TITLE: RATEMAKING FOR THE PERSONAL AUTOMOBILE PHYSICAL DAMAGE COVERAGES

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INTRODUCTION

As with any other line of insurance, the ratemaker's goal is to develop rates that will cover losses and expenses (including underwriting profit) arising from policies in force during a specified future period. In order to accomplish this goal, a proper match between premiums (or exposures) and losses plus expenses must be established. This is particularly important when starting from an experience period which may reflect conditions which have changed or which are expected to change prior to or during the period for which rates are being made.

The ratemaker must know what coverage was and will be provided. Has the insurance policy itself changed? Has the legislature, insurance regulator or court changed the interpretation of the policy resulting in a de facto change in losses? Has the term of the policy been modified? Has there been a shift in insureds by deductible?

The ratemaker must know who was and will be insured. Has there been a change in the company's marketing or underwriting policy? Has there been a change in the involuntary market mechanism? Has there been a change in cancellation or nonrenewal laws? Has there been a shift in insureds by class or territory?

The ratemaker must estimate what effects changes in economic and other conditions will have on insurance costs. What is the change in the cost of goods and services for which insurance pays? What is the change in claim frequencies?

The ratemaker must know what the rating system itself was and will be. Has a rating variable, e.g. damageability-repairability, been modified, introduced or eliminated? Has the overall rate level been revised?

All of the above factors and their interaction should be considered in making rates. The following sections of this paper will concentrate on them, particularly those most important or unique to ratemaking for the personal automobile physical damage coverages.

DEDUCTIBLES

A significant shift in the distribution of insureds by deductible during the experience period may lead to an improper matching of premiums and losses. For example, if there were a significant shift of insureds from the $100 deductible to the $200 deductible, the distribution of premiums and losses might be comparable to Table 1 for a given calendar year. If precise payments and reserves were known immediately with no effects from prior calendar years, then the actual incurred losses and the actual incurred loss ratio would be those in columns (2) and (3), respectively.

TABLE 1 (premiums and losses in thousands)

Deductible	(1) Earned Premiums	(2) Actual Incurred Losses	(3) Actual Loss Ratio(2)/(1)	(4) Calendar Year (C.Y.) Paid Losses
$100	$1,200	$ 840	70%	$1,250
200	800	560	70	200
Total	$2,000	$1,400	70	$1,450

Deductible	(5) C.Y. Loss Ratio(4)/(1)	(6) Accident Year (A.Y.) Paid Losses as of (12 mos.)	(7) A.Y. Loss Ratio(6)/(1)
$100	104%	800	67%
200	25	400	50
Total	73	$1,200	60

It is clear that the calendar year paid loss ratios in column (5), which differ from the actual incurred loss ratios in column (3), would produce improper matchings of losses and premiums due to the lag in reporting, processing and paying of claims.

The accident year paid losses as of 12 months in column (6) have to be developed to an ultimate level. Unless the overall loss development factor (or factors by deductible) reflects the shift in deductibles (more development on the growing $200 deductible than the declining $100 deductible), a difficult task, the losses will not precisely match the premiums.

As almost all physical damage claims are paid within 60 to 90 days of occurrence, few (if any) companies establish individual case basis reserves.

Consequently, as of the end of the experience year the actual incurred losses will not be precisely known. As of 15 months (three months after the end of the calendar year) the accident year paid losses should have developed to the actual incurred losses, and the distortion would have been eliminated.

Another way of correcting for the distortions in the data as of 12 months, particularly if calendar year paid losses are used, is to adjust the data to a common deductible basis as set forth in Table 2.

TABLE 2 (premiums and losses in thousands)

Deductible	(1) Earned Premiums at Current Levels	(2) Relativity to $200 Deductible	(3) Premiums on $200 Level (1) X 1.00/(2)	(4) Calendar Year Paid Losses
$100	$1,200	1.25	$ 960	$1,250
200	800	1.00	800	200
Total	$2,000		$1,760	$1,450

Deductible	(5) L.E.R. to $200 Level	(6) 1.0 - L.E.R. to $200 Level 1.0 - (5)	(7) Losses on $200 Level (4) X (6)	(8) Adj. Loss Ratio (7)/(3)
$100	20%	.80	$1,000	104%
200	0	1.00	200	25
Total			$1,200	68

Deductible	(9) Number of Paid Claims	(10) C.E.R. to $200 Level	(11) 1.0 - C.E.R. to $200 Level 1.0 - (10)	(12) Claims on $200 Level (9) X (11)
$100	2,500	10%	.90	2,250
200	500	0	1.00	500
Total	3,000			2,750

Generally this adjustment is to the higher deductible because the long term shift is to higher deductibles. Premiums, losses and claims should be known by deductible in order to do this properly. (Depending on the trend procedure, claims may not be needed. See the section on trend.) The $100 deductible premiums are adjusted to the $200 deductible level by multiplying by the ratio of the $200 to $100 rate relativity as shown in columns (1) through (3).

