VOLUME LXV NUMBERS 123 AND 124

PROCEEDINGS

OF THE

Casualty Actuarial Society

ORGANIZED 1914

1978
VOLUME LXV
Number 123 — May 1978
Number 124 — November 1978
1979 YEAR BOOK

Printed for the Society by
Recording and Statistical Corporation
Boston, Massachusetts

1978 PROCEEDINGS
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OBITUARIES

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Volume LXV, Part 1 No. 123

PROCEEDINGS

May 21, 22, 23, 24, 1978

ESTIMATION OF THE DISTRIBUTION OF REPORT LAGS BY THE METHOD OF MAXIMUM LIKELIHOOD

EDWARD W. WEISSNER

Often when we are pricing an insurance contract or setting an IBNR reserve, it would be very useful to know the underlying distribution of the time delay between the time a claim occurs and the time the claim is reported. The purpose of this paper is to estimate this distribution. Specifically, we introduce a procedure, based on the method of maximum likelihood, which can be used on immature claims data to estimate the distribution of the time delay between the time a claim occurs and the time the claim is reported.

We shall refer to this time delay, the elapsed time between the time of occurrence and the time the insurer records it on its books, as a *report lag*. While the distribution of these report lags would most likely be unknown, one might, based on experience and knowledge, be willing to assume that the underlying distribution is Poisson, exponential, log-normal or some other well known probability law. Further, if a random sample of report lags were available, one could use some statistical estimation procedure (i.e., maximum likelihood) to estimate the unknown parameters of the assumed distribution. Thus, a good estimate of the report lags distribution would be available.

Unfortunately, however, a random sample of current report lags is not usually available, especially for some of the long-tail casualty sublines like medical malpractice. We do have for each accident period, however, a cumulative record of the number of claims received over time. Table I, using accident month, is typical (though abbreviated for convenience).

TABLE I

Total Claims Reported

Accident Month	Report Month Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
3 Mar	8	13	21	25	31	37	42	44	44	45
4 Apr		5	15	22	32	34	37	39	42	43
5 May			4	20	27	35	40	43	45	47
6 June				4	14	25	31	36	39	41
7 July					7	15	24	29	33	43
8 Aug						4	22	29	35	42
9 Sept							5	15	28	36
10 Oct								11	22	31
11 Nov									10	25
12 Dec										8
									(Total)	361

This table can be restructured to yield the number of claims received during each report period for each accident period. If we assume that all claims occur and are reported at the middle of a period, then the restructured table also yields for each accident period the frequency of various report lags. Table II is the restructured Table I.

TABLE II

Number of Claims with a Report Lag of K Months

Accident Month	K = 0	1	2	3	4	5	6	7	8	9
3 Mar	8	5	8	4	6	6	5	2	0	1
4 Apr	5	10	7	10	2	3	2	3	1	
5 May	4	16	7	8	5	3	2	2		
6 June	4	10	11	6	5	3	2			
7 July	7	8	9	5	4	10				
8 Aug	4	18	7	6	7					
9 Sept	5	10	13	8						
10 Oct	11	11	9							
11 Nov	10	15								
12 Dec	8									

Hence, referring to Tables I and II, we observe that for the March accident month, 21 claims were reported by the end of May, 8 claims were reported in May, and therefore 8 claims have a report lag of 2 months. If we could assume that the 361 report lags from all the accident periods were a random sample, we could proceed as above. However, this sample of report lags is incomplete, immature, and biased toward small report lags. All the unreported claims in any accident period will yield only larger report lags. Hence, we do not have a random sample.

We now present a procedure which may be used to estimate the complete distribution of report lags, given the above data.

1) To begin, let us consider only the March accident month data received through the end of December (see Tables I and II). Let n be the number of reported claims; here $n=45$. Let the 45 report lags be $x_1, x_2, \ldots, x_{45}$; here $x_1 = x_2 = \ldots = x_8 = 0$, $x_9 = x_{10} = \ldots = x_{13} = 1, \ldots,$ $x_{43} = x_{44} = 7$, and $x_{45} = 9$. Now, for the moment, assume that the underlying report lag distribution is exponential with parameter θ, unknown. Then the report lag density is given by

$$f(x/\theta) = \theta \cdot exp(-\theta x) \qquad 0 < x < \infty,$$
$$= 0 \qquad \text{otherwise.}$$

If *all* the March accident month occurrences were known to have been reported by December 31 (i.e., no unreported claims), then the sample of 45 report lags would clearly be a random sample from the above exponential law. However, we don't know that this set of report lags is complete; several claims may be unreported as yet. We have observed only the claims reported through the end of December, that is, the claims with report lag less than or equal to 9 months. (Since our data is rounded to the nearest month and the model is continuous, we have effectively observed all the claims with report lag less than or equal to 9.5 months.) Let c be the maximum possible report lag (plus .5) for the accident period; here $c = 9.5$. *While these observed report lags are not a random sample from the exponential law, they do constitute a random sample from an exponential law conditioned (truncated) to allow only report lags of 9.5 months or fewer.*

Since according to our exponential model (recall $c = 9.5$)

$$P[\text{report lag} \leq c] = \int_0^c f(x/\theta)\, dx = 1 - exp(-\theta c),$$

the conditional (truncated) report lag density, $f(x/\theta,c)$ is given by

$$\begin{aligned} f(x/\theta,c) &= f(x/\theta)/P[\text{report lag} \leqslant c] \\ &= [\theta \cdot exp(-\theta x)]/[1 - exp(-\theta c)] \end{aligned} \tag{1.1}$$

for $0 < x < c$; 0 otherwise. Let us now use the concept of maximum likelihood estimation to estimate θ.[1] The likelihood function for θ for the March accident month, $L(\theta)$, is given by (recall that $n = 45$, $c = 9.5$, and the x_i's are known)

$$\begin{aligned} L(\theta) &= L(\theta; x_1, x_2, \ldots x_n) \\ &= \Pi_j f(x_j/\theta, c) \\ &= [\theta^n \cdot exp(-\theta \cdot \Sigma_j x_j)]/[1 - exp(-\theta c)]^n. \end{aligned}$$

Taking natural logs, we obtain

$$ln\, L(\theta) = n \cdot ln\theta - \theta \cdot \Sigma_j x_j - n \cdot ln[1 - exp(-\theta c)].$$

It follows that

$$\begin{aligned} \frac{d\, ln\, L(\theta)}{d\theta} &= \frac{n}{\theta} - \Sigma_j x_j - \frac{n \cdot c \cdot exp(-\theta c)}{[1 - exp(-\theta c)]} \\ &= g(\theta). \end{aligned} \tag{1.2}$$

Let the right hand side of (1.2) be $g(\theta)$. The maximum likelihood estimate of θ is the value $\hat{\theta}$ for which $g(\hat{\theta}) = 0$.

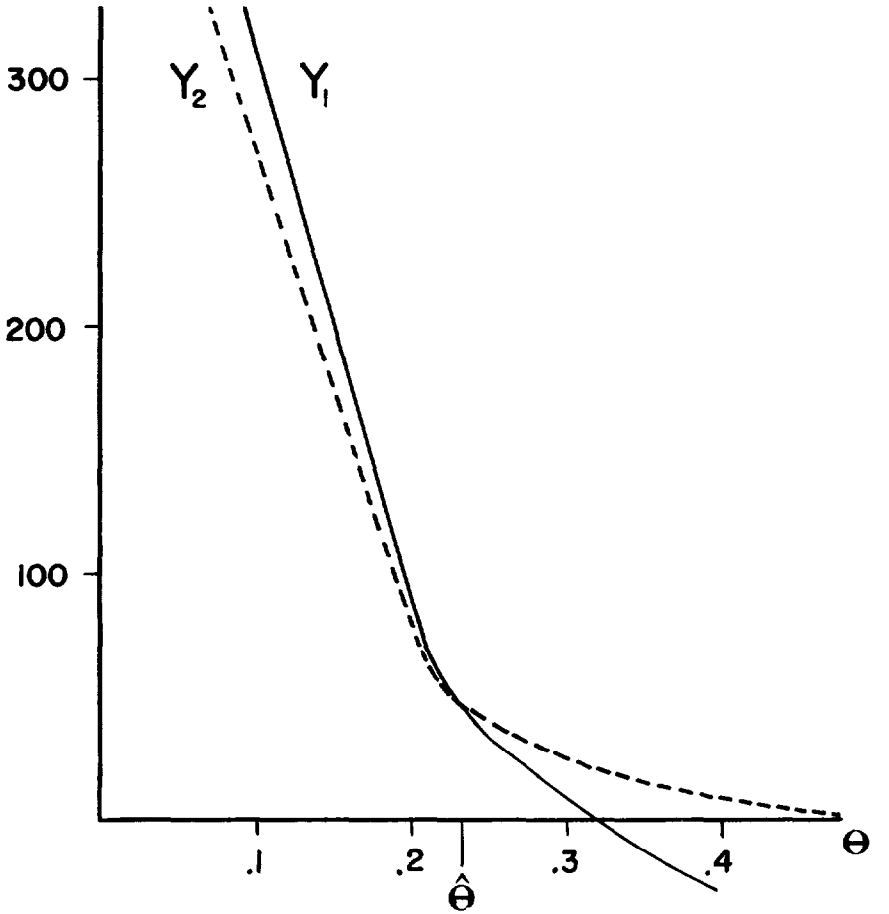
In our example then, we must solve

$$\frac{45}{\theta} - 140 - \frac{45(9.5)\, exp(-9.5\,\theta)}{1 - exp(-9.5\,\theta)} = 0$$

since $\Sigma x_j = 140$ (see Table II). To solve for θ, we might observe that the curves

$$\begin{aligned} y_1 &= (45/\theta) - 140 \\ y_2 &= 45(9.5)\, exp(-9.5\,\theta)/[1 - exp(-9.5\,\theta)] \end{aligned}$$

intersect when $\theta = \hat{\theta}$ (see Figure) and use this to determine θ.



Another approach would be to use a Newton-Raphson iteration to solve $g(\theta) = 0$. Since

$$g'(\theta) = -\frac{n}{\theta^2} + \frac{n \cdot c^2 \cdot exp(-\theta c)}{[1 - exp(-\theta c)]^2}$$

the Newton-Raphson iteration[2] for $\hat{\theta}$ is given by

$$\theta_{m+1} = \theta_m - g(\theta_m)/g'(\theta_m)$$

$$= \theta_m - \frac{(n/\theta_m) - \Sigma x_j - n \cdot c \cdot exp(-\theta_m c)/[1 - exp(-\theta_m c)]}{(-n/\theta_m^2) + n \cdot c^2 \cdot exp(-\theta_m c)/[1 - exp(-\theta_m c)]^2}$$

For our example, this reduces to

$$\theta_{m+1} = \theta_m - \frac{(45/\theta_m) - 140 - 45(9.5)\exp(-9.5\,\theta_m)/[1 - \exp(-9.5\,\theta_m)]}{(-45/\theta_m^2) + 45(9.5)^2\exp(-9.5\,\theta_m)/[1 - \exp(-9.5\,\theta_m)]^2}$$

This iteration is easy to program in APL on a mini-computer. Using a seed of $\theta_1 = .2$ (recall the mean of an exponential law is θ^{-1}; we thought it might be 5 months), we found

$$\theta_2 = .23442$$

$$\theta_3 = .23547$$

$$\theta_4 = .23547.$$

Hence, the maximum likelihood estimate of θ, using the March accident month data only, is $\hat{\theta} = .23547$. Thus, if you believe an exponential model for report lags is appropriate, you would use the exponential law with $\theta = .23547$ (and mean = 4.25 months).

Note that this value of θ is the parameter of the complete exponential report lags distribution as well as the parameter of the truncated exponential report lags distribution. Hence, the procedure, based on truncated distributions, yields an estimate of the complete report lags distribution.

As an example, if you would like to estimate the proportion of occurrences in any accident month which will have a report lag of at least 12 months, say, then the proportion p is given by

$$\begin{aligned} p &= P[\text{report lag of at least 12 months}] \\ &= P[lag \geq 11.5] \\ &= \int_{11.5}^{\infty} f(x/\theta = .23547)\,dx \\ &= \exp(-.23547(11.5)) \\ &= .067. \end{aligned}$$

(The shift from 12 to 11.5 is due to our correction for rounding.)

Or suppose you would like to estimate the number of unreported claims in the March accident month as of 12/31. Using an analysis similar to the above, we find that the proportion of occurrences reported within 9 months (use 9.5) is .893. If N is the total number of March accident month occurrences, then $.893N$ is the expected number of reported claims as of 12/31. Since the actual number of reported claims is 45 (see Table I), an estimate of N is found by solving $.893N = 45$. Thus for the March accident month, N is 50 which implies that the IBNR as of 12/31 is 5 claims.

2) Let us now use all of the available information to help us estimate θ. Let $n_3, n_4, \ldots, n_{12}$ be the respective numbers of reported claims through the end of December for the accident months March (3) through December (12). Then $n_3 = 45$, $n_4 = 43$, ..., and $n_{12} = 8$. Let $c_3, c_4, \ldots, c_{12}$ be the respective maximum possible report lag (plus .5) for the accident months March through December. It follows that $c_3 = 9.5$, $c_4 = 8.5$, ..., and $c_{12} = .5$ Finally, let x_{ij} be the j^{th} report lag in the i^{th} accident month ($i = 3,4,\ldots,12$ and $j = 1,2,\ldots,n_i$).

Then, as before, for the i^{th} accident month, the sample of report lags $\{x_{i1}, x_{i2}, \ldots, x_{in_i}\}$ obeys $f(x/\theta, c_i)$, the truncated exponential for the i^{th} accident month (see 1.1). Assuming that the accident months are independent, the generalized likelihood function for all the data, $L^*(\theta)$, is given by (see 1.1)

$$
\begin{aligned}
L^*(\theta) &= L^*(\theta; \text{all } x_{ij}\text{'s}) \\
&= \left[\prod_{j=1}^{n_3} f(x_{3j}/\theta, c_3)\right] \left[\prod_{j=1}^{n_4} f(x_{4j}/\theta, c_4)\right] \cdots \left[\prod_{j=1}^{n_{12}} f(x_{12j}/\theta, c_{12})\right] \\
&= \left\{exp(-\theta \cdot \Sigma_{ij} x_{ij}) \Big/ \prod_i [1 - exp(-\theta c_i)]^{n_i}\right\} \cdot \theta^{\Sigma_i n_i} \cdot
\end{aligned}
$$

It follows that

$$
\begin{aligned}
\frac{d \ln L^*(\theta)}{d\theta} &= \frac{\Sigma_i n_i}{\theta} - \Sigma_{ij} x_{ij} - \Sigma_i \left\{\frac{n_i \cdot c_i \cdot exp(-\theta c_i)}{[1 - exp(-\theta c_i)]}\right\} \\
&= g^*(\theta) \cdot \qquad (2.1)
\end{aligned}
$$

Again, let the right hand side of (2.1) be $g^*(\theta)$. The maximum likelihood estimate of θ is the value $\hat{\theta}$ for which $g^*(\hat{\theta}) = 0$. In our example it means solving

$$\frac{361}{\theta} - 759 - \left\{ \frac{45(9.5)\exp(-9.5\,\theta)}{[1-\exp(-9.5\,\theta)]} + \frac{43(8.5)\exp(-8.5\,\theta)}{[1-\exp(-8.5\,\theta)]} + \cdots \right\} = 0$$

since $\Sigma n_i = 361$ and $\Sigma x_{ij} = 759$ (see Table II). Again, a Newton-Raphson iteration can be applied to solve $g(\theta) = 0$. If you do so and let $\theta_1 = .2$ again, then

$$\theta_2 = .24829$$

$$\theta_3 = .24971$$

$$\theta_4 = .24971.$$

Hence, using all the data through December 31, we conclude, for this exponential model, that the maximum likelihood estimate of θ is $.24971$. This implies that the average report lag is 4.00 months.

