage and using rating schemes more like the one J. Daniel had favored, made a lot of money.

So it happened. J. Daniel McNary, who had won Mr. Biggley's eye anyway, was appointed Vice President and Actuary, and Mr. Bratt was shunted to the underwriting department, where his capacities wouldn't have to be so strained.

J. Daniel was ecstatic -- and all of a sudden he realized how important Rosemary was to him:

ROSEMARY

McNary and Rosemary

McNARY:

Rosemary,  
Rosemary.

Suddenly there is music in the sound of your  
name --

Rosemary,  
Rosemary was the melody locked inside me.  
Till at last out it came --  
Rosemary!

Rosemary, just imagine if we kissed,  
What a crescendo -- not to be missed.  
As for the rest of my lifetime program, give  
me more of the same --

Rosemary.  
Rosemary, there is wonderful music in the very  
sound of your name.

McNARY [spoken]: Rosemary, something wonderful has  
happened.

ROSEMARY [spoken]: What are you talking about?

McNARY [spoken]: Can't you hear it? Can't you hear  
it?

McNARY:

Suddenly there is music in the sound of your  
name --

ROSEMARY [spoken]: I can't hear a thing.

McNARY:

Rosemary --

McNARY [spoken]: Just listen, it's all around me like  
a beautiful pink sky.

ROSEMARY [spoken]: Now look here, J. Daniel McNary,  
have you lost your mind?

McNARY [spoken]: Rosemary, darling, will you marry  
J. Daniel McNary?

ROSEMARY [spoken]: Now I hear it! I hear it!  
I hear it!

ROSEMARY:

Suddenly there is music in the sound of your  
name --  
Jay Daniel.

McNARY:

Rosemary, just imagine if we kissed,  
What a crescendo --

McNARY AND ROSEMARY:

Not to be missed.

McNARY:

As for the rest of my lifetime program, give  
me more of the same --

McNARY:

Rose-  
mary,  
Rosemary --

ROSEMARY:

Jay Daniel,  
Jay Daniel.  
Jay Daniel --

McNARY AND ROSEMARY:

-- there is wonderful music in the very sound  
of your name.

NARRATOR: Other actuaries in Global Insurance became alarmed at the speed with which J. Daniel was rising. They had all been at Global a lot longer than J. Daniel, and they tended to regard him as a young upstart. One day in the executive washroom they were griping about J. Daniel, not realizing that the object of their scorn and jealousy was right around the corner in the same room, peering into a mirror, trying to decide whether to shave in preparation for a date with Rosemary:

FIRST ACTUARY: Gotta stop that man!

SECOND ACTUARY: Big deal, big rocket!

THIRD ACTUARY: Thinks he has the world in his pocket.

I BELIEVE IN YOU

McNary

Now, there you are,  
Yes, there's that face,  
That face that somehow I trust.  
It may embarrass you to hear me say it,  
But say it I must, say it I must!

You have the cool, clear eyes of a seeker  
of wisdom and truth;  
Yet there's that upturned chin,  
And the grin of impetuous youth.  
Oh, I believe in you, I believe in you.

I hear the sound of good, solid judgment  
whenever you talk;  
Yet there's the bold, brave spring of the  
tiger that quickens your walk.  
Oh, I believe in you, I believe in you.

And when my faith in my fellow man all but  
falls apart,  
I've but to feel your hand grasping mine,  
And I take heart, I take heart.

To see the cool, clear eyes of a seeker of  
wisdom and truth,  
Yet with the slam, bang, tang reminiscent  
of gin and vermouth,  
Oh, I believe in you,  
Oh, I believe in you.

SECOND ACTUARY: Big wheel, big beaver,

THIRD ACTUARY: Boiling hot with front office fever,

FIRST ACTUARY: Gotta stop that man!

McNARY [singing]:

I believe in you, I believe in you.

THIRD ACTUARY: Don't let him be such a hero!

FIRST ACTUARY: Gotta stop that man!

McNARY [singing]:

I believe in you, I believe in you.

NARRATOR: For some time the Global Insurance Company had been losing money in one of its principal commercial lines of business. Mr. Biggley, along with presidents of other companies who were having the same experience, was alarmed. The company presidents gathered to discuss their mutual miseries and decided the only answer was to reorganize completely the rating basis for this line, and to collect statistics on a different basis also.