The $100 deductible losses and claims are adjusted to the $200 level by loss and claim elimination ratios (L.E.R.'s and C.E.R.'s), respectively, as illustrated in columns (4) through (12). L.E.R.'s and C.E.R.'s are developed from a distribution of losses and claims by size and reflect the dollars of losses and numbers of claims eliminated by switching from a lower to a higher deductible. These ratios should reflect loss levels and distributions comparable to the experience period. The total loss ratio of 68% in column (8) of Table 2 does not equal the actual incurred ratio of 70% in column (3) of Table 1 because the former is on a paid basis and the latter is on an incurred basis. Because of the inherent lag in paid data the paid losses in column (7) of Table 2 have an average date of accident two or three months earlier than the actual incurred losses and consequently reflect earlier loss levels. The paid losses can be adjusted to an incurred basis by multiplying by a ratio of incurred losses to paid losses (generally about 102% for a sample of companies).

In Tables 1 and 2 it was assumed that earned premiums and actual incurred losses were in equal proportions by deductible, i.e., deductible rate relativities were appropriate during the experience period. If this were not the case, then distortions might be shrouded as illustrated in Table 3. Though the losses and total premiums are the same as in Table 2, the premiums by deductible in column (1) have been changed to reflect the inappropriate relativities assumed in column (2).

TABLE 3 (premiums and losses in thousands)

Deductible	(1) Earned Premiums at Current Levels	(2) Relativity to $200 Deductible	(3) Premiums on $200 Level (1) X 1.00/(2)	(4) Actual Incurred Losses
$100	$1,400	1.40	$1,000	$ 840
200	600	1.00	600	560
Total	$2,000		$1,600	$1,400

Deductible	(5) Actual Loss Ratio (4)/(1)	(6) Calendar Year Paid Losses	(7) Paid Loss Ratio (6)/(1)
$100	60%	$1,250	89%
200	93	200	33
Total	70	$1,450	73

Deductible	(8) L.E.R. to $200 Level	(9) 1.0 - L.E.R. to $200 Level	(10) Losses on $200 Level (6) X (9)	(11) Adj. Loss Ratio (10)/(3)
$100	20%	.80	$1,000	100%
200	0	1.00	200	33
Total			$1,200	75

While the overall calendar year paid loss ratio and the overall actual incurred loss ratio equal those in Table 1, the overall adjusted loss ratio of 75% in column (11) is much greater than the overall adjusted loss ratio of 68% in column (8) of Table 2. The actual rate level need is much greater than a superficial review of the overall data would indicate. Consequently it is essential to rate each deductible appropriately. This can be accomplished by developing rates independently for each deductible having a credible volume of data. However, problems may result from this type of an approach. A smaller deductible might indicate a lower rate than a larger deductible. A smaller deductible might cost unreasonably more than a larger deductible. These problems can be rectified by requiring reasonable relationships between rates of different deductibles.

Another way of pricing the deductibles appropriately is to adjust the data to a common deductible basis as discussed previously. This will result in a proper pricing of this key deductible. Rates for the other deductibles will then be established by relativity to the key deductible.

Regardless of whether or not the deductibles were rated appropriately in the past, it is necessary that they be reevaluated for the future. This can be accomplished by recalculating L.E.R.'s after the distribution of losses and claims by size has been adjusted to future loss levels. Each L.E.R. would equal the rate discount to shift from the lower to the higher deductible (assuming that expenses are treated separately).

It should be noted that the deductible rates developed by the above procedures are appropriate for the average insured. If certain deductibles are generally purchased by atypical insureds, then the results for those deductibles will be atypical. Rate relativities should be adjusted to reflect such atypical distributions. An example of such a situation would be the very high deductibles, e.g., $1,000. Such a deductible is generally purchased by an insured who has a car valued much greater than that of an average insured. The expected percentage loss savings for such an insured with a $1,000 deductible would undoubtedly be significantly less than the size of loss distribution for the average insured would indicate due to the greater value of the car. The rate relativity should be adjusted to reflect this.