Again recall that this value of θ is the parameter of the complete exponential report lags distribution as well as a parameter in each of the truncated exponential report lags distributions. Thus, this procedure, based on truncated distributions, yields an estimate of the complete report lags distributions. Moreover, it also yields therefore an estimate of the complete average report lag.

According to the above analysis, the average report lag for all occurrences is 4 months. That is, when all the occurrences from a specific accident period have been reported, we expect that the average report lag will be 4 months.

Finally, based on the estimated average report lag of 4 months, we can demonstrate the accuracy of this procedure. The data in Table II was randomly generated using an exponential report lag with a mean of 4 months ($\theta = .250$) and increasing numbers of occurrences each accident month. While this data is therefore highly regular, we have obtained similar results on actual reinsurance claims data.

3) You need not of course assume an exponential model for the distribution of report lags or even a continuous model. This procedure however is easier to carry out for some models than for others. If you believe for instance that the model is log-normal, then the report lag density, $f(x/\mu, \sigma^2)$ is given by

$$f(x/\mu, \sigma^2) = (1/\sqrt{2\pi}\,\sigma \cdot x)\exp\left\{-.5[(\ln x - \mu)/\sigma]^2\right\}$$

and the truncated density is given by

$$f(x/\mu, \sigma^2, c) = f(x/\mu, \sigma^2)/\phi((\ln x - \mu)/\sigma)$$

where ϕ is the cumulative distribution function of the standard normal, $N(0,1)$. The procedure outlined yields the following equations for the joint maximum likelihood estimation of μ and σ^2:

$$\mu = \frac{\sum_{ij} \ln x_{ij}}{\sum_i n_i} + \sum_i \left\{ \frac{\sigma \cdot n_i}{\sum_i n_i} \right\} \left\{ \frac{\phi((\ln c_i - \mu)/\sigma)}{\phi((\ln c_i - \mu)/\sigma)} \right\}$$

$$\sigma^2 = \frac{\sum_{ij} (\ln x_{ij} - \mu)^2}{\sum_i n_i} + \sum_i \left\{ \frac{\sigma^2 \cdot n_i}{\sum_i n_i} \right\} \left\{ \frac{\phi((\ln c_i - \mu)/\sigma) \cdot ((\ln c_i - \mu)/\sigma)}{\phi((\ln c_i - \mu)/\sigma)} \right\}$$

where ϕ is the density of the standard normal, $N(0,1)$. To solve these equations for μ *and* σ^2, one could use successive substitution or a 2-dimensional Newton-Raphson iteration.[3] The Newton-Raphson method is much quicker!

4) We close with some procedural remarks. If after estimating the parameters of your model you wish to compare the model distribution and the observed sample distribution for an accident period, remember to use the truncated model distribution in your comparison. Secondly, it is important that the length of the accident (report) periods be relatively short (i.e., month or week). The report lag as defined can differ from the actual report lag by as much as one report period. For example, if an accident occurs on January 1 and is reported on March 31, the report lag based on the mid-points of the reporting months is 2 months, whereas the actual lag is 3 months. Thus, the shorter the period, the more precise the report lag is, the closer the data is to reality, and the better the estimation procedure works. Thirdly, it appears that the procedure works very well if there is at least one accident period with some "tail" lags to help give the early lags the appropriate balance. Finally, this kind of estimation using truncated distributions can also be useful in pricing problems where the losses are restricted only to large claims, only to small claims, or only to claims in a certain layer.[4]

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[1] R. V. Hogg and A. T. Craig. *Introduction to Mathematical Statistics*. (3rd ed.) MacMillan, New York, 1970, p. 254.

[2] S. G. Kellison. *Fundamentals of Numerical Analysis*. Irwin, Homewood, Ill., 1975, p. 263.

[3] S. D. Conte and C. de Boor. *Elementary Numerical Analysis: An Algorithmic Approach*. (2nd ed.) McGraw-Hill, New York, 1972, p. 84.

[4] H. G. Verbeek. "An Approach to the Analysis of Claims Experience in Motor Liability Excess of Loss Reinsurance." *The ASTIN Bulletin*. Vol. 6, Part 3 (1972), pp. 195-202.

LOSS RESERVE ADEQUACY TESTING: A COMPREHENSIVE, SYSTEMATIC APPROACH

JAMES R. BERQUIST AND RICHARD E. SHERMAN

VOLUME LXIV, PAGE 131

DISCUSSION BY JOSEPH O. THORNE

INTRODUCTION

A model for estimating loss and loss expense reserves is presented in the paper. This model is extensive, and the authors are to be commended for their clarity and for the enormous effort required in its preparation. However, some of the concepts of the model may be difficult to extract due to the length of the paper. In my discussion, I shall review a few of the concepts I believe to be fundamental. In addition I shall highlight steps in the application of the model that require particular caution and recommend areas of possible improvement.

USE OF PAID LOSSES

For the most part, the methodology used in the model is designed for the analysis of paid losses rather than incurred losses. This emphasis on paid loss development can partly be attributed to the actuary's search for an objective standard with a minimum of dependence on case estimates. Although paid losses are an objective measure of past losses, the projection of future payment patterns from past ones has several potential sources of distortion.

Adjustment for Shifts in Claim Settlement Rates

One of the primary causes of distortion in payment patterns, as was pointed out in the paper, is variation in the rate of settlement of claims. Settlement can be influenced by a multitude of factors. Some factors such as the workload of the claims department and directives from management may be within the control of the company, while others such as late reporting of claims may not be within its control. In either case, the effect on payment patterns can be substantial.

One technique is presented to adjust paid losses for shifts in the rate of settlement of claims. The primary assumption is that if a higher percent of ultimate claims is closed, then a higher percent of ultimate losses will be paid. Lack of recognition of the settlement patterns *by size of loss* can be an important source of error. As mentioned in the paper, it may be necessary to modify the technique to apply to size of loss categories adjusted for "inflation".

In Exhibit I-A an example is given to illustrate the need for recognition of settlement patterns by size of loss. In this simplified example it is assumed that the number of small claims ($3,000) is steadily decreasing and the number of larger claims ($20,000) is steadily increasing. As shown in Exhibit I-B, the primary assumption is not satisfied; the percent of claims closed decreases from Accident Years 1973 to 1976, and yet the percent of losses paid increases due to the underlying shifts by size of loss. Thus the technique actually adjusts paid losses to be less comparable among accident years and increases the error in the reserve estimate as shown in Exhibit I-A. Although the example is hypothetical, it was selected recognizing the recent trend toward an increasing proportion of severe, late closing claims in many lines of business and demonstrates the hazards of not recognizing settlement patterns by size of loss.[1]

"Tail of Payments"

In projecting paid losses to ultimate, the payments beyond a selected point of development are often grouped to form a "tail of payments". Although the paper did not specifically address its estimation, the tail can be a key element of the loss reserve. The selected point of development typically can vary from less than five years for property coverages to fifteen or more years for Medical Malpractice. For example, ten years has generally proved satisfactory for Workers' Compensation since losses paid more than ten years after the accident year have represented a relatively small percent of the ultimate payments (approximately 10% or less). Care must be taken in projecting the tail from older accident years to recent accident years. For example, in Workers' Compensation the tail percentage may increase due to trends in cumulative injury, shifts to unlimited medical benefits, and increases in the proportion of pension claims. On the other hand, the percentage may decrease due to trends in settlement practices for lump sum awards or for compromise and release of claims. The effects of certain factors may be quantified by analysis of loss experience (such as claims by size or injury type) or by specific sampling; other factors may require considerable judgment. In either case, it should be recognized that the adoption of a fixed percentage for the tail of payments may not be appropriate.

Use of Ultimate Severity for Recent Accident Years

The techniques of traditional paid loss development as represented in Methods I, II, and V may be satisfactory in estimating loss reserves for older, more mature accident years. However, such techniques are many times inaccurate and unstable for recent accident years as shown in Exhibit II. The estimates in that

[1]See Exhibits I-C, I-D and I-E for a complete application of the adjustment technique for this example.

exhibit have been developed from the Medical Malpractice example presented in the paper. The potential inaccuracy of methods based only on paid losses can be seen by comparing Columns (2) to (4) with Column (1), while the instability can be seen by comparison among Columns (2), (3) and (4). These weaknesses of paid loss methods for recent accident years can be improved by separating the estimation of ultimate losses into two components—number of claims reported and average severity. For many lines of business the estimation of ultimate claims reported is stable, as is the estimation of ultimate severity for older accident years. The ultimate severity for recent accident years can then be projected by trending from prior accident years.

Although the use of ultimate severity can improve the stability and accuracy of the reserve estimates for recent accident years, the periodic warnings in the paper regarding procedural changes in the processing of claims should not be overlooked. A change in the meaning of a "claim" can cause substantial errors in the resulting reserve estimates when relying on the projection of ultimate severity for recent accident years. These changes need not even be internal to the company. For example, changes in waiting periods, statutes of limitation, and no-fault coverage can have a significant effect on the meaning of a "claim" and thus on ultimate severity.

Ex Ante Analysis

In the evaluation of Methods I to VI, the statistical technique of ex ante analysis[2] was used. In this technique past bias is determined by comparing the past actual average payments with the estimates made at that time. The percentage deviations of the actual from estimated average payments are illustrated in Exhibit V for Method II. To consolidate these deviations two measures are considered—the average percentage deviation and the median percentage deviation. The average percentage is rejected due to its tendency to be overly influenced by large individual percentage deviations. The median is adopted as the measure of bias. While I agree that the median is preferable to this arithmetic average percentage deviation, I feel that a more direct measure is possible. By assigning weights to the percentage deviations by payment year, a weighted average deviation could be determined. That weighted average deviation would relate directly to the calendar year reserve. The weights would be the estimated percent of the calendar year reserve that is contributed by each payment year. One approach to the estimation of the weights and of the weighted percentage deviation is illustrated in Exhibits III-A and III-B for the Automobile Bodily Injury Liability example from the paper.

[2]McLagan, Donald L., "A Non-econometrician's Guide to Econometrics", *Business Economics* Vol. VIII, No. 3, May 1973, p. 38.

The use of a weighted average deviation should be less susceptible to the large individual percentage deviations that eliminated the arithmetic average deviation from consideration. These individual deviations may be large as percentages, particularly for later development periods. When related to their contributions to the calendar year reserve, though, they should have a smaller effect on the weighted average. I would not expect the weighted average to differ significantly from the median percentage selected in the paper. However, the weighted average has the advantage of relating *directly* to the calendar year loss reserve. It is the calendar year loss reserve that we are estimating—not a set of unweighted percentages.

The technique of ex ante testing can be a useful tool in evaluating past bias in reserve estimates. However, care must be taken that it does not create an unwarranted confidence in the projected loss reserve estimates. The variability inherent in the projection of the future will not be eliminated by the existence of stable indications in the past.

CASE RESERVE ADEQUACY

One method of projecting ultimate losses using incurred loss development rather than paid loss development is presented in the paper. The method addresses the problem of changes in case reserve adequacy. For example, incurred loss development factors can be too high if the claim adjusters have been improving the adequacy of their case estimates. In the method presented in the paper, the current calendar year adjusters' estimates for each accident year are adopted and an underlying trend in severity is assumed. Adjusted incurred loss development factors and ultimate loss estimates are then derived.

The estimation of the underlying trend in severity requires much care due to the sensitivity of the reserve estimates to the selected rate, and due to the substantial judgment often necessary. The sensitivity of the reserve estimate is illustrated in Exhibit IV for the Medical Malpractice example presented in the paper. The loss reserve estimate prior to adjustment by the method is approximately $750 million, based on average incurred loss development and corresponding to a 30% severity trend. The adjusted estimate of the method is approximately $430 million, corresponding to the 15% severity trend selected in the paper. Thus by reducing the estimated severity trend from 30% to 15%, the effect on the loss reserve estimate will be a decrease of 43%—nearly one-half. The degree of judgment necessary in the estimation of the severity trend makes this substantial effect on the loss reserve estimate particularly critical. For example, estimation of the severity trends for

Medical Malpractice is complicated by several factors. The slow payment of losses substantially reduces the experience available by accident year for trending in Exhibit C of the paper. Less than 3% of ultimate losses are paid during the first two payment years of an accident year and less than 30% during the first five payment years. Furthermore, the trends in severity are distorted by irregular settlements and variation in the rate of claims closed without payment. For example, the claim severities from which the calendar year trend of 15.0% is derived in the paper are average paid losses per claim closed *with* payment, while the severities in Exhibit C are average paid losses per claim closed *with or without* payment. Since the rate of claims closed without payment is typically in excess of 60% for Medical Malpractice (over 70% for the example), then variation in the rate can distort the trend in the average reserves per outstanding claim in Exhibit B.

The importance of the type of complicating factors mentioned above is not that 15% or 20% or 25% is the best estimate of the rate. Instead the importance is that *any* selected rate will have a high degree of uncertainty. As shown in Exhibit IV this uncertainty in the rate is directly translated to the reserve estimate.

HINDSIGHT OUTSTANDING SEVERITY

The methods presented in the paper concentrate primarily on the projection of ultimate losses, from which the implied loss reserve estimates are determined. An alternate approach is to concentrate directly on the outstanding losses. For example, the average outstanding case estimates (Exhibit B for Medical Malpractice) provide a direct basis for the estimation of loss reserves. However, three disadvantages with these case estimates stand out:

1. The estimates are distorted by varying levels of adequacy from year to year.

2. IBNR is not included in the estimates.

3. Settlement patterns and reporting patterns can make the averages less comparable at corresponding points of development.

The effects of the first two can be reduced if we use our current hindsight knowledge of case development and reportings to adjust these case estimates. The loss reserve estimates of such a method are presented in Exhibit U of the paper. This "hindsight average outstanding losses" technique is not discussed in the paper, but it can be a valuable tool in the evaluation of loss reserve adequacy.