J. Daniel McNary supported the objectives of the new rating and statistical schemes but believed the changes were too extreme, the statistical plans too complex. He was convinced the new plans would exhaust the capacities of the Global Insurance computers. He said as much to Mr. Biggley, but Mr. Biggley felt obligated to go along with the other company presidents. The actuarial, statistical, secretarial, and computer staffs of the Global called the new statistical plan CRISPY, a corruption of C-R-S-P for Commercial Risk Statistical Plan. J. Daniel tried to make it work, but in a few months all was chaos:

CRISPY

Boys and Girls

Well, I think I'm going out of my head,  
Yes, I think I'm going out of my head  
Over you, over you;  
I need you, they tell me,  
The Bureau assures me I'll never need anything but you.

But I think I'm going out of my head,  
And I'm tortured by a terrible dread  
Over you, over you;  
I wonder if ever  
We'll gather together the data we've never seen before.

You're just too much to be true,  
Can't keep my mind off of you,  
You're just the devil to code,  
I'm trying not to explode,  
I wait for help to arrive,  
And wonder if I'll survive;  
You're just too much to be true,  
Can't keep my mind off of you.

Going out of my head over you,  
Into the red over you,  
Feeding garbage in, garbage out, garbage in and out,  
all in doubt --

I love you, CRISPY,  
Although you caused my plight, you don't assist me,  
I work the whole damn night,  
You gorgeous CRISPY, I'm all choked up when I say  
Oh, lovely CRISPY, you'll bring me down, I say,  
You lovely CRISPY, I guess you're here to stay,  
So let me love you, baby, let me love you!

I wonder if ever  
We'll gather together the data we've never seen before.

Going out of my head over you,  
Into the red over you,  
Feeding garbage in, garbage out, garbage in and out,  
all in doubt;

I must think of a way to handle this Plan;  
There's no reason why I shouldn't try  
As hard as I can;  
But I think I'm going out of my head,  
Yes, I think I'm going out of my head,  
Oh, I think I'm going out of my head.



NARRATOR: Things got so bad that people started quitting their jobs, the computers broke down, and other financial work -- particularly the investment analyses important to the Chairman of the Board of the Global Insurance Company -- was stalled. The Chairman of the Board found out that this whole rating and statistical scheme was Mr. Biggley's baby and that the Vice President and Actuary, J. Daniel McNary, had argued against it from the beginning. In his anger and annoyance, the Chairman called a quick meeting of the Board, fired Mr. Biggley, and appointed J. Daniel McNary as President.

J. Daniel's first action was to pull Global Insurance out of the statistical agency that had promulgated CRISPY and join another agency where rating and statistics could be simple again -- however ineffective -- as in the past. J. Daniel made the announcement of the change to the entire staff, and there was great rejoicing. He also announced promotions for several members of the staff. J. Daniel was understandably proud of himself and his band of loyal employees:

DAN McNARY'S BAND

Entire Company

1.

McNARY:

My name is Dan McNary, I'm the leader of our band;  
Although we're not the biggest, we're the finest  
in the land.  
We write the good and not so good, the jumbos and  
the small,  
And if we get the rates we need we're sure to  
make a haul.

ENTIRE COMPANY:

Oh, the agents howl, the adjusters growl, the  
accountants scratch away;  
The actuaries cogitate, the underwriters pray;  
The premium income hums along and the music is  
something grand;  
A credit to the insurance biz is Dan McNary's band.

2.

McNARY:

Right now we think we're heading for a most  
unusual year;  
An underwriting profit is the goal we're getting  
near.

FRUMP:

When Uncle Wiggley Biggley learns we've done what  
we have planned,  
He'll say he never heard of the likes of Dan  
McNary's band.

ENTIRE COMPANY:

Oh, the agents howl, the adjusters growl, the  
accountants scratch away;  
The actuaries cogitate, the underwriters pray;  
The premium income hums along and the music is  
something grand;  
A credit to the insurance biz is Dan McNary's band.

3.

TWIMBLE:

I'm Alexander Twimble and statistics is my game;  
I diddled with data for thirty years and no one  
knew my name.  
But he made me Third Assistant Veep and my job's  
no longer bland,  
I'm playing second fiddle now in Dan McNary's band.

4.

BRATT:

My title and rank are out the window much to my  
chagrin,  
But we all know mediocrity is not a mortal sin.  
So now I'm an underwriter in a job I understand,  
And I'm thankful for the harmony in Dan McNary's  
band.

5.

BIGGLEY:

When Dan McNary came along I knew he was pretty  
smart,  
But I never dreamed he'd march right in and tear  
the firm apart.  
And now that it's too late and I'm no longer in  
command,  
I'll stand aside and beat the drums for Dan McNary's  
band.