In the foregoing paragraphs the proper matching of premiums and losses was discussed as it pertained to the experience period and the future rate relativities between deductibles. The shift in distribution by deductible may also impact trend data. If comprehensive or collision data were examined for all deductibles combined, e.g., Fast Track data, the trend for the underlying experience period would be understated due to a shift to higher deductibles. In Table 4 an extremely simple example illustrates how a shift to higher deductibles would result in an apparent downward "trend" in losses when in fact there were no trends in the loss components.

TABLE 4

Year	(1) Exposures	(2) Claims	(3) Losses	(4) Claim Cost	(5) Claim Frequency	(6) Loss Cost
x	10,000	1,000	$1,000,000	$1,000	10%	$100
x + 1	10,000	900	800,000	889	9%	80
Change from x to x + 1	0%	-10%	-20%	-11%	-10%	-20%

Assumptions: 1. All coverage in year x and x + 1 was $100 and $200 deductible, respectively.

2. The L.E.R. to go from $100 to $200 deductible was 80%.

3. The C.E.R. to go from $100 to $200 deductible was 90%.

4. There were no other differences in conditions from year x to year x + 1, i.e., no change in claim cost or claim frequency by deductible.

5. (4)=(3)/(2); (5)=(2)/(1); (6)=(3)/(1)=(4)X(5).

The problem of shifting distributions by deductible can be reduced by examining trend data separately by deductible. Nevertheless the innate lag in the payment of claims might create an improper match between paid loss and exposure data used in determining claim frequency and loss cost (pure premium) trends.

Substantial shifts in the distribution of insureds by collision deductible might even impact property damage liability (P.D.L.) loss data. For example, if insured A had $100 deductible collision coverage and incurred $180 worth of collision damage, then insured A could collect $80 from his own company. If insured B caused the accident, then insured A's company could collect $180 from insured

B's company and should return the $100 deductible to insured A. The total P.D.L. loss would be $180 for that claim. To simplify the example it is assumed that exactly the same situation occurred one year later except that insured A had a $200 deductible. With a $200 deductible insured A could not collect from his own insurance company. Insured A would have to seek recovery of his loss on his own. Collecting on a liability claim requires substantially more effort than collecting under first party coverage. If insured A did not seek recovery, there would be a reduction of one claim and $180 in losses for P.D.L. This would result in a reduction in P.D.L. claim frequency and loss cost. As the average claim cost for P.D.L. has been greater than $180, the average claim cost would actually increase due to the elimination of a small claim. It should be noted that such a situation would only be expected to affect a small number of P.D.L.claims, and therefore, the effect on P.D.L. trend data would be much less than on collision trend data.

THE INSURED

Physical damage insurance is not compulsory, but it may be required for the life of the loan if the car is financed. As the car ages many insureds drop collision and possibly comprehensive coverage. Thus there is a gradually shifting mix of insureds in the data over time. While paid loss data is not as current as premium data in calendar year ratemaking, the match of premiums and losses is only minimally affected. To make rates for a somewhat different group of insureds in the future, it is necessary to develop proper class and territory rate relativities between risks so that a change in distribution will not result in changes in overall loss ratios.

The shifting mix over time of insureds purchasing coverage might impact physical damage trend data. On the other hand the mix of insureds would be relatively consistent in P.D.L. trend data because the need for coverage is not a function of the insured's car. However, there are overall demographic shifts which might have some impact on trends for both P.D.L. and physical damage coverages. There has been a gradual population movement from urban to suburban and rural areas. This shift has largely been to areas with lower loss levels and lower rate levels. With the shift to more rural areas has come an increase in multi-car families. Multi-car insureds receive a multi-car discount on each car because of lower losses per car than single car insureds. Both of these shifts may not continue in the future. There has also been a gradual increase in the average age in the general American population. This has resulted in a decreasing percentage of youthfull operators and an increasing percentage of adult and "over 65" operators. This gradual shift has been to insureds with lower loss and rate levels. All of these shifts have resulted in a small declining effect on average rates and on loss trends for all coverages.

ECONOMIC & OTHER CONDITIONS

Recent inflationary trends of over 10% a year in automobile damage repair costs have exceeded the cost increases in the overall economy. These large repair cost increases were primarily due to the rise in crash parts prices resulting from the increasing cost to produce such parts and probably from the monopolistic nature of crash parts

production. Consideration of inflation as the most important economic factor impacting insurance costs must recognize that inflationary rates have been volatile, and therefore, past trends may not be the best indicator of future conditions.

Inflation also causes increases in the cost of both new and used cars. As insurance rates for the physical damage coverages reflect the price of the car when new (symbol), they increase with the price of the car. In recent years auto manufacturers have increased the prices of their new cars during the model year as well as at the beginning of the model year. As symbols have been assigned to a car at the inception of the model year, these subsequent auto price increases have not resulted in any additional premium revenue which was needed to offset the increased loss potential. While used cars generally decrease in value as they age, inflation generally helps to reduce the magnitude of this decrease and thereby lessen the decrease in losses on these cars. Thus losses remain high through the life of the car and losses on new cars are larger then losses on old cars.