The derivation of hindsight average outstanding losses is illustrated in Exhibits V-A, V-B and V-C for the Automobile Bodily Injury Liability example of the paper. In Exhibit V-A the hindsight outstanding losses are derived as in the retrospective test from cumulative paid losses and estimated ultimate losses. The hindsight outstanding claims (including IBNR claims) are similarly determined in Exhibit V-B. Then the hindsight outstanding losses are divided by the hindsight outstanding claims to give the hindsight average outstanding losses in Exhibit V-C. Thus the averages in Exhibit V-C are the loss severities per outstanding-plus-IBNR claim that "should have been" assigned in the past based on our current hindsight knowledge.[3]

The hindsight average outstanding losses developed in Exhibit V-C are the key to the technique. These hindsight outstanding severities have two particular applications in loss reserve analysis. First, they can be used to evaluate the loss reserve estimates of various other methods. For example, the loss reserve estimates of Methods I to VI can separately be translated into hindsight outstanding severities and evaluated at comparable points of development. A loss reserve estimate that seems otherwise appropriate may not be reasonable when viewed from this perspective. Secondly, the hindsight outstanding severities can be used to develop methods for estimating loss reserves, as in the paper. For example, the hindsight outstanding severities for recent accident years can be trended from older accident years and multiplied by the hindsight outstanding claims. Alternately, they can be compared to claim adjusters' case estimates (Exhibit B for Medical Malpractice) to determine past case adequacy. The current claim adjusters' case estimates can then be adjusted for this indicated past case adequacy. The estimates in the paper use the former method.

Since we concentrate on outstanding rather than paid losses in this technique, two adjustments become especially important. First, just as with closed claims, the mix of outstanding claims can be changed by shifts in settlement patterns. An adjustment for these shifts was discussed earlier. I recommend that the method used in the paper be extended one step further to include this adjustment. Exhibit V-A and V-B have been adjusted. Secondly, the treatment of partial payments can alter the meaning of the averages. By adjusting the average outstanding values to include partial payments, we could convert them to average incurred values per outstanding claim. These average incurred values would provide a more consistent trend, particularly in lines such as Workers' Compensation where significant variations in the extent of partial payments can occur between accident years.

[3]Salzmann, Ruth, "Estimated Liabilities For Losses and Loss Adjustment Expenses", Chapter 3, *Property-Liability Insurance Accounting*, ed. Robert W. Strain, The Merritt Company, Santa Monica, California, 1974

The hindsight outstanding severity technique is vulnerable to inaccuracies in certain key estimates—especially the ultimate claims closed and the adjustment for shifts in settlement patterns. However, in application the technique has proved to be a valuable approach since it provides an additional perspective with a more direct relationship to the loss reserve being estimated. It can be an important tool which, when combined with the many other methods, can provide the actuary with an improved basis for his judgmental selection of the loss reserve.

TRIANGLE VS PARALLELOGRAM

The accident year experience analyzed by the authors is in "triangular" form, as is illustrated in Exhibit VI. In such a form, the experience of the older accident years is lost (1973 and prior in Exhibit VI). The experience from the early development years of these accident years may be difficult to compile and in many instances is only of marginal value due to its age. However, the experience from the later years of development is often not as difficult to compile and may be well worth the extra effort. The expansion of the triangle to a parallelogram, as shown in Exhibit VI, could result in a gain in the accuracy and stability of the reserve estimates at nearly every phase in the model.[4]

CONCLUSION

I have reviewed certain stages of the model to which I believe the reserve estimates are particularly sensitive. However, the recognition of these crucial stages does not imply a rejection of the model. On the contrary, in application to a variety of companies and lines I have found that with recognition of their sensitivity such techniques can be useful tools in the evaluation of loss and loss expense reserves. The model presented has many positive features, particularly its flexibility in the recognition of the effects of the common but crucial considerations reviewed in Appendices B and C of the paper. It is the vulnerability of the various reserve models to such effects and the need for considerable actuarial judgment at key stages that concerns me, especially in view of the tendency of non-technicians to expect a "mechanized" reserving procedure. I believe a reserve model can only be expected to be a tool on which the actuary can impose his judgment.

[4] For example, tail of payments, ex ante testing, trend in paid and outstanding claim severity, Methods I to VI, hindsight average outstanding losses.

EXHIBIT I-A

Adjustment for Shifts in Claim Settlement Rates
Changes in Distribution of Claims by Size of Loss

Pattern of Payment Assumed

Accident Year	Claims Closed From 0-12 Mos. $3,000 Claims	Claims Closed From 0-12 Mos. $20,000 Claims	Claims Closed From 13-24 Mos. $20,000 Claims	Claims Closed From 25-36 Mos. $30,000 Claims	Total No. of Claims Closed
1973	50,000	0	30,000	20,000	100,000
1974	46,000	1,000	32,000	20,000	99,000
1975	42,000	2,000	34,000	20,000	98,000
1976	38,000	3,000	36,000	20,000	97,000

Projected Ultimate Losses as of 12/31/76
Before and After "Adjustment for Claims Disposed"

Accident Year	Actual Ultimate Losses	Projected Ultimate Losses	
		Before Adj.	After Adj.
1973	$1,350,000	$1,350,000	$1,350,000
1974	1,398,000	1,398,000	1,398,000
1975	1,446,000	1,502,496	1,527,030
1976	1,494,000	1,560,258	2,058,350

Notes: 1. The above example illustrates how the adjustment for shifts in the settlement of claims can potentially increase rather than decrease errors in reserve estimates unless variation in distribution of claims by size of loss is considered.

2. Ultimate losses are projected using average paid loss development. See Exhibits I-C, I-D and I-E for their derivation.

3. Amounts are in thousands of dollars.

EXHIBIT I-B

Underlying Effect of Assumed Shift in Size of Loss Distribution

Ultimate Claims Disposed Ratio

Accident Year	Month of Development			
	12	24	36	Ult.
1973	.5000	.8000	1.0000	1.0000
1974	.4747	.7980	1.0000	
1975	.4490	.7959		
1976	.4227			

Percent of Ultimate Losses Paid

Accident Year	Month of Development			
	12	24	36	Ult.
1973	11.11	55.56	100.00	100.00
1974	11.30	57.08	100.00	
1975	11.48	58.51		
1976	11.65			

Notes: 1. The adjustment would reduce the losses paid in older accident years since the percent of claims closed has decreased. However, the percent of losses paid is already too low for older accident years. Thus in this example the adjustment would make the losses *less* comparable among accident years, not *more* comparable.

2. The ultimate claims disposed ratio is the cumulative closed claims divided by the ultimate claims.

EXHIBIT I-C

Projected Ultimate Losses Before Adjustment

Unadjusted Paid Losses

Accident Year	Month of Development 12	24	36	Ult.
1973	$150,000	$750,000	$1,350,000	$1,350,000
1974	158,000	798,000	1,398,000	
1975	166,000	846,000		
1976	174,000			

Development Factors

Accident Year	Month of Development 12 to 24	24 to 36	36 to Ult.
1973	5.0000	1.8000	1.0000
1974	5.0506	1.7519	
1975	5.0964		
Arith. Avg.	5.0490	1.7760	1.0000
Cum. Product	8.9670	1.7760	1.0000

Projection of Ultimate Losses

Accident Year	Cum. Paid Losses @ 12/31/76	Cum. Paid Loss Dev. Factor	Proj. Ult. Losses (1)x(2)
	(1)	(2)	(3)
1973	$1,350,000	1.0000	$1,350,000
1974	1,398,000	1.0000	1,398,000
1975	846,000	1.7760	1,502,496
1976	174,000	8.9670	1,560,258

Note: Amounts are in thousands of dollars.

EXHIBIT I-D

Projected Ultimate Losses After Adjustment

Adjusted Paid Losses

Accident Year	Month of Development 12	24	36	Ult.
1973	$ 99,070	$733,762	$1,350,000	$1,350,000
1974	121,717	789,804	1,398,000	
1975	146,724	846,000		
1976	174,000			

Development Factors

Accident Year	Month of Development 12 to 24	24 to 36	36 to Ult.
1973	7.4065	1.8398	1.0000
1974	6.4889	1.7701	
1975	5.7659		
Arith. Avg.	6.5538	1.8050	1.0000
Cum. Product	11.8296	1.8050	1.0000

Projection of Ultimate Losses

Accident Year	Cum. Paid Losses @ 12/31/76	Cum. Paid Loss Dev. Factor	Proj. Ult. Losses (1)x(2)
	(1)	(2)	(3)
1973	$1,350,000	1.0000	$1,350,000
1974	1,398,000	1.0000	1,398,000
1975	846,000	1.8050	1,527,030
1976	174,000	11.8296	2,058,350

Notes: 1. The adjustment of paid losses for shifts in the rate of settlement of claims is calculated in Exhibit I-E.

2. Amounts are in thousands of dollars.

EXHIBIT I-E

Estimation of Adjusted Paid Losses at Equal Percentiles of Ultimate Claims

Unadjusted Closed Claims

Accident Year	Month of Development 12	24	36	Ult.
1973	50,000	80,000	100,000	100,000
1974	47,000	79,000	99,000	99,000
1975	44,000	78,000		98,000
1976	41,000			97,000

Adjusted Closed Claims at Equal Percentiles of Ultimate Claims Closed [1]

Accident Year	Month of Development 12	24	36	Ult.
1973	42,268	79,592	100,000	100,000
1974	41,845	78,796	99,000	
1975	41,423	78,000		
1976	41,000			

EXHIBIT I-E
(Continued)

Adjusted Paid Losses at
Equal Percentiles of Ultimate Claims Closed

Accident Year	Mo. of Dev.	Adj. Closed Claims x	Unadj. Closed Claims @ 12 Mo. x_1	Unadj. Closed Claims @ 24 Mos. x_2	Unadj. Paid Losses @ 12 Mos. y_1	Unadj. Paid Losses @ 24 Mos. y_2	Adj. Paid Losses[2] y
1973	12	42,268	50,000	80,000	$150,000	$750,000	$ 99,070
1973	24	79,592	50,000	80,000	150,000	750,000	733,762
1974	12	41,845	47,000	79,000	158,000	798,000	121,717
1974	24	78,796	47,000	79,000	158,000	798,000	789,804
1975	12	41,423	44,000	78,000	166,000	846,000	146,724

Notes: 1. For 12 months of development the adjusted closed claims are 41,000/97,000 times the ultimate claims closed and for 24 months of development 78,000/98,000 times the ultimate claims closed.

2. The adjusted paid losses y are estimated from an exponential curve of the form $y = a \cdot b^x$ $(= c \cdot e^{dx})$ with x representing the claims closed and y the paid losses. The equation for y is then

$$y = y_1 \cdot \left(\frac{y_2}{y_1}\right)^{\left[\frac{x - x_1}{x_2 - x_1}\right]}$$

While the magnitude of the effect on the estimates in Exhibit I-A is dependent on the form of the equation, the primary assumption without recognition of size of loss (not the form) is the basic cause for the incorrect direction of the adjustment.

3. Amounts are in thousands of dollars.

EXHIBIT II

Medical Malpractice
Comparison of Loss Reserve Estimates
Methods I, II, V and Selected

Accident Year	Selected Paid Proj.	Paid Loss Development Method		
		I	II	V
	(1)	(2)	(3)	(4)
1975	$123,432	$171,805	$141,817	$399,928
1976	111,833	212,483	154,901	731,930

Notes: 1. Methods I and V trend cumulative paid loss development factors while Method II uses a weighted average. The sensitivity of the indications of the methods and comparison with the selected reserve estimate illustrates the need for measures other than paid losses for the more recent accident years (for example, trended ultimate severity).

2. The above estimates for Methods I, II and V have assumed that the payments beyond 96 months of development for Accident Years 1975 and 1976 will be comparable with those for Accident Years 1969 to 1973; that is, payment beyond 96 months will be approximately 32.5% of the total payments for the accident year.

3. Amounts are in thousands of dollars.

EXHIBIT III-A

Automobile Bodily Injury Liability
Estimated Weights for Calendar Year 1976
Reserve Ex Ante Errors

Distribution of Calendar Year Loss Reserve to Year of Payment

Accident Year	Year of Payment									Est. Ultimate Pymts.
	AY	AY + 1	AY + 2	AY + 3	AY + 4	AY + 5	AY + 6	AY + 7	AY + 8 +	
	12.73%	30.22%	23.47%	16.75%	9.14%	4.15%	2.01%	0.69%	0.84%	100.00%
1969									$87	$10,343
1970								$84	103	12,218
1971							$297	102	124	14,757
1972						$692	335	115	140	16,665
1973					$1,679	762	369	127	154	18,370
1974				$2,968	1,620	735	356	122	149	17,721
1975			$5,018	3,581	1,954	887	430	148	180	21,380
1976		$6,647 *	5,163	3,684	2,011	913	442	152	185	21,997
CY1976 Reserve		$6,647	$10,181	$10,233	$7,264	$3,989	$2,229	$850	$1,122	

EXHIBIT III-A
(Continued)

Estimation of Payment Year Weights for Calendar Year 1976 Loss Reserve

Pymt. Period	Contribution to CY1976 Loss Reserve	Pct. of Total Contr. to CY1976 Loss Reserve
AY + 1	$ 6,647	17.3%
AY + 2	10,181	26.6
AY + 3	10,233	26.7
AY + 4	7,264	19.0
AY + 5	3,989	10.4
Total	$38,314	100.0%

Notes: 1. (*) $6,647 = 30.22% × $21,997.

2. The estimated ultimate payments correspond to the mean of the Methods I-VI estimates; an alternate basis could have been selected judgmentally.
3. The pattern for payment of losses (12.73%, 30.22%, 23.47% . . .) is derived from the estimated ultimate payments and the cumulative payments as of 12/31/76.
4. The contributions to the Calendar Year 1976 loss reserve are restricted to payment periods prior to AY + 6, since lack of loss experience prevented the calculation of ex ante errors beyond AY + 5 (see Exhibit V). The expansion from triangular to parallelogram form would allow estimation of errors beyond AY + 5 and avoid this restriction (see Exhibit VI).
5. Amounts are in thousands of dollars.

EXHIBIT III-B

Automobile Bodily Injury Liability
Estimated Ex Ante Error in Calendar Year 1976
Reserve Projection for Method II

Pymt. Period	Wgts. for Errors	Arithmetic Avg. Error for Est. of Pymts. During Period (1)	Weighted Avg. Ex Ante Error in Est. of CY1976 Res. (2) × (3)
(1)	(2)	(3)	(4)
AY + 1	17.3%	− 7.45%	− 1.29%
AY + 2	26.6	− 8.93	− 2.38
AY + 3	26.7	− 0.85	− 0.23
AY + 4	19.0	+ 3.25	+ 0.62
AY + 5	10.4	+ 2.41	+ 0.25
Total	100.0%	− 4.44%	− 3.03%

Weighted average ex ante error for Method II in estimation of CY1976 loss reserve = − 3.03%

Notes: 1. The method assumes that the ex ante error and the period of payment are correlated; this correlation has been frequently observed, particularly when the trend for later payments has been accelerating faster than for early payments.