ENTIRE COMPANY:

Oh, the agents howl, the adjusters growl, the  
accountants scratch away;  
The actuaries cogitate, the underwriters pray;  
The premium income hums along and the music is  
something grand;  
A credit to the insurance biz is Dan McNary's band.

Oh, the agents howl, the adjusters growl, the  
accountants scratch away;  
The actuaries cogitate, the underwriters pray:  
The premium income hums along and the music is  
something grand;  
A credit to the insurance biz is Dan McNary's band.

ROSEMARY: I don't care if you're an actuarial trainee,  
President of Global Insurance Company, or President  
of the United States -- I love you, J. Daniel  
McNary.

McNARY [dreamily]: Say it again.

ROSEMARY: I love you.

McNARY: No, no -- before that.

BRATT: The White House better watch out for this guy.

I BELIEVE IN YOU (reprise)

Rosemary

You have the cool, clear eyes of a seeker  
of wisdom and truth;  
Yet there's that upturned chin,  
And the grin of impetuous youth.  
Oh, I believe in you, I believe in you.

THE COMPANY WAY (reprise)

Entire Company

We play it the company way;  
Executive policy is by us okay.  
Though for the departed we shed a mournful  
tear,  
Whoever the company fires, we will still  
be here!

CREDITS

From HOW TO SUCCEED IN BUSINESS WITHOUT REALLY TRYING

"How To Succeed"  
"Happy To Keep His Dinner Warm"  
"Coffee Break"  
"The Company Way"  
"Rosemary"  
"I Believe In You"

Words and music by Frank Loesser

"An Actuary Is Not A Toy"  
"Global Original"

Music by Frank Loesser

"Smart Insurance President"

Music by Sir Arthur Sullivan

"He Touched Me"

Words by Ira Levin, music by Milton Schafer

"The Halls Of Ivy"

Words and music by Henry Russell and Vick Knight

"CRISPY"

"Goin' Out Of My Head," music by Teddy Randazzo  
and Bobby Weinstein

"Can't Take My Eyes Off You," music by Bob Crewe  
and Bob Gaudia

"Dan McNary's Band"

Music by Shamus O'Connor



## **1964 FELLOWSHIP EXAM**

I recently ran across this 1964 Fellowship exam. I thought you would find it enjoyable to go through this exam and see what today's exam looks like compared to the 1964 exam. Any comments would be welcome. Your comments might show up in a future issue of the Actuarial Forum.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is crucial for ensuring transparency and accountability in the organization's operations.

2. The second part outlines the various methods and tools used to collect and analyze data. It highlights the need for consistent and reliable data collection processes to support informed decision-making.

3. The third part focuses on the role of technology in modern data management. It discusses how advanced software solutions can streamline data collection, storage, and analysis, leading to more efficient operations.

4. The fourth part addresses the challenges associated with data security and privacy. It stresses the importance of implementing robust security measures to protect sensitive information from unauthorized access and breaches.

5. The fifth part discusses the importance of data governance and compliance. It outlines the necessary policies and procedures to ensure that data is used in a lawful and ethical manner, in accordance with relevant regulations.

6. The sixth part explores the benefits of data-driven insights. It explains how analyzing large volumes of data can uncover valuable trends and patterns, enabling organizations to optimize their performance and gain a competitive edge.

7. The seventh part concludes by emphasizing the need for a data-centric culture. It encourages organizations to foster a mindset where data is valued and used to drive strategic initiatives and innovation.

8. The final part of the document provides a summary of the key points discussed and offers recommendations for future research and implementation. It encourages organizations to continue exploring new data management techniques and to stay updated on the latest industry trends.



# CASUALTY ACTUARIAL SOCIETY

EXAMINATION COMMITTEE  
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## EXAMINATION FOR ENROLLMENT AS FELLOW

### PART IV

MAY 15, 1964

TIME 1:30 TO 4:30 P.M.

#### SECTION (a)

- (a) (8 Points)  
What statistics are published by or are available from the National Board of Fire Underwriters? Include in your answer compilations which the National Board regards as "confidential" and supplies "to the insurance departments and rating bureaus of the respective states and also to member and subscriber companies".
- (b) (2 Points)  
Describe the significant changes which became effective at the beginning of 1963 in the statistical area with respect to the automobile line of insurance.
- (5 Points)  
Describe briefly the contents of each of the following publications and state the source document(s) from which the various publishers obtain the information.
  - Spectator—Insurance by States
  - Best's Fire and Casualty Aggregates and Averages
  - Argus Chart
  - Spectator Handy Chart
- (5 Points)  
Of what does the Spectator's "Factual Financial Appraisal" as shown in the Fire Index consist and on what is it based?