A recession or a severe slowdown in economic growth generally includes a decrease in new car sales. This results in a short term reduction in premium levels from what would otherwise have been expected. In the past new car sales have rebounded so that in the year(s) following the recession a large number of new cars would be sold. In the long run the distribution of cars by age has remained relatively constant. To make rates for a different mix of insured cars by age (and symbol too) in the future, it is necessary to develop age (and symbol) rate relativities between cars as precisely as possible.

In the past reduced economic growth had meant a reduction in the inflation rate. Recently stagflation, reduced economic growth with a continuing high rate of inflation, has resulted in continued large cost increases with no premium increases, or even decreases, due to the decline in the sale of new cars.

In recent years the exchange rate for American dollars has vacillated and has generally decreased for most countries exporting cars to the United States. While resulting increases in the cost of foreign cars have led to higher rates and losses for them, increases in the cost of foreign car parts have only led to higher losses. These higher losses have been in addition to the increased losses due to inflation. Repairs of foreign cars have also been more costly because of the limited availability of replacement parts and repair services. Also foreign cars have been increasing their share of the market steadily through the 1970's.

One of the reasons for the increased popularity of foreign cars is their greater fuel efficiency. Only in the late 1970's did domestic auto manufacturers seriously begin to develop fuel efficient cars in response to increased consumer demand and federal regulation. Fuel efficiency has become an important consideration because of the uncertain availability and cost of gasoline.

The gasoline shortage in 1973-4 resulted in fewer miles driven and reduced claim frequencies. As the reduction in mileage driven exceeded the decrease in claim frequencies, it is likely that the mileage eliminated was of a lower frequency nature. The recent and

continued shift to more fuel efficient cars should reduce the need for gasoline from what it otherwise would have been. Thus a decline in gasoline usage would not necessarily translate into an equal decline in claim frequencies. This would be particularly true for comprehensive claim frequency which includes many perils largely unaffected by gasoline usage.

For a ratemaking experience period reflecting reduced claim frequencies due to a temporary gasoline shortage, e.g. 1973-4, it is necessary to adjust claim frequencies to expected levels as if no gasoline shortage occurred. Such an adjustment should probably vary by region as the claim frequency reductions probably varied by region. In addition, this atypical experience might cause distortions in both collision and P.D.L. trend data unless adjustments are made to remove the effects of the temporary gasoline shortage.

Offsetting to at least some degree any claim frequency reductions due to reduced gasoline usage has been the increase in claim costs due to higher energy costs. In addition, more fuel efficient (smaller) cars have also been shown to have worse loss experience than larger cars.

If claim frequencies might be reduced in the future because of the uncertainty of reduced gasoline usage, there would undoubtedly be public pressure to reduce rates or expected rate level needs. If claim frequencies did not decline as anticipated or they rebounded to past levels, then rate increases would be needed, and needed immediately, sooner than they could be implemented.

While the prior paragraphs dealt with uncertain reductions in gasoline supplies, it is possible that the federal government could ration or otherwise substantially limit gasoline supplies for an extended period of time. Under such conditions consideration should be given to reducing expected claim frequencies in the ratemaking formula. At the same time premium income would probably be reduced because of a reduction in the number of cars driven and a shift to lower rated classes. The reduction in gasoline supplies is one example of an economic factor which could impact both premium and loss data.

Comprehensive data can be distorted by a catastrophe or a series of catastrophes. To make adequate and stable rates, losses from such an occurrence(s) should be excluded from the experience period. A provision based on a long-term average of such losses should be included in the rates even if no catastrophe occurred.

TREND

While the prior section discussed changes in economic and other conditions in general terms, this section will concentrate on the more specific reflection of these changes through trend data.

Experience period losses can be trended to future levels by use of physical damage data, property damage liability data, econometric indices or some combination of these items. Of course, physical damage data most closely reflects all past changes in physical damage losses. It is also distorted by the change in the distribution of

insureds by deductible. As discussed in the section on deductibles this distortion can be reduced, but not eliminated, by examining trend data by deductible. The alternate approach of adjusting trend data to a common deductible basis requires modification of at least some points of trend data which might distort the resulting trend factors. If individual size of loss distributions are not available for each point to be adjusted, then the adjustment factors themselves have to be estimated further increasing the likelihood of inaccurate results.