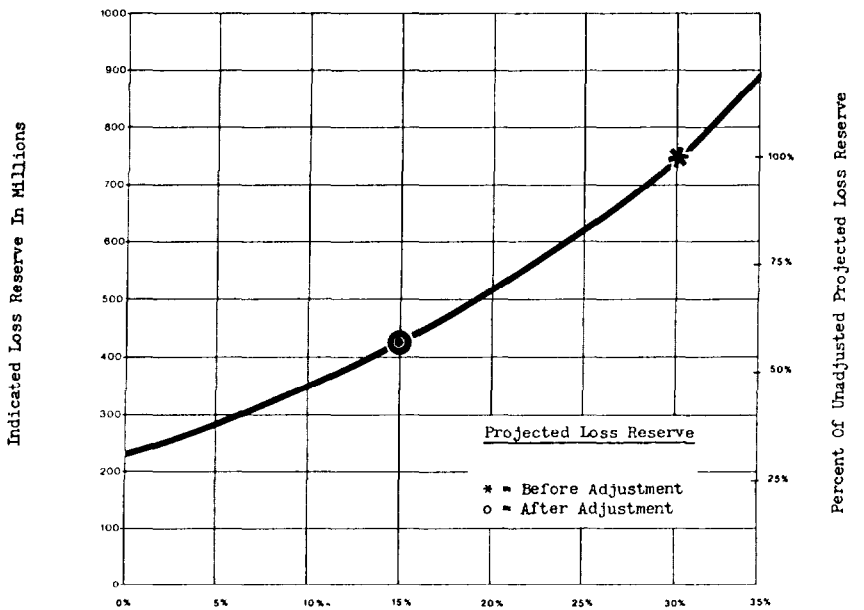
2. The arithmetic average errors in Column (3) are "column averages" of the percentage deviations presented in Exhibit V. Note that the accuracy of these "column averages" potentially could be improved by expansion to a parallelogram (see Exhibit VI).

3. The weights in Column (2) are derived in Exhibit III-A.

EXHIBIT IV

Medical Malpractice

Sensitivity of Loss Reserve Estimates to Assumed Rate of Growth in Average Outstanding Claim Cost



Rate of Growth Assumed for Average O/S Claim Cost

Incurred Loss Development Factors

	Policy Year							
	1969	1970	1971	1972	1973	1974	1975	1976
Before Adj.	1.000	1.027	1.080	1.302	1.525	2.291	4.402	11.145
After Adj.	1.000	.979	.944	1.003	.932	1.244	1.900	7.425

Note: The sensitivity of the loss reserve estimate to the selected rate of growth is demonstrated in the graph. The impact of adopting the 15% rate selected in the paper (after adj.) rather than the 30% underlying the claims adjuster estimates (before adj.) is shown both in the loss reserve estimate of the graph and in the implied incurred loss development factors.

EXHIBIT V-A

Automobile Bodily Injury Liability

Calculation of Hindsight Outstanding Losses

Cumulative Paid Losses

Accident Year	Month Of Development 12	24	36	48	60	72	84	96	Selected Ultimate
1969	$ 1,398	$ 4,222	$ 6,452	$ 8,522	$ 9,585	$10,066	$10,187	$10,256	$10,343
1970	1,705	5,116	7,845	10,160	11,309	11,739	12,031		12,223
1971	1,938	6,168	9,580	12,261	13,571	14,235			14,752
1972	2,191	7,127	11,034	13,843	15,383				16,616
1973	2,523	7,892	11,943	15,278					18,231
1974	2,240	7,189	11,771						17,347
1975	2,670	9,182							20,588
1976	2,801								21,419

EXHIBIT V-A
(Continued)

Hindsight Outstanding Losses

Accident Year	Month Of Development							
	12	24	36	48	60	72	84	96
1969	$ 8,945	$ 6,121	$ 3,891	$ 1,821	$ 758	$ 277	$ 156	$ 87
1970	10,518	7,107	4,378	2,063	914	484	192	
1971	12,814	8,584	5,172	2,491	1,181	517		
1972	14,425	9,489	5,582	2,773	1,233			
1973	15,708	10,339	6,288	2,953				
1974	15,107	10,158	5,576					
1975	17,918	11,406						
1976	18,618							

Notes: 1. Cumulative paid losses are adjusted for shifts in the rate of settlement of claims (Exhibit N). The selected ultimate losses correspond to the selected loss reserve estimates in Exhibit U. For example, for Accident Year 1976 $21,419 = $18,618 + $2,801.

2. The hindsight outstanding losses are the selected ultimate minus the cumulative paid losses. For example, for Accident Year 1969 $8,945 = $10,343–$1,398.

3. Amounts are in thousands of dollars.

EXHIBIT V-B

Automobile Bodily Injury Liability

Calculation of Hindsight Outstanding Claims

Cumulative Closed Claims

Accident Year	Month Of Development								Selected Ultimate
	12	24	36	48	60	72	84	96	
1969	3,327	6,018	6,926	7,417	7,644	7,748	7,788	7,806	7,822
1970	3,693	6,681	7,690	8,234	8,486	8,602	8,647		8,674
1971	4,232	7,656	8,811	9,435	9,723	9,855			9,950
1972	4,121	7,455	8,580	9,188	9,469				9,690
1973	4,079	7,379	8,492	9,093					9,590
1974	3,322	6,009	6,916						7,810
1975	3,442	6,226							8,092
1976	3,230								7,594

EXHIBIT V-B
(Continued)

Hindsight Outstanding Claims

Accident Year	Month Of Development							
	12	24	36	48	60	72	84	96
1969	4,495	1,804	896	405	178	74	34	16
1970	4,981	1,993	984	440	188	72	27	
1971	5,718	2,294	1,139	515	227	95		
1972	5,569	2,235	1,110	502	221			
1973	5,511	2,211	1,098	497				
1974	4,488	1,801	894					
1975	4,650	1,866						
1976	4,364							

Notes: 1. Cumulative closed claims are adjusted for shifts in the rate of settlement of claims (Exhibit M). The ultimate claims are those selected in Exhibit J of the paper.

2. The hindsight outstanding claims are the selected ultimate minus the cumulative closed claims and thus include both reported claims that are still open and IBNR claims. For example, for Accident Year 1969 4,495 = 7,822 − 3,327.

EXHIBIT V-C

Automobile Bodily Injury Liability
Hindsight Average Outstanding Losses

Accident Year	Month Of Development							
	12	24	36	48	60	72	84	96
1969	$1,990	$3,393	$4,343	$4,496	$4,258	$3,743	$4,588	$5,438
1970	2,112	3,566	4,449	4,689	4,862	6,722	7,111	
1971	2,241	3,742	4,541	4,837	5,203	5,442		
1972	2,590	4,246	5,029	5,524	5,579			
1973	2,850	4,676	5,727	5,942				
1974	3,366	5,640	6,237					
1975	3,853	6,113						
1976	4,266							

Notes: 1. The hindsight average outstanding losses are the hindsight outstanding losses in Exhibit V-A divided by the hindsight outstanding claims in Exhibit V-B.

2. The hindsight average outstanding losses above can be used to test the reasonableness of the selected ultimate loss estimates in Exhibit V-A. Alternately, the loss reserves can be estimated directly.

EXHIBIT VI

Expansion from Triangular to Parallelogram Form for Loss Experience

Triangular Form

Accident Year	Month of Development 12	24	36	48
1974	XXX	XXX	XXX	XXX
1975	XXX	XXX	XXX	
1976	XXX	XXX		
1977	XXX			

Parallelogram Form

Accident Year	Month of Development 12	24	36	48
1971				XXX
1972			XXX	XXX
1973		XXX	XXX	XXX
1974	XXX	XXX	XXX	XXX
1975	XXX	XXX	XXX	
1976	XXX	XXX		
1977	XXX			

Notes: 1. The expansion from the triangular to the parallelogram form for loss experience could result in possible gains in accuracy and stability of the reserve estimates of the model since indications for later development on older accident years are obtained.

2. The only loss experience prior to Calendar Year 1974 used in the expansion from the triangular to the parallelogram form for cumulative losses and claims is the cumulative paid losses and closed claims as of 12/31/73.

MINUTES OF THE 1978 SPRING MEETING

May 21-24, 1978

LOEWS PARADISE ISLAND HOTEL & VILLAS, PARADISE ISLAND, BAHAMAS

Sunday, May 21, 1978

The Board of Directors Meeting was held in the Essex Room A from 12:00 to 6:00 p.m.

From 4:00-6:00 p.m. registration took place in the Lobby East.

The President's Reception for new Fellows was held in the Gwaine Room from 6:00-6:30 p.m., followed by a reception in the Main Ballroom from 6:30-7:30 p.m.

There were no formal dinner arrangements.

Monday, May 22, 1978

Registration was held from 8:00-8:30 a.m. in the Lobby East.

The meeting was called to order by President P. Adger Williams at 8:30 a.m. in the Crown Ballroom. Opening remarks by President Williams followed.

Ed Boynton, President of the American Academy of Actuaries, spoke on the current activities within the academy.

There was no business brought before the assembly during the business session.

Reviews of the following two papers were then heard:

1. "Use of National Experience Indications in Workers' Compensation Insurance Classification Ratemaking", authored by Frank Harwayne, Vice President and Director of Actuarial Research, National Council on Compensation Insurance, was reviewed by Robert F. Lowe, Consulting Actuary, Tillinghast, Nelson and Warren, Inc.

2. "Loss Reserve Adequacy Testing: A Comprehensive Systematic Approach", authored by James R. Berquist, Consulting Actuary and Richard E. Sherman, Assistant Actuary, both of Milliman and Robertson, Inc., was reviewed by Joseph O. Thorne, Actuarial Assistant, The Travelers Insurance Companies.

The authors reserved the right to prepare an answer to the review at a later date.

Following the review of prior papers was the admission of new Fellows and Associates, as listed below:

FELLOWS

Wayne R. Ashenberg
Bruce C. Bassman
George G. Bertles
Roger W. Bovard
Albert B. Carbaugh
Robert A. Daino
*Donald J. Eldridge
*Philip L. Engel
*Richard C. Ernst
Richard I. Fein
Kenneth R. Frohlich
Thomas L. Gallagher
Owen M. Gleeson
Timothy L. Graham
Patrick J. Grannan
Thomas M. Hermes
Urban E. Leimkuhler
Peter L. Lindquist
Joseph O. Marker
David L. Miller
Bruce A. Petersen
Steven Petlick
Albert J. Quirin
David E. Renze
Jane C. Taylor
Walter C. Wright, III

*Not Present

ASSOCIATES

William R. Andrus
Michael R. Antolino, Jr.
John W. Bartlett
Guy Cloutier
Robert F. Conger
Mark A. Doepke
Gary J. Egnasko
Edward W. Ford
James D. Hurley
Michael A. LaMonica
Stuart N. Lerwick
Michael A. McMurray
Russell K. Nash
John M. Purple
Donald P. Skrodenis
Alain P. Thibault
Jerome E. Tuttle
Edward W. Weissner
Frank T. White
Jonathan White
Mark Whitman
William F. Wilson
Timothy L. Wisecarver

Group pictures of the new Fellows and Associates were taken during the 10:00 informal discussion with coffee in the Crown Ballroom Foyer.

At 10:15 in the Crown Ballroom, the panel entitled "What Went Wrong with Workers' Compensation?" was moderated by Robert Sturgis, Assistant Vice President, Aetna Life & Casualty. The panel members were: 1) William Aldrich, Vice President, Hartford Insurance Group, 2) Gary Countryman, Vice President, Liberty Mutual Insurance, and 3) Anthony Grippa, Actuary, National Council on Compensation Insurance.

At 11:15 a.m. the panel entitled "Professional Conduct" was moderated by W. James MacGinnitie, Consulting Actuary, Tillinghast, Nelson & Warren, Inc. The panel members were: 1) Charles Hewitt, Jr., Vice President, Metropolitan Property and Liability Insurance, and 2) Mavis Walters, Vice President, Government & Industry Relations, Insurance Services Office.

A "Teaching Session On Credibility" took place from 2:00-3:30 p.m. on the Mezzanine Floor. Charles Hachemeister, Actuary, Prudential Reinsurance, was the leader.

Committee meetings were held from 2:00-5:00 p.m.

Between 6:30-7:30 p.m. a reception took place on the Pool Deck.

There were no formal dinner arrangements.

Tuesday, May 23, 1978

At 9:00 a.m., in the Crown Ballroom, the panel entitled "Current Research Topics" was moderated by James Hall, III, Vice President, AIG Risk Management. The panel members were: 1) Jon D. Collins, Vice President, Product Liability, J. H. Wiggins Co., and 2) William S. Jewell, Professor of Industrial Engineering & Operations Research, University of California at Berkeley.

Following this panel was an informal discussion with coffee in the Crown Ballroom Foyer.

At 10:30 a.m. the panel entitled "Breaking Out of the Vicious Cycle" was moderated by John Muetterties, Vice President, Government & Industry Relations, Insurance Services Office. The panel members were: 1) Leandro Galban, Jr., Vice President, Donaldson, Lufkin and Jenrette, 2) Carlton Honebein, Vice President & Actuary, Fireman's Fund Insurance, and 3) Dale Nelson, Assistant Vice President & Actuary, State Farm Mutual.

There were no formal luncheon arrangements.

From 2:00-5:30 p.m. six workshops were held. Each workshop was held twice during three periods according to the following schedule:

Schedule of Workshops

2:00-3:00 — Workshops 1,2,3,4
3:15-4:15 — Workshops 1,2,5,6
4:15-4:30 — Informal discussion with coffee
4:30-5:30 — Workshops 3,4,5,6

The workshop titles and participants are listed below:

Workshop 1 — "Hospital Trust Funds"

Leader: Gregory Leonard
Consulting Actuary
Tillinghast, Nelson & Warren, Inc.

Members: Gustave Krause
Casualty Actuary
Marsh & McLennan

George A. Rudduck
Vice President and Sr. Actuary
Booke and Company

Daniel J. Flaherty
Consulting Actuary
Milliman & Robertson, Inc.

Workshop 2 — "Confidence Intervals on Loss Reserves"

Leader: Neil A. Bethel
Consulting Actuary
Tillinghast, Nelson & Warren, Inc.

Members: David J. Grady
Secretary and Associate Actuary
North American Reinsurance Corporation

Richard Sherman
Assistant Actuary
Milliman & Robertson, Inc.