Page 1

14. (a) (5 Points)  
You have been furnished with some data on New York Disability Benefits Law Insurance experience which reveals the following:

- Female morbidity is about 1.7 times that of male morbidity.
- The covered payroll for women is 22% of the total covered payroll.
- The average claim cost per \$1.00 of weekly benefits exposed was \$.326.

Determine the average claim cost for males for each \$1.00 of weekly benefits exposed.

- (b) (10 Points)

Experience shows that the claim cost for Statutory D.B.L. Coverage is approximately 60% of the cost of 8th day, 13 weeks plans. What reasons would you give for this difference?

15. (10 Points)

Outline and briefly discuss the procedure discussed by Mr. J. M. Cahill in P.C.A.S. XXVII for developing rates for Workmen's Compensation Excess Coverage (Per Accident Basis) for Self-Insurers.

16. (a) (5 Points)

What are the basic elements entering into premium determination in individual health insurance?

- (b) (5 Points)

As used in Bartelson's "Health Insurance," what is the difference between "realistic" and "conservative" assumptions in determining premiums?

- (c) (5 Points)

What are the major factors to be recognized in the classification of risks in individual health insurance?

17. (10 Points)

In late 1963 a meeting of representatives of stock agent groups and major stock companies resulted in a set of recommendations with respect to insurance rating which have come to be known as the "Johnson Plan" or "Johnson Principles". With what area of insurance rating are these recommendations concerned? Briefly, what are the general provisions of the recommendations?

Page 4

4. (10 Points)

An objector to a workmen's compensation rate filing refers to compensation underwriting results for stock carriers in Best's Fire and Casualty Aggregates and Averages. As Insurance department actuary, do you think these results should have any bearing on the propriety of the proposed rates? Why?

5. (30 Points)

Sketch a multiple peril policy of your own design. Include specifically the category of risk for which you intend this policy, the major lines which will be mandatory or optional, your method of establishing the initial premium charge, and your proposed subsequent rating treatment of this policy either in the context of existing rating organizations or as an independent venture. Outline a statistical plan which will meet the statutory requirements of a selected state and will provide the basis for your rating treatment or analysis.

6. (20 Points)

By specific reference to a line or kind of insurance for which traditional premium, loss, and exposure statistics in recent years have not been, in your opinion, a satisfactory basis for prospective ratemaking, develop a procedure utilizing external non-insurance data to attempt to correct the deficiencies you have noted. If you are opposed to introducing external data in your ratemaking, set forth your objections and suggest a modification of the existing statistical program which could improve your ratemaking methods.

7. (10 Points)

Some companies have explored the possibility of retaining punched cards as the basic file-keeping medium, while using magnetic tape electronic equipment as the processing medium. What are the advantages and disadvantages of such a system?

8. (a) (8 Points)

Define the following terms as used in Punched Card Data Processing.

- a. Collating
- b. Control Panel
- c. Detail Printing
- d. Gang Punching

e. Group Printing

- f. Reading
- g. Verification
- h. Zone Punch

(b) (2 Points)

What are "COBOL" and "FORTRAN"? How do they differ?

SECTION (b)

9. (10 Points)

The Comprehensive Dwelling Policies, the Homeowners Policies and the Commercial Property Coverage Policies are examples of the various types of multiple line coverages that have been developed. Briefly describe the methods used in rating each of these policies.

10. (10 Points)

It has sometimes been suggested that the effect of wage changes should be included in the determination of workmen's compensation rate levels because compensation premiums are based on payrolls and will increase with the increase in payrolls while losses, which are also based on wages, will increase to a lesser degree. Discuss, giving your reasons for agreeing or disagreeing with the suggestion.

11. (10 Points)

In the fire field, rating organizations have introduced in many states a revised method of rating dwellings and some other residential property with the method commonly being referred to as the "loss constant plan". Discuss this plan, including a description of the way it operates, the reasons why it was needed and the appropriateness of its title.

12. (10 Points)

What are the major differences in the rating procedures of the Factory Mutual companies as compared with other rating organizations in the fire field?

13. (10 Points)

How are the rating territories established under Massachusetts compulsory auto rating procedures?