Because comprehensive provides coverage for losses due to catastrophes, storms and other irregular occurrences, the use of comprehensive data for trend may require additional judgmental adjustments. Changes in the distribution of losses by peril can be due to unique conditions or continuing long term trends. While the latter should be reflected in the trend data, the former should not be reflected. Thus trend factors based on comprehensive data may be even less accurate than trend factors based on collision data.

Like collision data property damage liability (P.D.L.) data reflects damage to primarily automotive parts. Damage to non-automotive parts and the third party nature of P.D.L. losses may cause some small distortion in using P.D.L. trend data to measure trends in collision losses. As P.D.L. claims require longer time to settle, P.D.L. trend data is not as current as physical damage trend data. As noted in the section on deductibles, P.D.L. data is only minimally impacted by the change in distribution of insureds by deductible.

P.D.L. coverage pays claims from the first dollar of loss whereas physical damage coverages are generally subject to a deductible. The trend in physical damage deductible losses, therefore, exceeds the trend in P.D.L. losses. The trend in physical damage deductible losses is analogous to the trend in excess losses explained by Mr. J. T. Lange in his paper "The Interpretation of Liability Increased Limits Statistics", PCAS LVI, 1969. For example, if the inflation rate applicable to automobile damage is 10%, then a $400 P.D.L. claim will be $440 in the following year. If the exact same occurrence were paid under a physical damage coverage with $200 deductible, the loss would be $200 one year and $240 in the following year, or 20% higher. The use of a P.D.L. claim cost factor of only 10% to trend physical damage losses would obviously understate the increase in physical damage losses. To adjust for this understatement in expected physical damage losses, the deductible can be added back on each claim, then the P.D.L. trend factor can be applied to the total damage amount, and finally the deductible can be removed from each claim as shown in Table 5.

TABLE 5 (Losses in Thousands)

(1) $200 Deductible Losses	(2) $200 Deductible Claims	(3) P.D.L. Trend	(4) Trended $200 Deductible Losses [(1)+(2)X$200]X[1.0+(3)]-[(2)X$200]
$1,600	2,000	10%	$1,800

The calculated trend in $200 physical damage losses is +12.5% ($1,800/$1,600-1.0) in this example.

As the mix of parts damaged in comprehensive losses differs from that in P.D.L. and collision losses, there may be a difference in trends for these losses. As noted earlier in this section, apparent trends in comprehensive losses may even be caused by shifts in the distribution of losses by peril. Any long term trends in comprehensive losses due to such shifts would not be reflected in P.D.L. trend data, although they should be.

Inflation leads to an increase in physical damage claim frequencies by causing previously uninsured (small) accidents to exceed the deductible level and thereby become collectible. Thus, the application of a P.D.L. claim frequency trend factor to physical damage losses would understate future levels of physical damage claim frequencies. As P.D.L. claim frequency has been decreasing about 2% or 3% per year, no change in collision claim frequency has generally been assumed. Because no consistent pattern in comprehensive claim frequency has been identified and comprehensive covers perils different than P.D.L. and collision, no change in comprehensive claim frequency has generally been assumed.

By definition insurance data reflects historical facts, and therefore, may not be responsive to current and future conditions. Economic indices may provide leading indicators of changes in physical damage losses. Furthermore, econometric models may eventually succeed in predicting future physical damage losses, or at least future claim costs. Of course, such models must provide an acceptable fit to actual physical damage loss trends which are affected by many different economic and other conditions.

As discussed in the section on economic conditions, the increase in the cost of new cars has resulted in a gradual increase in symbol (based on cost new), and therefore, rates for new cars. This increase has been partially offset by the shift from larger to smaller less expensive cars. The resulting increase in symbol can be measured by the change in the average symbol insured separately for comprehensive and collision coverages. As a car ages it generally has decreased in value, and therefore, its rates have gradually decreased in relationship to new car (age 1) rates. To reflect changes in the volume of new cars purchased as well as their increase in price, the average age and symbol factor can be examined separately for comprehensive and collision coverages. Average symbol and average age and symbol relativities must be examined separately by coverage and deductible because of different rate relativities by coverage and distributional differences by coverage and deductible.

As discussed in the section on the insured, there has been a gradual population movement from urban to suburban and rural areas with an increase in multi-car insureds. There has also been a gradual decrease in the percentage of youthful operators. Both of these factors, which result in a small gradual decrease in average rates, can be measured by examining the change in average rates on the current rate level after excluding any age and symbol changes.