Workshop 3 — "Corporate Planning and Financial Modeling"

Leader: Roger Wade
Vice President, Pricing
Volkswagen Insurance

Members: Michael Conn
Vice President, Corporate Strategy
INA

Steven R. Resnick
Associate Investment Strategist
Merrill Lynch

Workshop 4 — "Increased Limits"

Leader: Lee Steeneck
Assistant Secretary
General Reinsurance Company

Members: Patrick J. Grannan
Milliman & Robertson

Robert Miccolis
Assistant Actuary
INA

Workshop 5 — "Damageability"

Leader: John S. Trees
Vice President
Allstate Insurance Company

Member: Brian O'Neill
Vice President of Research
Insurance Institute for Highway Safety

Workshop 6 — "New Papers"

Leader: C. K. Khury
Actuarial Director
Prudential Property & Casualty

Paper Presented: "Estimation of the Distribution of Report Lags by the Method of Maximum Likelihood", authored by Edward W. Weissner, Actuarial Associate, Prudential Reinsurance Co. Reviewers were: 1) Sanford R. Squires, Actuarial Assistant, The Hartford Insurance Group, and 2) Jerry Miccolis, Assistant Actuary, Chubb & Son, Inc.

A reception was held on the Pool Deck from 6:30-7:30 p.m.

There were no formal dinner arrangements.

Wednesday, May 24, 1978

At 8:45 a.m., in the Crown Ballroom, the panel entitled "Current Events in Financial Reporting" was moderated by Ronald Bornhuetter, Sr. Vice President and Comptroller, General Reinsurance Corporation. Panel members were: 1) James Faber, Manager, Peat, Marwick & Mitchell, 2) Jack Hart, Partner, Coopers & Lybrand, 3) Robert Lowe, Consulting Actuary, Tillinghast, Nelson & Warren, Inc., and 4) Robert McMillen, Senior Vice President, Travelers Insurance.

Following the 10:15 informal discussion with coffee, the panel entitled "Discussion Memorandum on Loss Reserves" was moderated by Richard Snader, Actuary, U.S.F.&G. Panel members were: 1) Robert Miller, III, Vice President and Corporate Actuary, Aetna Life & Casualty, 2) Harry Richards, President, Independent Actuarial Services, Inc., and 3) James Zid, Partner, Ernst & Ernst.

President P. Adger Williams gave his closing remarks at 11:45 a.m. The meeting adjourned at noon.

In attendance, as indicated by registration records, were 147 Fellows, 116 Associates, 29 guests, 7 students, and 165 spouses. A list of Fellows, Associates and Guests follows.

FELLOWS

Aldrich, W. C.
Alexander, L. M.
Anderson, D. R.
Angell, C. M.
Arata, D. A.
Ashenberg, W. R.
Balcarek, R. J.
Balko, K. H.
Bassman, B. C.
Beckman, R. W.
Bell, L. L.
Ben-Zvi, P. N.
Bertles, G. G.
Bethel, N. A.
Bickerstaff, D. R.
Bill, R. A.
Bland, W. H.
Blivess, M. P.
Bornhuetter, R. L.
Bovard, R. W.
Boyajian, J. H.
Brannigan, J. F.
Brown, W. W., Jr.
Byrne, H. T.
Carbaugh, A. B.
Carter, E. J.
Childs, D. M.
Collins, D. J.
Conners, J. B.
Curley, J. O.
Daino, R. A.
D'Arcy, S. P.
Davis, G. E.
Dieter, G. H., Jr.
Drennan, J. P.
Ehlert, D. W.
Eliason, E. B.
Eyers, R. G.
Faber, J. A.
Fallquist, R. J.
Farnam, W. E.
Fein, R. I.
Fitzgibbon, W. J., Jr.
Flaherty, D. J.
Forker, D. C.
Foster, R. B.
Fresch, G. W.
Frohlich, K. R.
Fusco, M.
Gallagher, T. L.
Garand, C. P.
Gersie, M. H.
Gibson, J. A., III
Gillespie, J. E.
Gleeson, O. M.
Goddard, D. C.
Golz, J. F.
Gottlieb, L. R.
Grady, D. J.
Graham, T. L.
Grannan, P. J.
Grippa, A. J.
Hachemeister, C. A.
Hall, J. A., III
Hartman, D. G.
Harwayne, F.
Haseltine, D. S.
Hazam, W. J.
Heer, E. L.
Hermes, T. M.
Hewitt, C. C., Jr.
Hillhouse, J. A.
Honebein, C. W.
Hughey, M. S.
Jones, A. G.
Kates, P. B.
Kaufman, A. M.
Keene, V. S.
Khury, C. K.
Kollar, J. J.
Krause, G. A.
Kreuzer, J. H.
Kuehn, R. T.
Lange, J. T.
Leimkuhler, U. E., Jr.
Leonard, G. E.
Levin, J. W.
Lowe, R. F.
MacGinnitie, W. J.
Makgill, S. S.
Marker, J. O.
McClure, R. D.
McLean, G. E.
McManus, M. F.
Miller, D. L.
Mills, R. J.
Moore, B. C.
Morison, G. D.
Muetterties, J. H.
Munro, R. E.
Nelson, D. A.
Newman, S. H.
Pagnozzi, R. D.
Palczynski, R. W.
Perkins, W. J.
Petersen, B. A.
Petlick, S. A.
Phillips, H. J.
Pollack, R.
Quirin, A. J.
Radach, F. R.
Renze, D. E.
Retterath, R. C.
Richards, H. R.

FELLOWS

Richardson, J. F.
Riddlesworth, W. A.
Rodermund, M.
Rogers, D. J.
Roth, R. J.
Ryan, K. M.
Salzmann, R. E.
Scott, B. E.
Sheppard, A. R.
Smick, J. J.
Snader, R. H.
Squires, S. R.
Stanard J. N.
Steeneck, L. R.
Streff, J. P.
Strug, E. J.
Sturgis, R. W.
Switzer, V. J.
Tatge, R. L.
Taylor, J. C.
Toothman, M. L.
Walters, M. A.
Webb, B. L.
Wilcken, C. L.
Williams, P. A.
Wilson, J. C.
Winkleman, J. J., Jr.
Woll, R. G.
Wood, J. O.
Wright, W. C., III
Wulterkens, P. E.
Zelenko, D. A.
Zory, P. B.

ASSOCIATES

Andrus, W. R.
Antolino, M. R., Jr.
Applequist, V. H.
Bartlett, J. W.
Bass, I. K.
Bayley, T. R.
Biondi, R. S.
Brahmer, J. O.
Brewer, F. L.
Briere, R. S.
Cadorine, A. R.
Cheng, L.
Chorpita, F. M.
Chou, P. S.
Cis, M. M.
Cloutier, G.
Cohen, H. S.
Conger, R. F.
Conner, J. B.
Connor, V. P.
Covney, M. D.
Crowe, P. J.
Dahlquist, R. A.
Demers, D.
Dickson, J. J.
Doepke, M. A.
Dolan, M. C.
Dorval, B.
Durkin, J. H.
Egnasko, G. J.
Faga, D. S.
Fisher, R. S.
Foley, C. D.
Ford, E. W.
Gould, D. E.
Gruber, C.
Gwynn, H. M.
Hafling, D. N.
Haner, W. J.
Head, T. F.
Hearn, V. W.
Herzfeld, J.
Hoylman, D. J.
Jensen, J. P.
Jerabek, G. J.
Johnston, D. J.
Jorve, B. M.
King, K. K.
Kolojay, T. M.
Kozik, T. J.
LaFrenaye, A. C.
Lamb, J. A.
LaMonica, M. A.
Lattanzio, S. P.
Ledbetter, A. R.
Lerwick, S. N.
Lindquist, P. L.
Lommele, J. A.
Lowe, S. P.
Marino, J. F.
Marks, R. N.
Masella, N. M.
McConnell, D. M.
McHugh, R. J.
McMurray, M. A.
Meyer, R. E.
Miccolis, J. A.
Miccolis, R. S.
Miller, M. J.
Miyao, S. K.
Mokros, B. F.
Morell, R. K.
Morgan, S. T.
Nash, R. K.
Neuhauser, F., Jr.

ASSOCIATES

Oakden, D. J.
O'Brien, T. M.
Penniman, K. T.
Pilon, A.
Plunkett, R. C.
Potok, C. M.
Potter, J. A.
Pratt, J. J.
Purple, J. M.
Reichle, K. A.
Rodgers, B. T.
Roman, S. M.
Rudduck, G. A.
Sandler, R. M.
Schaeffer, B. G.
Schumi, J. R.
Shatoff, L. D.
Sherman, R. E.
Shoop, E. C.
Silberstein, B.
Singer, P. E.
Skrodenis, D. P.
Smith, F. A.
Stroud, R. A.
Thibault, A. P.
Thorne, J. O.
Torgrimson, D. A.
Trees, J. S.
Tuttle, J. E.
Wade, R. C.
Waldman, R. H.
Whatley, M. W.
White, F. T.
White, J.
Whitman, M.
Wickwire, J. D., Jr.
Wiegert, P. M.
Wilson, W. F.
Wisecarver, T. L.
Wiser, R. F.
Zatorski, R. T.

GUESTS

*Allen, T. C.
Belton, E. F.
Boynton, E. F.
Byrne, P. J.
Chen, H.
Collins, J. D.
Conn, M. K.
Countryman, G. L.
Friend, E. H.
*Galban, L. S., Jr.
Guarini, L.
*Hager, G. A.
Halvorson, W. A.
Hart, J. E.
Hill, J.
Jewell, W. S.
Just, P.
Kellison, S. G.
*Kraysler, S. F.
*Liptak, W. T.
McGovern, W. G.
McMillen, R. H.
Miller, R. A., III
O'Neill, B.
*O'Shea, H. J.
*Peterson, T. M.
Resnick, S. R.
Robitaille, J.
Rowland, V. T., Jr.
Shuford, H. L.
*Smith, D. A.
Sobel, M. J.
*Spangler J. L.
Stenmark, J. A.
Weissner, E. W.
Zid, J. F.

*Invitational Program

Respectfully submitted,

DARRELL W. EHLERT,
Secretary

Volume LXV, Part 2 No. 124

PROCEEDINGS

November 15, 16, 17, 1978

PRESIDENTIAL ADDRESS BY P. ADGER WILLIAMS

THE CHALLENGE OF BEING PROFESSIONAL
ESSE QUAM VIDERE
TO BE, RATHER THAN TO SEEM

It is probably a mistake to have this address at the end rather than the beginning of the President's term of office. If it were at the beginning you could hold him accountable for any wild predictions he made and also for the implementation of any suggested improvements he may have proposed. But my predecessors wisely put it at the end and I am happy to continue that tradition.

It would be easy to spend this time recounting the advances that have taken place during this past year or, to put it more properly, the ways in which your activities have allowed me to bask in the reflected glory of your accomplishments; however this would consume the time allotted not only for this address, but for this entire meeting as well. What seems to me to be more constructive is to dwell on the various problems confronting us as casualty actuaries.

As I proceeded through my years as Vice President, then President-Elect and finally President, it would have been easy to view the parade of events as being entirely random, but the more I thought about it, the more these events came into focus as one major problem confronting our Society.

The professionalism of the casualty actuary is being challenged.

In some cases it is by an open and brazen attack on our hallowed professional ground, a direct assault on the domain that the actuary has always considered his own, such as that being made by the certified public accountants to stake out a claim to equal jurisdiction in the certification of loss reserves. In other instances the encroachment has been more subtle, taking the form of the actuary simply being outsmarted by other professionals, such as the operations researcher, who often come better equipped to do the very things that we think we do best.

In between these extremes we have been under pressure from every quarter:

— State insurance regulators are questioning the most sacred practices upon which actuarial science is based, some turning to sophisticated techniques to attempt to prove the fallacy of traditional approaches, others relying on populist rhetoric to erode the parameters upon which we have depended for so long.

— Consumerists and other members of the public have risen up and demanded what they deem to be more equitable treatment than that which they were receiving, in terms of both overall affordability of insurance products, and in price discrimination, however fair the actuaries believe that discrimination might be.

— Managers of casualty companies have questioned actuarial methods and the answers they provided as they watched deficient reserves and inadequate rates evolve into depleted surpluses.

— Members of other actuarial bodies have made incursions into areas that were clearly casualty-property.

How should we react to these challenges to our professionalism? Our response should be on three levels:

— As members of the Casualty Actuarial Society

— As individual professionals

— As members of that larger group which makes up the actuarial profession.

As members of the Casualty Actuarial Society, we should recognize the mixed blessing that the publicity given these challenges brings to the actuarial profession. On the one hand they give us greater visibility and create an increased demand for our services. But that increased visibility brings with it the increased responsibility for being truly professional. It also dangles the carrot of a lucrative livelihood in front of those outside our profession.

It appears that the certification of casualty-property loss reserves is just around the corner. The advent of this requirement will bring about a need for a dramatic increase in the number of casualty actuaries. But the current proposals for certification also hold a threat. The definition of "qualified loss reserve specialist" includes not only members of the American Academy of Actuaries and the Casualty Actuarial Society but members of the Society of Actuaries and the American Institute of Certified Public Accountants as well. The Life Society, feeling that its qualified members are adequately represented by the American Academy, has reacted in a professional manner and asked that the Society of Actuaries be removed from the definition.

Incidentally, the definition also includes ". . . . a person who has otherwise demonstrated his or her competence . . . ." We feel that this is all that is necessary to take in those accountants who might be qualified to certify loss reserves and it is therefore being proposed to the N.A.I.C. Subcommittee that the A.I.C.P.A. be removed from the definition of qualified loss reserve specialists.

At the same time, we have to ask ourselves why there should have been any question in the first place about the casualty actuary being the uniquely qualified certifier of casualty-property loss reserves. It could only be because some confusion existed about our profession and our ability to respond, brought on by our failure to communicate to the regulators and to the public just who we are and what we are capable of doing.

To be recognized as a professional the casualty actuary must have a unique calling which requires special education, knowledge, and experience, all of which leads to an *identifiable expertise*. The Syllabus and our exams are clear examples of special education and our meetings and *Proceedings* attest to our accumulated knowledge and experience.

It is in *communicating* a clear identity that we have fallen short in the past, but we are now taking great strides toward obtaining this recognition. The *"Statement of Principles Regarding Property and Casualty Loss and Loss Adjustment Expense Liabilities,"* published earlier this year, was an important step toward further establishing our claim to this special identifiable knowledge.

The Ad Hoc Committee on Education and Examination is looking into the exam structure to see to it that a successful candidate will have a clearly identifiable capability. We want to reinspect our goals relating to the kind of professional we are attempting to create and then see to it that a thoroughly professional approach is being used to determine who is an actuarial professional.

For years, the debate has gone on about whether we should give more emphasis in the exams to producing the generalist or specialist. That debate is not relevant for our times, which demand that we create an elite corps of specialists who leave no doubt in anyone's mind about what they are qualified to do. If this also lays the groundwork to help the actuary move into the higher reaches of management—and I think it undoubtedly does—then that's all to the good. But the clearly identifiable expertise must come first, so that casualty actuaries can earn the unequivocal recognition they must have in order to do their jobs.