Reviewing average class plan or average age and symbol relativities over some experience period may be difficult. When such relativities have been revised during the experience period, the change in the average relativity may be distorted. To adjust for this distortion,

one set of relativities (preferably the current one) can be substituted for any other set of relativities in effect during the experience period. Because of the extensive degree of detailed data needed, it may not be possible to make this adjustment by class or age and symbol group. In such a situation approximate adjustments could be made.

To this point discussion of premium and loss trends has concentrated on historical data. This may not be the best indicator of future, or even current conditions. All factors impacting premium or loss trends must be considered. To ensure the responsiveness of trend factors to current and future conditions judgmental modifications should be made as necessary. Trend factors could be selected to be higher or lower than past trends. If trend factors vary by region or state, minimum and maximum trend factors could be used to ensure the reasonableness of individual trend factors.

RATING SYSTEM

In addition to the typical rating variables of class and territory, physical damage rates have traditionally varied by age and symbol of car. As illustrated in Table 6, each symbol has represented a dollar range to which each make and model of car in the new model year has been assigned based on its cost when new. As more expensive cars have generally cost more to repair or replace than less expensive cars, rates for more expensive cars (higher symbols) have been greater than rates for less expensive cars (lower symbols).

TABLE 6

Price New	Symbol	Comprehensive Rate	Collision Rate
$0 - 1,000	1	$ 90	$ 180
1,001 - 2,000	2	90	180
2,001 - 3,000	3	90	180
3,001 - 4,000	4	100	200
4,001 - 5,000	5	110	220
5,001 - 6,500	6	155	250
.	.	.	.
.	.	.	.
.	.	.	.

In the 1970's many insurance companies began to collect data by make and model of car. This was accomplished by recording data by auto manufacturer vehicle identification number (V.I.N.). Analysis of this data indicated that cars of similar value could have substantially different experience. This has led to the modification of symbols by make and model of car, or vehicle series rating (V.S.R.) as it is frequently called.

After a symbol has been assigned to each make and model of car (vehicle series) for a new model year based on price new at the beginning of the model year, an experience modification is made to it. The experience modification is based on the latest available combined comprehensive and collision data by V.I.N. for the predecessor of that vehicle series. Loss ratios are examined so that differences in distribution of insureds by class, territory and deductible are reflected. For example, a vehicle series that is driven by a disproportionate number of higher rated operators would be expected to have higher than average losses as its rate would also be higher than average. The loss ratio for each vehicle series is then compared to the loss

ratio for all vehicle series combined for that model year. The resulting relativity indicates how much better or worse that vehicle series has been than the average. As both comprehensive and collision rates will increase or decrease significantly due to a change in symbol, a threshold must be exceeded before a symbol is increased or decreased. The threshold can be established in several ways. One amount, e.g. 20% better or worse than the average, can be used. A decision rule which requires an indicated change greater than the resulting change in combined comprehensive and collision rates is more precise but also more complex (see examples in Table 7.)

TABLE 7

Symbol Based On Price New	Indicated Change Required to Upsymbol	Indicated Change Required to Downsymbol
4	+10%	-10%
5	+25%	-10%
6	+25%	-20%

In both of these approaches a maximum change of one symbol at a time has been permitted, but greater changes might be indicated and could be implemented.

Reviewing data for every vehicle series poses obvious credibility problems. The Highway Loss Data Institute (H.L.D.I.) has been collecting the loss and exposure data by V.I.N. of many large auto insurers and publishing results by make and model. H.L.D.I. collects data separately by deductible and separately for youthful and non-youthful operators so that results by make and model can be normalized,

i.e., adjusted to a common distribution by deductible and age category of operator. This removes most distortion due to a disproportionate distribution of youthful insureds by deductible or make and model.

Even with H.L.D.I. data many vehicle series have only a small volume of data. To produce meaningful results for every vehicle series a credibility procedure is required. This can be accomplished by credibility weighting the indication of the vehicle series with the indication of a similar group of vehicle series.

When an entirely new vehicle series is introduced, there is no data on which to base an experience modification. A similar situation occurs when a vehicle series is changed so that experience of past model years is substantially different from the expected experience of the new model year. In both cases, it can be assumed that the new model year of the vehicle series will have experience comparable to a similar group of vehicle series.

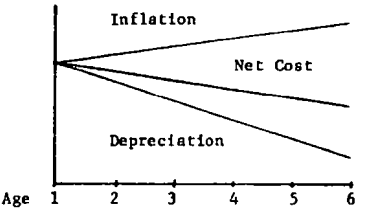
In addition to evaluating symbols for the new model year, symbols (including previous modifications) can be annually reevaluated on earlier model years (resymboled). By the second resymboling the review of symbols for a model year can be based on the data for that model year. Modifying a symbol on a new model year vehicle series has no impact on a company's policy issuing system because the new car is being covered on the policy for the first time. On the other hand, modifying a symbol on older model years requires the ability (by hand or automatedly) to rerate policies by V.I.N. The size and

complexity of accomplishing this task automatedly cause a substantial impact on a company's policy issuing system as V.I.N. data must be accurate and accessible.

Rating cars by make and model as described above has little impact on overall premium levels. However, it does provide for more accurate rates by vehicle series. In the long term it may help to control increases in losses by encouraging auto manufacturers to build less damageable and more repairable cars. While the above approach modifies cost new symbols based on insurance experience, it is possible that future developments will comprise of more sophisticated rating by make and model including the modification of experience indications based on engineering analysis to reflect substantial changes in vehicle design which are expected to impact insurance losses.

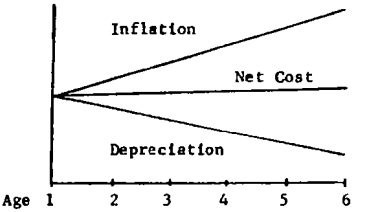
Physical damage rates have also traditionally varied by age of car. Older cars cost less to insure than newer cars; cars generally decrease in value as they age. Through the early 1970's the long term inflation rate was less than 5% per year. The increased cost of partial losses due to inflation combined with the decreasing value of total losses due to depreciation resulted in decreasing losses as a car aged as illustrated in Graph I. Thus it was appropriate to charge less for a car as it aged. This was accomplished by applying increasing discounts to the new car rates (age 1).

GRAPH I



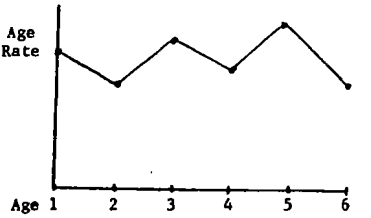
Since 1973 the high inflation rate has rapidly increased the cost of partial losses. It has also caused cars to depreciate more slowly. Consequently the net effect of inflation and depreciation has been no change or an increase in losses as a car aged as illustrated in Graph II.

GRAPH II



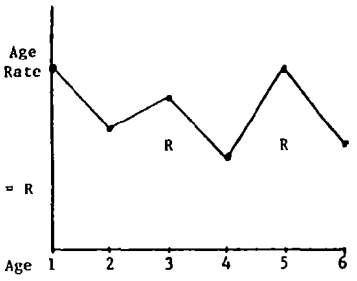
In reality insureds did not receive lower rates because rate revisions for substantial increases had to be implemented to overcome the inappropriate age discounts. The combination of age discounts and rate increases frequently caused rates to fluctuate as a car aged as shown on Graph III.

GRAPH III



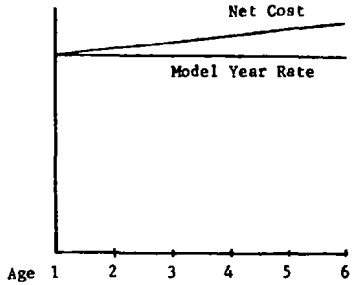
While Graph III assumed modest annual rate revisions and age discounts in alternate years (ages 2,4,6), Graph IV illustrates a less stable situation with infrequent rate revisions for large increases (ages 3, 5).

GRAPH IV



Model year rating (M.Y.R.) is reducing these problems by assigning a rate to a car based on its model year. The model year rate generally stays the same until an overall rate revision is implemented. Thus M.Y.R. more closely matches rates and costs than age rating as illustrated on Graph V.

GRAPH V



As new cars continue to cost more to insure than old cars, rates for newer model years continued to be higher than rates for older model years. As each new model year is introduced, it is rated a percentage, e.g. 5%, higher than the preceding model year to reflect the higher insurance cost of new cars.

The absence of age discounts and the shift in distribution to newer, higher rated model years results in more stable rates and a significant growth in premium income under M.Y.R. as illustrated in Table 8. This growth translates into a comparable reduction in overall rate level need from what would otherwise have been indicated. The combination of premium growth due to M.Y.R. and reduced rate level need results in approximately the same indicated rates as under age rating.