But your Society can do only so much to establish the professional framework within which we live. Ultimately, it falls on the shoulders of each individual to come to grips with the responsibilities of being professional. Even though the Casualty Actuarial Society will celebrate its sixty-fifth birthday next year, we are novices in the realm of professionalism. For most of our existence, the great majority of our members have worked for companies where they were called upon to perform a variety of tasks, some actuarial, some not. The strict boundaries demanded by professionalism were seldom required.

The luxury of that comfortable, sheltered existence is no longer possible. Members of a more aware public are asking for a better explanation of the factors being used to judge their insurability and they are seeking confirmation from "experts" that they are being treated fairly. The actuary must be certain that the advice he gives is only in those areas where he is truly an expert.

One of the marks of a true professional is that he knows what he knows. When advice is sought in areas outside of his specialty, the professional disqualifies himself and refers the client to someone else. This is simply an understanding that a professional develops about himself, what he is capable of doing and not doing. The general practitioner doesn't reach for the scalpel; he refers the appendicitis case to the surgeon.

If our training and experience dictate that we are life actuaries, we do not sign off on casualty reserves; if casualty actuaries, we do not work on pension plans. If our life work has been in automobile insurance ratemaking, we do not pose as experts in the calculation of workers' compensation reserves. This professional responsibility also applies to the members of our Society who have moved outside the profession or gone on to greater glories in management, thereby failing to keep up the necessary practice and continuing education that would permit the competent wielding of the actuarial scalpel.

We must be what we claim to be, being careful to retain the distinction between the appearances and the reality of our professional capabilities. "To Be, Rather Than To Seem" would be an appropriate motto for the casualty actuary—as it is for any true *professional*.

As individuals we have to develop a greater awareness of what it means to be a professional and of the high level of integrity and honesty that this demands. Too often the things we say and do take on a non-professional tone, casting doubts on the motives of the casualty actuary. I would remind you that you are professionals in a professional society, not members of a trade association.

Establishing this principle becomes especially important in light of the rapid changes that are taking place in society, which strike at the heart of the actuarial process. Ratemaking methods based on comfortable classification criteria are being rejected. Traditional factors such as age, sex, and marital status are being discarded as socially unacceptable and new ways of viewing territorial differentials are being demanded.

These changes should be viewed as another opportunity to employ actuarial skills in direct response to exhibited needs of the public. Usually, shifts in society are at least one step removed from the applications of actuarial science. But in this case the challenge and the opportunity are direct.

The Massachusetts decision on automobile insurance ratemaking epitomizes the mixed blessing that these changes bring to actuaries. The opportunity was there, but the chance for the initiative that should have been ours passed us by. Now we have a choice. We can spend our time defending the old ways, the traditional approaches, or we can marshall our considerable talents to help extract from the decision the many things which the actuary should have been exploring all along as possible actuarial approaches to the rating problem. In fact, it is only in this way that we retain any credibility when we question some of the decision's assumptions and methods that are considerably less than actuarial.

We have to keep up with the age in which we live with careful regard for our environment; in fact, the most damning criticism of actuaries has been that they have not taken into account all relevant factors, that they have spent so much time looking backwards that they have missed some of the critical turns in the road of progress. When this happens, the regulators, the industry, and the public turn to other sources. They turn to the economists, the operations researcher, the accountant, or the politician to respond to their needs. The problems to be solved are posed and defined outside of our profession, and consequently the solutions to these problems are also sought elsewhere. Unless we assert ourselves and apply our actuarial skills to the realities of the age in which we live, we can be accused, not just of underachievement but of dynamic underachievement.

We are going to have to go to a sort of "zero based budgeting" for the casualty actuary which would take us back to first principles. This approach would concentrate on the fundamentals of actuarial science and on what it is we're trying to accomplish rather than doting on the use of the traditional tools of accomplishing it. It is, after all, the risk, the exposure to loss, that we are attempting to measure, and if the old classifications no longer serve us then we should move, in an orderly fashion, to a new set of measures.

At the same time, I would caution that, as actuaries, we must be concerned with the *reality* of the underlying criteria and not with temporary solutions which only seem to solve the problems.

— We should be aware of what is going on in society without trying to build all aspects of social change into our formulas.

— We should be aware of politics without trying to be political in our rate-making.

— We should be concerned with affordability without letting the underlying rate structure become a method for redistribution of wealth.

In short, the actuary should provide one clear voice, one clear answer to the actuarial questions that are being asked. If there are other questions and other answers based on other needs, then let others provide them.

Finally, how do these challenges affect us as members of that larger group that makes up the actuarial profession. It is as part of this group that the public will know us or not know us. It is to the members of this group that the appellation "actuary" is attached. The public does not ask or care whether the actuary got that name by taking the life exams, the casualty exams, or the pension exams. So we have, with the other actuarial organizations, the common problem of establishing a common professional identity which could be clearly communicated to and widely recognized by the public. It is in this quest that the actuarial organizations have turned again and again to various plans of reorganization as a possible solution to this problem.

The Roman satirist Petronius said, ". . . . we tend to meet any new situation by reorganization, and a wonderful method it can be for creating the illusion of progress while producing confusion, inefficiency and demoralization."

"Demoralization" is an appropriate term because nothing can be more destructive to an organization than being in the constant fear of ceasing to exist. And we have been living with that threat for too long. Perhaps we should stop talking about "reorganization" and instead start thinking about modernization; that is, start looking at current problems facing the actuarial profession and how we might solve them. I am in favor of an evolutionary approach to solving the problems of the actuarial profession. Each problem should be identified and a solution sought either within the present structure or by adjusting the structure to respond to the particular problem. We should not go ahead with a wholesale reorganization and then try to determine afterwards whether or not we solved our problems.

Rather than looking at the advantages or disadvantages of a complete reorganization, we should proceed by looking at the things the Societies do best together and the things they do best apart. We should hasten to establish policies which will bring about mutually beneficial programs. At the same time we should identify and emphasize those areas of separateness which we feel are necessary to the fulfillment of the *casualty actuary* as a professional.

More specifically, there should be a joint effort in such areas as:

— Identification and recognition of who is an actuary.
— Administrative facilities.
— Standards of professional conduct and related disciplinary procedures.

On the other hand we should continue to emphasize our differences and the ability to maintain those differences in such areas as:

— Professional specialization.
— Advancement of knowledge and continuing education which would include meetings and conferences stressing specialty interest.
— Undiluted influence on the affairs of our own Society.

If the key problem is identity, one face, speaking with one voice, presenting to the public one kind of professional known as "Actuary," then let's give the American Academy of Actuaries the wherewithal to establish that identity.

Members of the American Academy will soon be voting on a membership proposal which would vastly expand the numbers in the Academy. I urge you to vote for this proposal, not just because it would bring in the Associates of this Society as members, but because the actuarial profession in the United States needs one encompassing body which can speak for and have jurisdiction over all actuaries.

I propose to the American Academy a major additional step in connection with this expansion. I urge it to make the necessary changes in its Constitution and By-Laws to make the President and President-Elect of each major actuarial body in the United states ex-officio members of its Board of Directors, giving true senatorial representation to all groups.

Perhaps then, actuaries could speak with one unified voice and still maintain the elite professional specialties which are regarded as so important by all the actuarial organizations.

I leave you with the words of James B. Conant, "Each honest calling, each walk of life has its own elite, . . . based on excellence of performance . . . you will become a member . . . only if your accomplishments and integrity earn this appellation."

ACTUARIAL NOTE ON LOSS RATING

RONALD E. FERGUSON

Substantial underwriting losses in the mid-1970's are testimony to the inability of the insurance industry to deal effectively in the pricing process with some of the forces that affect its product. The problems are numerous; however, each of the problems can be subsumed under one of three categories. First of all, our inward looking ratemaking techniques did not equip us to cope with a changing economic environment. Our economic environment includes inflation, recession, a combination of the two, and an economy that is increasingly subject to shocks of various types.[1]. The second major problem is societal changes.[2]. Under this broad heading are changing attitudes about the level of risk one can (or should) bear, changing concepts of entitlement, and the erosion of tort law. The third problem area is unsound or inept ratemaking techniques. In this paper, unsound ratemaking practices are defined to include only the technically unsound aspects of ratemaking.

The objective of this paper is modest in that the focus will be on one relatively small area under the heading of unsound ratemaking practices.

Incredible as it may seem—until the mid 1970's, loss development and trending procedures were not part of most industry loss rating schemes. Although this serious defect has been remedied in the current (ISO) individual risk rating plans, we believe many underwriters continue to use loss rating techniques without paying adequate attention to development and trend. The literature and the day-to-day practices of some segments of the excess loss market suggest that many still ignore the impact of these important forces.

One of the rating concepts developed in many textbooks is the "burning cost."[3] "Burning cost" or pure loss cost[4] is generally defined as the unmodified excess losses divided by the total subject premium. The so-called "burning cost" is then surcharged by the use of a loss conversion factor (e.g. 100/85ths) to provide for the assuming carrier's expenses, risk charge, and profit, and becomes the charged rate. The typical observation period of such a rating scheme is five years. In a static environment (i.e. no inflation), this scheme will produce acceptable results. In fact, it will on average produce a loss ratio equal to the reciprocal of the loss conversion factor $\times$ 100. While it is probably obvious that in a changing environment (loss development or inflation) there is a lagging process, such schemes are still in use today. Simple loss rating schemes such as these will produce inadequate premiums.

The loss ratio at any given year under such a scheme can be determined from the formula below. The development of this formula is included in the Appendix.

$$\frac{\left[a(1+i)^5 - R\right] \times 100}{\left\{\frac{a}{5} \cdot \frac{[(1+i)^5 - 1]}{i} - R\right\} \times LCF} \tag{1}$$

Where a = Gross loss
i = Inflation rate
R = Retention
LCF = Loss conversion factor

The inception-to-date loss ratio at any given time (t − 1) will be:

$$\frac{\left[a(1+i)^5 \times \frac{(1+i)^t - 1}{i} - tR\right] \times 100}{\left\{\frac{a}{5}\left[\frac{(1+i)^t - 1}{i} \cdot \frac{(1+i)^5 - 1}{i}\right] - tR\right\} \times LCF} \tag{2}$$

To determine the extent or effect of the lagging process, we sought to find the limiting value of the above expression as t becomes very large. Using L'Hopital's rule[5], it can be demonstrated that:

$$\frac{\left[a(1+i)^5 \times \frac{(1+i)^t - 1}{i} - tR\right] \times 100}{\left\{\frac{a}{5}\left[\frac{(1+i)^t - 1}{i} \times \frac{(1+i)^5 - 1}{i}\right] - tR\right\} \times LCF} \rightarrow \frac{5\,i\,(1+i)^5 \times 100}{[(1+i)^5 - 1]\,LCF} \quad \text{as } t \rightarrow \infty \tag{3}$$

The development of this formula is contained in Part B of the Appendix.

Note that while the original expression was set up to describe an excess of loss situation, the limiting value is independent of R and is therefore applicable to a primary loss rating situation.

Apparently those who use such rating schemes feel that the sequence converges to $(1/LCF) \times 100$ or that the slippage is minor. With the above expression, it can be demonstrated that the sequence does not converge to $(1/LCF) \times 100$. For example, with an overall inflation rate of a modest 3%, the limiting loss ratio becomes 92.80%, and at 6%, it becomes 100.8% even though the conversion factor is 100/85ths.

If you use a burning cost or simple loss rating scheme such as described above, consider the implications. There is good news and bad news. The bad news is that there is a fundamental lagging process in such a scheme which cannot be overcome even with unlimited time. The good news is that one could very simply work backward from the above formula to determine what *LCF* should be used with a given rate of inflation, i, and a target loss ratio after t years.

CONCLUSION

Mr. R. E. Stewart, former New York Insurance Department Superintendent, pointed out in a recent essay that it is the business of insurance "to create economic stability for others in the face of certain misfortunes of all kinds—negligent, capricious, malicious, or divine, not to mention social and economic." To fulfill this role, we must overcome what he calls the "fifth legacy of the cartel mind . . ." a feeling "that insurance must have a stable economic and social environment in which to function."[6].

To fulfill its role, the industry must develop ideas and techniques that are suitable for a changing or unstable economic and social environment. In this paper, we have pointed to only one small problem area—industry results suggest there must be many other as yet undiscovered problems.

REFERENCES

[1] The shock theory is put forward by Dr. Otto Eckstein and Sara Johnson in a DRI report dated the summer of 1975 *(The Data Resources—U.S. Long Term Review)*. They noted that we have seen the following major economic shocks in the last 21 years:

1) The end of price controls in 1946;
2) The Korean War;
3) The 116-day steel strike of 1959;
4) The Kennedy-steel industry confrontation of 1962;
5) The Vietnam War (1965-6);
6) The price controls of 1971;
7) The food price explosion of early 1973;
8) The oil embargo of November 1973 and the quadrupling of the price of oil;
9) The second food price explosion and the end of controls in 1974.

[2] "A Culture in Transformation: Toward a Different Societal Ethic?"—Trend Analysis Program Report #12, American Council of Life Insurance.

[3] Munich Re monograph, *Reinsurance and Reassurance*, Volume 2, Page 43 *Property and Liability Reinsurance Management*, Robert C. Reinarz, Mission Publishing Company, 1965, Pages 63, 76.

[4] Sometimes the expressions "pure loss cost," "Carpenter plan," "spread loss plan," are used to describe concepts similar or identical to the burning cost idea.

[5] If $F(t) \longrightarrow \infty$ and $q(t) \longrightarrow \infty$ as $t \longrightarrow a$ and if the limit of the ratio $F'(t)/q'(t)$ as t approaches a exists, then

$$\lim_{t \longrightarrow a} \frac{F(t)}{q(t)} = \lim_{t \longrightarrow a} \frac{F'(t)}{q'(t)}$$

In the notation $t \longrightarrow a$, a may either be finite or infinite.

[6] Richard E. Stewart, "On the 'Commodity' of Insurance," *The National Underwriter*, December 16, 1977.