TABLE 8

	Comprehensive			Collision		
	(1)	(2)	(3)	(4)	(5)	(6)
Model Year	Rate Rel.	Dist. in Year X	Dist. in Year X+1	Rate Rel.	Dist. in Year X	Dist. in Year X+1
x+1	1.05	-	9%	1.05	-	10%
x	1.00	9%	11	1.00	10%	12
x-1	.94	11	11	.92	12	12
x-2	.88	11	11	.85	12	12
x-3	.83	11	11	.78	12	12
x-4	.78	11	11	.72	12	12
x-5	.73	11	11	.66	12	12
x-6	.69	11	11	.60	12	10
x-7	.65	25	14	.55	18	8

		Comprehensive	Collision
(7)	Average rate relativity in year x:	.786	.743
(8)	Average rate relativity in year x+1:	.829	.801
(9)	Change in rate relativity:	+5.5	+ 7.8%
(10)	Approximate effect on rate level indication: 1.0/[1.0 + (9)] - 1.0	-5.2%	- 7.2%

While the same distribution of cars by age has been a reasonable assumption in the long term, the distribution has varied in the short term. However, a substantial change in distribution would be needed to significantly impact the effect on rate level line (10) of Table 8. The future distributions used to weight the relativities must be estimated. Consequently, exposures are generally used although premiums would be more precise.

Model year rate relativities must be reviewed frequently to ensure their continued appropriateness. Rates by model year allow responsiveness to better or worse experience between model years, which was not feasible under the age rating system.

STATISTICAL IMPLICATIONS

After rating and ratemaking requirements have been identified, all statistical implications must be determined. This is not to say that statistical implications are secondary. On the contrary, before any rating or ratemaking change is implemented, its statistical implications should be considered.

All data must have sufficiently high quality to have positive value in rating or ratemaking. Inaccurate data can lead to inadequate or excessive rates thereby damaging a company's fiscal or market position, not to mention its credibility when errors are discovered.

To develop quality data the coding of information should be logical and simple. Instructions should be provided with examples as necessary. Training should be a prerequisite for all new coders and for all coders when there is a major statistical change.

As information needed to rate risks is usually recorded more carefully than other data, code as rated is generally a good rule to follow. However, if the rating scheme is too complicated, a significant number of both rating and coding errors will result. In certain situations it may be important to collect data in greater detail than is used for rating. Review of such data should consider its possible lower quality because it is not used in rating.

When the statistical implications of a change in rating or ratemaking have been determined, then the cost of all facets of the change can be weighed against all benefits of the change. This may lead to a simplification of the rating system. While it may be necessary to make a change in the rating system, the decision may be made to forego the coding of less significant items of information. Detail desired for ratemaking may have to be modified. For example, collecting ratemaking data in complete detail by deductible, age and symbol, V.I.N., etc. may not be feasible for a company.

Whatever data is collected can be edited to enhance its quality. Field edits check the validity of certain columns of data: is a particular class code valid? Relationship edits check the validity of certain columns of data relative to other information about the

insured: is a particular class code valid in a given state? Distributional edits compare summarized data of many insureds to determine if the distribution by a particular category is atypical: is there a disproportionate number of insureds in a particular class?

A similar problem to collecting data is that of summarizing the data in the detail that is required to produce needed reports. The cost of designing and implementing a particular report may exceed the benefits of the report.

Once the decision has been made on what data to collect and what reports to produce, methods of estimating required, unavailable data may have to be developed. In addition, other affected areas within the company must be informed of the limited availability of data in certain detail as this may impact their operations.

The final review of the data rests with the ratemaker. Knowledge of economic conditions and other factors affecting data during the experience period allow the ratemaker to determine the overall reasonableness of the data. For example, the presence of a large catastrophe may make comprehensive losses look overstated relative to years without a catastrophe. The ratemaker would recognize the effect of the catastrophe on the data and would be able to make the appropriate adjustments to the data as discussed in the section on economic and related conditions.

CONCLUSION

After rates are developed by the ratemaker, they are subject to management review. As the rates were developed on the basis of certain key assumptions about coverage, insureds, economic conditions and the rating system, these assumptions should be considered in the management review. If the rates are changed by management (or later by a regulatory body), the original assumptions should be modified to reflect the changes in rates. Whatever the final rates the modified assumptions underlying them should be transmitted to all involved in the selling of insurance.

As actual economic conditions can vary substantially from the expectations underlying the revised rates, the ratemaker should be continuing to monitor available sources, e.g. Fast Track data, so that management can be informed of changes in the appropriateness of the rates. This would allow the rate users in the company to adjust their assumptions about the appropriateness of the existing rates even before revised rates can be developed and implemented. The importance of good communications within a company is another aspect of properly matching premiums and losses to ensure appropriate rates.

As mentioned at the beginning of this section, the final formula rates should be evaluated for overall reasonableness and responsiveness to current and expected conditions. The formula is a tool for establishing such rates and not an end in itself. Therefore, it should be modified as necessary to reflect changing conditions...for today's formulas are tomorrow's antiquities.