APPENDIX

A. Background for formula (1)

Gross loss in year $-5 = a$

$-4 = a(1+i)$

$-3 = a(1+i)^2$

$-2 = a(1+i)^3$

$-1 = a(1+i)^4$

$0 = a(1+i)^5$

Premium for year 0:

$$\frac{(a + a(1+i) + a(1+i)^2 + a(1+i)^3 + a(1+i)^4 - 5R)}{5} \times LCF$$

Loss ratio in year 0:

$$\frac{\left[a(1+i)^5 - R\right] \times 100}{\frac{1}{5}[a + a(1+i) + a(1+i)^2 + a(1+i)^3 + a(1+i)^4 - 5R] \quad \times LCF}$$

or

$$\frac{a(1+i)^5 - R \times 100}{\left\{\frac{a}{5}\ \frac{(1+i)^5 - 1}{i} \quad - R\right\} \quad \times LCF}$$

B. Background for development of the limit:

Show that:

$$\lim_{t \to \infty} \frac{\left[a(1+i)^5 \cdot \frac{(1+i)^t - 1}{i} - tR \right] \times 100}{\left[\frac{a}{5} \cdot \frac{(1+i)^t - 1}{i} \cdot \frac{(1+i)^5 - 1}{i} - tR \right] \times LCF} = \frac{5\, i\, (1+i)^5 \times 100}{[(1+i)^5 - 1] \times LCF}$$

Proof: Let f and g be functions, such that:

$$f(t) = \left[a\,(1+i)^5 \cdot \frac{(1+i)^t - 1}{i} - tR \right] \times 100, \text{ and}$$

$$g(t) = \left[\frac{a}{5} \cdot \frac{(1+i)^t - 1}{i} \cdot \frac{(1+i)^5 - 1}{i} - tR \right] \times LCF$$

on the interval $(0, \infty)$

By simple algebraic manipulation, we have:

$$f(t) = t \left[\frac{a\,(1+i)^5}{i} \cdot \frac{(1+i)^t - 1}{t} - R \right]$$

Since $(1+i)^t - 1 \to \infty$ as $t \to \infty$,

$\frac{(1+i)^t - 1}{t}$ is an indeterminate form of type ∞/∞.

Apply L'Hôpital's rule:

$$\lim_{t \to \infty} \frac{(1+i)^t - 1}{t} = \lim_{t \to \infty} \frac{(1+i)^t \log (1+i)}{1} = \infty$$

It follows that $\lim_{t \to \infty} f(t) = \infty$.

Similarly, $\lim_{t \to \infty} g(t) = \infty$.

Hence, $\frac{f(t)}{g(t)}$ is an indeterminate form of type ∞/∞.

Since,

$$f'(t) = \frac{d}{dt} f(t) = \left[\frac{a(1+i)^5}{i} \cdot (1+i)^t \log(1+i) - R \right] \times 100,$$

and

$$g'(t) = \frac{d}{dt} g(t) = \left[\frac{a}{5} \cdot \frac{(1+i)^5 - 1}{i^2} \cdot (1+i)^t \log(1+i) - R \right] \times LCF,$$

it is evident that

$\lim_{t \to \infty} f'(t) = \infty$ and $\lim_{t \to \infty} g'(t) = \infty$, therefore

$\frac{f'(t)}{g'(t)}$ is also an indeterminate form of type ∞/∞.

Differentiate $f'(t)$ and $g'(t)$ with respect to t:

$$f''(t) = \frac{d}{dt} f'(t) = a \cdot \frac{(1+i)^5}{i} \cdot (1+i)^t \cdot [\log(1+i)]^2 \times 100$$

$$g''(t) = \frac{d}{dt} g'(t) = \frac{a}{5} \cdot \frac{[(1+i)^5 - 1]}{i^2} \cdot (1+i)^t \cdot [\log(1+i)]^2 \times LCF$$

It is easy to prove that:

$$\frac{f''(t)}{g''(t)} = \frac{5\,i\,(1+i)^5 \times 100}{[(1+i)^5 - 1] \times LCF,}$$

which is independent of t. Applying L'Hôpital's rule twice, we should have

$$\lim_{t \to \infty} \frac{f(t)}{g(t)} = \lim_{t \to \infty} \frac{f'(t)}{g'(t)} = \lim_{t \to \infty} \frac{f''(t)}{g''(t)} = \frac{5\,i\,(1+i)^5 \times 100}{[(1+i)^5 - 1] \times LCF}$$

C. For example, using formula (2), we can find the appropriate *LCF* given inflation of 7%, a planning horizon of 10 years, and a target loss ratio of 90%. Assuming a is 100,000 and R is \$50,000—it appears that an *LCF* of $\frac{100}{68.18}$ would satisfy all requirements.

DISCUSSION BY GARY PATRIK

I read Mr. Ferguson's paper with great interest. His topic is critical to the reinsurance business, since so-called burning cost rating is the reinsurance underwriter's favorite pricing technique. An actuarial analysis of it is long overdue.

The paper analyzes burning cost rating and quantifies the degree to which loss results will usually exceed the target loss ratio. This occurs because traditional burning cost rating formulas ignore both loss development and the inflationary growth of losses over time. As actuaries, we are astounded by this formula deficiency.

Burning cost rating is historically a property insurance technique, hence the name. When there is little or no loss development (including IBNR) and rates are essentially constant and there is no rapid change in underlying exposure, burning cost rating can work well enough. However, the very real problem is that this technique is still being used at a time when none of those conditions hold. I have seen burning cost rating formulas used to price excess liability coverage!

The paper concentrates upon the problem of inflationary growth in losses. It ignores the side issue of loss development which is sometimes accounted for by including an extra loading in the loss conversion factor. But we must realize that if a burning cost rating formula does not account for loss development, the resulting situation is even worse than depicted here.

The type of contract which the paper analyzes is one covering loss excess of a fixed retention. The limiting value of the excess loss ratio is given by Ferguson's formula (3) as:

$$\left[\frac{5i(1+i)^5}{(1+i)^5-1}\right] \times \frac{100}{LCF}$$

where LCF = loss conversion factor, traditionally taken as $100 \div$ (target loss ratio).

$1 + i$ = annual inflationary growth factor for losses.

The term in brackets is $5 \div a\overline{5}|^{i}$ in annuity notation. This term is greater than 1 whenever $i > 0$. Thus, this loss ratio will usually be greater than the target loss ratio.

The author suggests that we can solve this problem by redefining the loss conversion factor to be:

$$(1) \qquad LCF = \left[\frac{5i(1+i)^5}{(1+i)^5-1}\right] \times \left(\frac{100}{\text{target loss ratio}}\right)$$

Before discussing some problems regarding mathematical details, I want to emphasize that the author's result holds true in one general case with a suitable interpretation of the notation. And his result can be modified to account for other conditions so as to hold true in another general situation. I will be discussing details, not general direction. Reinsurers are losing money by using traditional burning cost rating formulas. We are all very concerned by this.

Mathematical Details

The author's result, his formula (3), is correct if we interpret his notation as follows:

1. the burning cost premium is defined to be the average of the gross excess losses for the preceding 5 years (including loss development) and multiplied by LCF.
2. $a(1+i)^{t+5}$ is the expected value of the gross excess loss in year t (counts times amounts). Drop the symbol R.
3. $1+i$ is the inflationary growth rate of the gross *excess* losses.

With this interpretation, the expected value of the burning cost premium for year 0 is given by the formula in his Appendix (dropping the symbol R) as:

$$(2) \qquad \frac{1}{5}[a + a(1+i) + a(1+i)^2 + a(1+i)^3 + a(1+i)^4] \times LCF$$

In this case, the ratio of the expected values of the excess loss and the burning cost premium for the year 0 is exactly the limiting value in Mr. Ferguson's formula (3)[1]:

$$(3) \qquad \frac{a(1+i)^5}{\frac{a}{5}\cdot\left[\frac{(1+i)^5-1}{i}\right] \times LCF} = \left[\frac{5i(1+i)^5}{(1+i)^5-1}\right] \times \frac{1}{LCF}$$

Note, that you need not take limits. Also, remember that 1 + i is the excess inflationary growth factor; it is 1.25 or more[2], so that the term in brackets is at least 1.85. Thus, the expected loss ratio will be 85% worse than the target loss ratio.

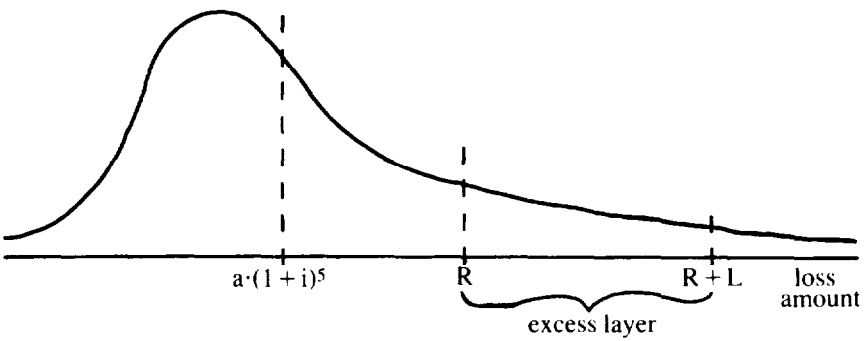
With any other straightforward interpretation of the notation, the formulas do not work. For instance, suppose we take the symbol R to be an aggregate retention. In this case, I believe the author intends that $a(1+i)^{t+5}$ denote the expected value of the gross (excess?) loss subject to the aggregate retention R in the year t[3].

According to the Appendix, the expected value of the burning cost premium for the year 0 is:

$$(4) \qquad \frac{1}{5}\left[a + a(1+i) + \ldots + a(1+i)^4 - 5R\right] \times LCF$$

I suppose the intention here is to take the average over the last 5 years of the gross losses excess of the retention R for each year and then look at the expected value of the resulting premium. However, the expected value of the loss excess of R in the year t is usually *not* $a(1+i)^{t+5} - R$.[4] For example, suppose the graph of the probability density function for the gross loss is of the following form:

Figure 1



The term $a(1+i)^5 - R$ is negative if the situation is as in Figure 1. This is, in fact, usually the case for excess coverage.

The true expected value of the loss excess of R in the year t can best be written (assuming an upper limit of L on the excess loss):

$$(5) \qquad \int_{R}^{R+L} (x - R)\, dF_t(x) + L \cdot \int_{R+L}^{\infty} dF_t(x)$$

where $F_t(x) =$ Probability $\left[\text{total loss} \leq x \,\middle|\, \text{year } t\right]$

This exact value can be rewritten from (5) as:

$$(6)\quad [a(1+i)^5 - R] + \text{Probability}[x \leq R] \cdot (R - E[x \mid x \leq R])] - \left\{\text{Probability}[x \geq R+L] \cdot (E[x \mid x \geq R+L] - [R+L])\right\}$$

where x is the random variable denoting gross loss[5].

The positive term added to $a(1+i)^5 - R$ is the "insurance savings" in the Table M sense and the term subtracted is the "insurance charge".

The other straightforward interpretation takes R as an individual loss retention. In this case, I believe the author intends that $a(1+i)^{t+5}$ denote the expected value of the total loss (ground-up) per loss event (occurrence) in the year t. If this were true, one might try to repair the premium formula in the Appendix by including a factor for the number of loss events. One might then suppose that this factor could cancel out of the loss ratio formula (3) and that the rest of the formulas might hold. But once again we are faced with the certainty that $a(1+i)^{t+5} - R$ is *not* the expected value of the individual loss excess of R in year t.

Another Burning Cost Formula

Most applications of burning cost rating that I have seen do not compute a flat premium as in the preceding discussion. Instead, what is usually computed is a burning cost rate. The burning cost is, as the paper mentions on page 2, "generally defined as the unmodified excess losses divided by the total subject premium"; this total subject premium is usually the total direct premium for the total direct coverage[6]. The burning cost is then multiplied by a loss conversion factor to obtain a final burning cost rate.

Next year's excess premium is the product of the burning cost rate and next year's total subject premium. The total subject premium is estimated in advance and a provisional excess premium is calculated; this may be adjusted later when the actual total subject premium becomes known.

The reason for tying the excess premium to the total subject premium for the year of coverage is that most changes in the underlying exposure will be reflected in the total subject premium, and will then be automatically reflected in the excess premium. However, if the individual loss amounts are growing over time, the excess premium should grow even faster. A moment's reflection on the fact that liability increased limits factors are (necessarily) growing should convince you of this[7].

We can postulate a particularly simple model wherein the total subject premium is growing at a rate of $1+j$ while the excess loss is growing at a rate of $1+i$. In this case, the expected value of the burning cost rate for year 0 would be (assuming that IBNR is taken into account and that the total subject premium is deterministic, and generally using the paper's notation).

$$(7) \qquad \left[\frac{a + a(1+i) + \ldots + a(1+i)^4}{b + b(1+j) + \ldots + b(1+j)^4}\right] \times LCF$$

or

$$(8) \qquad \left(\frac{a}{b}\right) \times \left(\frac{j}{i}\right) \times \left[\frac{(1+i)^5 - 1}{(1+j)^5 - 1}\right] \times LCF$$

where $a(1+i)^{t+5}$ = expected value of excess loss in year t

$b(1+j)^{t+5}$ = total subject matter premium in year t

The expected value of the excess premium for year 0 would be:

$$(9) \qquad \left(\frac{a}{b}\right) \times \left(\frac{j}{i}\right) \times \left[\frac{(1+i)^5 - 1}{(1+j)^5 - 1}\right] \times LCF \times \left[b(1+j)^5\right]$$

$$= a \cdot \left[\frac{j(1+j)^5}{i}\right] \times \left[\frac{(1+i)^5 - 1}{(1+j)^5 - 1}\right] \times LCF$$

And the ratio of the expected values of the excess loss and excess premium would be:

$$(10) \qquad \left[\frac{i(1+i)^5}{j(1+j)^5}\right] \times \left[\frac{(1+j)^5 - 1}{(1+i)^5 - 1}\right] \times \frac{1}{LCF}$$

or simply

$$(11) \qquad \left(\frac{a\,\frac{j}{5\rceil}}{a\,\frac{i}{5\rceil}}\right) \times \frac{1}{LCF} \qquad \text{in annuity notation}$$

We could then define LCF so that (10) is equal to our target loss ratio.

Of course, if loss development is not taken into account when computing the burning cost rate, the situation is more complex. We must then make some assumptions regarding loss development and we must modify the formulas. Rather than go through this exercise, I would urge you not to use burning cost rating.

Don't Use Burning Cost

I immensely distrust burning cost rating. I would go so far as to say that it should only be used when you cannot get more information. If you must use it, loss development and the inflationary growth in excess losses should be accounted for directly in the rating formula year-by-year. And even then, if you cannot get more information, perhaps you should not write the contract.

Why do I so intensely distrust burning cost? The first reason is that burning cost formulas bury all information pertaining to changes in underlying exposure to loss, both counts and amounts. It is better to get more information for each past year and dig into the data to attempt to forecast the next year.

The second reason relates to the variance of the resulting estimate of the proper rate for next year. If the only loss information explicitly considered are the realized losses excess of a fixed retention R for the last 5 years, there may be almost nothing to work with.

For example, suppose that the *overall* growth rate of individual losses is $1 + i$ from year-to-year. That is, assume a simple constant inflation rate which relates the individual loss distribution functions from year-to-year via:

$$F_{t(x)} = F_{(t+n)}[x(1+i)^n] \qquad \text{for all } t,\ n \text{ and } x \tag{12}$$

where $1 + i =$ annual inflationary factor for (ground-up) individual losses

In this case, the retention R in the year 0 (next year) is equivalent to the retention $R \cdot (1 + i)^t$ in the year t. In particular, for year $t = -5$, it is $R \cdot (1 + i)^{-5}$. Thus, we see that by considering only losses in excess of R, we will have less and less to work with from earlier years. Thus, the earlier the data, the larger the variance relative to the expected value, or the larger the coefficient of variation (standard deviation divided by expected value). Other sources of variance are the loss development factors and inflationary trend factors. Since these are estimates, they are random variables and thus have variance. So, when a burning cost rate estimate is multiplied by loss development factors and trend factors, the resulting estimate of the proper rate for next year will have even more variance.

Now, what more information should we obtain and what should we do with it? I would like to suggest two possibilities:

1. Ideally, it is best to obtain individual reports of all losses which exceed some suitably low but yet manageable retention. Use this information, together with general exposure information, to estimate suitable parameters for a stochastic risk model such as described by Hans Bühlmann and others in the actuarial literature[8]. We have computers and there is plenty of mathematics lying around for us to use. The problem is that building such a model takes time. However, the major advantages of a stochastic risk model are that (1) the important conditions which affect the losses are explicitly taken into account and (2) the model can reflect changing conditions through explicit parameter changes.

2. The next best, and more easily implemented, suggestion is hinted at by formula (12). That is, obtain individual reports on all losses which exceed $R(1+i)^t$ in the year t, i.e., $t = -5$, $t = -4$, etc. Also gather general exposure information which allows you to predict either the total number of loss events or the number of excess losses for year 0. Put these two pieces together to estimate the gross excess loss, or the gross excess loss with respect to total subject premium, for year 0.

For example, suppose that L is the excess limit per loss in year 0 along with the retention R. Let $XL(t)$ be the realized excess loss for past year t, in the layer $R(1+i)^t$ up to $(R+L)\times(1+i)^t$. Suppose that $N(t)$ is the total number of losses for year t. Then an estimate of the expected value of the excess loss per loss event in year 0 may be written:

(13)

$$\frac{(1+i)^{-t}\cdot XL(t)}{N(t)} \qquad \text{(e.g., } t = -5\text{)}$$

We get an estimate like this from each past year and we can multiply some suitable average by an estimate of $E[N(0)]$ to obtain an estimate of the expected excess loss for year 0. An analogous procedure holds if $N(t)$ above is the number of losses excess of $R(1+i)^t$. This estimate has a lower relative variance than does the typical estimate using only past losses excess of R multiplied by a highly variant excess-of-loss trend factor.

In summary, I agree with Mr. Ferguson that burning cost rating leads to inadequate pricing. And I understand that he is addressing the problem: if underwriters insist upon using burning cost, let us actuaries at least supply them with better factors. However, I would go further and say that the situation is even worse than he depicts, e.g., it is excess inflation—not ground-up inflation—in formula (3), and we should avoid the use of burning cost rating altogether.

REFERENCES

[1] The expected value of the ratio is usually not the ratio of the expected values. Thus, the following is not the expected value of the loss ratio. The terminology "expected loss ratio" would be statistically confusing in this case.

[2] See Lange, Jeffrey T., "The Interpretation of Liability Increased Limits Statistics", *PCAS* LVI, 1969, pp. 168ff and Miccolis, Robert S., "On the Theory of Increased Limits and Excess of Loss Pricing", *PCAS* LXV, 1977.

[3] The actual loss is a random variable. What Mr. Ferguson means by a $(1 + i)^{+.5}$ is apparently the expected value.

[4] The expected excess loss is equal to the expected total (ground-up) loss minus the retention if and only if the loss cannot be below the retention or above the reinsurer's limit. As an example, take the degenerate distribution wherein the loss is a constant value.

[5] This reformulation of formula (5) is due to Charles Hachemeister.

[6] See also the Munich Re monograph, *Reinsurance and Reassurance*, volume 2, page 43 (CAS Exam 10 syllabus 1978).

[7] Same as Reference [2].

[8] Bühlmann, Hans, *Mathematical Methods in Risk Theory*, Springer-Verlag, 1970; Beard, R. E., Pentikainen, T. and Pesonen, E., *Risk Theory, The Stochastic Basis of Insurance*, 2nd Edition, Chapman and Hall, 1977; Seal, Hilary, *Stochastic Theory of a Risk Business*, John Wiley & Sons, 1969.

MINUTES OF THE 1978 ANNUAL MEETING

November 15-17, 1978

WALDORF ASTORIA HOTEL, NEW YORK CITY

Wednesday, November 15, 1978

The Board of Directors held its regular quarterly meeting from 1:00 p.m. to 5:10 p.m.

Registration was held from 4:00 p.m. to 6:00 p.m.

The President's Reception for new Fellows and their guests was held from 6:00 p.m. to 6:45 p.m.

A reception for members and guests was held from 6:30 p.m. to 7:30 p.m.

Thursday, November 16, 1978

Registration was held from 8:00 a.m. to 9:00 a.m.

President Williams opened the meeting at 8:45 a.m. with a short welcoming statement and pointed out minor errors in the printed program.

A moment of silence was observed for our members who have died since the last Annual Meeting.

The business meeting was called to order by President Williams. Motion was made, seconded and passed to waive the reading of the Minutes of the Spring 1978 Meeting.

The report of the Nominating Committee was read by Ronald L. Bornhuetter and, upon motion made, seconded and passed, names of proposed candidates were placed in nomination. After solicitation of further nominations by office from the floor, motion was made, seconded and passed to close the nominations to each office. The President directed the Secretary to cast one vote for each candidate for an uncontested office. Ballots for contested offices were distributed by Tellers Rafal J. Balcarek, David R. Bickerstaff and Ronald E. Ferguson.

Those elected and their offices are as follows:

President-Elect	W. James MacGinnitie
Vice President	Jerome A. Scheibl
Secretary	David P. Flynn
Treasurer	Walter J. Fitzgibbon, Jr.
Editor	David C. Forker
General Chairman, Education and Examination Committee	Jeffrey T. Lange
Board of Directors	James R. Berquist
	Joseph W. Levin
	Richard H. Snader

The Secretary's and the Treasurer's reports were read. The Woodward-Fondiller Prize was awarded to Edward W. Weissner for his paper: "Estimation of the Distribution of Report Lags by the Method of Maximum Likelihood"; and to Sheldon Rosenberg for his review of a paper by Robert Miccolis, "On the Theory of Increased Limits and Excess of Loss Pricing." The award was presented by Lewis H. Roberts of Woodward-Fondiller, Inc.

The Dorweiler Prize was awarded to James R. Berquist and Richard E. Sherman for their joint paper, "Loss Reserve Adequacy Testing: A Comprehensive Systematic Approach." President Williams presented the award.

President Williams read the names of the new Associates who rose and received the applause of the assembly. A short biography of each new Fellow was read as each came forward to be recognized and receive the diploma. Group pictures of the new Fellows and the new Associates were taken.

The fifteen new Fellows and thirteen new Associates are:

FELLOWS

Linda L. Bell	Marc B. Pearl
Richard M. Beverage	John J. Reynolds, III
Laurence W. Cheng	Richard E. Sherman
Janet L. Fagan	John A. Swift
Robert P. Irvan	Gary G. Venter
James R. Neidermyer	Ronald F. Wiser
Terrence M. O'Brien	Charles P. Wood, Jr.
Gary S. Patrik	

ASSOCIATES

Debra L. Baer
Dale L. Brooks
Francis X. Corr
Ross A. Currie
Lawrence S. Davis
Mary B. Gaillard
Dennis R. Henry
Marvin A. Johnson
Loren A. Perry
Stephen W. Philbrick
Ralph S. Pulis
Joseph V. Taranto
Frederick A. Urschel

A report from the Actuarial Education and Research Fund was given by Ronald E. Ferguson.

After an informal discussion with coffee, a panel discussion, "The Property Casualty Industry—Where Have We Been and Where Are We Going" was presented. Thomas E. Murrin, Executive Vice President, Insurance Services Office was the moderator. The panelists were:

Jack Moseley, President, United States Fidelity & Guaranty Co.

F. Dean Hildebrandt, Jr., Senior Vice President, American Insurance Association

Joseph H. Dowling, FSA, First Vice President — Research and Investment Bonding, Drexel, Burnham, Lambert, Inc.

A formal luncheon was held at 12:30 p.m. The Honorable Albert B. Lewis, Superintendent of Insurance, New York State, was the guest speaker.

The regular program reconvened at 2:00 p.m. with a concurrent workshop program. Six different workshops were held, each twice, and four at a time from 2:00 to 5:30 p.m. according to the following schedule:

2:00 p.m. – 3:00 p.m., workshops A,B,C,D

3:15 p.m. – 4:15 p.m., workshops A,B,E,F

4:30 p.m. - 5:30 p.m., workshops C,D,E,F

The workshop subjects and participants were as follows:

Workshop A — Current NAIC Financial Items

Moderator:	Donald E. Trudeau Vice President and Controller American Mutual Liability Ins. Co.
Members:	Robert McMillen Senior Vice President and Actuary Travelers Insurance Co.
	Paul M. Otteson Consulting Actuary

Workshop B — Expense Loadings in Ratemaking

Moderator:	Philip O. Presley Actuarial Consultant
Members:	Richard L. Johe Vice President and Actuary Michigan Mutual Insurance Group
	James F. Richardson Second Vice President — Actuary The Hanover Insurance Co.

Workshop C — Insurer Insolvency

Moderator:	Warren P. Cooper Vice President and Actuary INA Corporation
Members:	Walter J. Fitzgibbon, Jr. Actuary Aetna Life and Casualty
	Phillip Schwartz CPA, Senior Counsel American Insurance Association

Workshop D — Workers' Compensation Issues

Moderator: Jerome A. Scheibl
Vice President
Employers Insurance of Wausau

Members: Frank Harwayne
Vice President and
Director of Actuarial Research
National Council on Compensation
Insurance

Robert F. Lowe
Consulting Actuary
Tillinghast, Nelson & Warren, Inc.

Workshop E — Risk Classifications — Personal Lines

Moderator: Lee M. Smith
Actuary
Michigan Insurance Bureau

Members: Holmes M. Gwynn
Actuary
AMICA Mutual Insurance Co.

Sanford R. Squires
Vice President and Actuary
Commercial Union Insurance Cos.

Workshop F — New Papers and Review of Papers

Moderator: C. K. Khury
Actuarial Director
Prudential Property & Casualty
Insurance Co.

Papers: R. E. Ferguson, "An Actuarial Note on Loss Rating"

Reviews presented by David J. Grady and
Gary S. Patrik

C. C. Hewitt and B. Lefkowitz, "Fitting Distributions by Size of Loss"

A reception for members and guests was held from 6:30 p.m. to 7:30 p.m.

Friday, November 17, 1978

The regular meeting resumed at 8:30 a.m. with President-Elect Salzmann presiding. A panel discussion was presented on "Future CAS Directions". Robert B. Foster, Actuary, The Travelers Insurance Cos., was moderator. Panel members were:

Alan C. Curry, Chairman, Ad Hoc Education and Examination Committee, Vice President and Actuary, State Farm Mutual Automobile Insurance Co.

Harry R. Richards, Chairman, Committee on Paid Consultants, President, Independent Actuarial Services, Inc.

George D. Morison, Chairman, Long Range Planning Committee, President, New York Compensation Insurance Rating Board

President Williams delivered his presidential address on "The Challenge of Being Professional". An informal discussion with coffee followed. A panel discussion was then presented on "The Influence of the Risk Manager on Casualty Actuaries". Michael L. Toothman, Vice President and Actuary, Great American Surplus Lines Insurance Company, was the moderator. Panel members were:

Walter E. Farnam, Assistant Vice President, Aetna Life & Casualty

Klaus J. Gebhardt, Vice President, RIMCO

Robert S. Spencer, Vice President, Fugue Industry, Inc.

A third panel was then presented. The subject was "Consumerism and Auto Insurance". Frederick W. Kilbourne, Consulting Actuary, was moderator. The panelists were:

Michael A. Walters, Senior Vice President and Actuary, Insurance Services Office

John B. Conners, Associate Actuary, Liberty Mutual Insurance Co.

James B. Hunt, Director, Massachusetts Insurance Department

Roy R. Anderson, Vice President, Allstate Insurance Company

After the panel discussion, President-Elect Salzmann presented a plaque to President Williams in appreciation for his contributions to the Society. The Society's appreciation was extended to the Local Arrangements Committee for its work. The meeting was adjourned at 1:15 p.m.

After the Annual Meeting, a special interest meeting was held on the New York Free Trade Zone and Reinsurance Exchange.

Moderator: Charles C. Hewitt, Jr.
Vice President
Metropolitan Property & Liability
Insurance Co.

Members: Patrick J. Foley
Assistant General Counsel
American Insurance Group

Donald Kramer
President
Kramer Capital Consultants

A list of attendees of the Annual Meeting follows:

FELLOWS

Alexander, L. M.
Anker, R. A.
Bailey, R. A.
Balcarek, R. J.
Barnes, G. R.
Barrette, R.
Bell, L. L.
Bennett, N. J.
Ben-Zvi, P. N.
Bergen, R. D.
Berquist, J. R.
Bevan, J. R.
Bickerstaff, D. R.
Bill, R. A.
Bornhuetter, R. L.
Bradshaw, J. G., Jr.
Brian, R. A.
Brown, W. W., Jr.
Brubaker, R. E.
Cahill, J. M.
Carter, E. J.
Cheng, L. W.
Conners, J. B.
Cook, C. F.
Curry, A. C.
Curry, H. E.
Daino, R. A.
D'Arcy, S. P.
Davis, G. E.
Dempster, H. V., Jr.
Dorf, S. A.
Dropkin, L. B.
Eldridge, D. J.
Ernst, R. C.
Eyers, R. G.
Faber, J. A.
Fagan, J. L.
Fairbanks, A. V.
Farnam, W. E.
Ferguson, R. E.
Fisher, W. H.
Fitzgibbon, W. J., Jr.
Flaherty, D. J.
Flynn, D. P.
Forker, D. C.
Fossa, E. F.
Foster, R. B.
Fowler, T. W.
Fresch, G. W.
Fusco, M.
Gallagher, T. L.
Garand, C. P.
Gibson, J. A., III
Gleeson, O. M.
Gottlieb, L. R.
Grady, D. J.
Grannan, P. J.
Hachemeister, C. A.
Hall, J. A., III
Hanson, H. D.
Hartman, D. G.
Harwayne, F.
Hazam, W. J.
Heer, E. L.
Hermes, T. M.
Hewitt, C. C., Jr.

FELLOWS

Hillhouse, J. A.
Honebein, C. W.
Irvan, R. P.
Jaeger, R. M.
Johe, R. L.
Kaliski, A. E.
Kallop, R. H.
Kates, P. B.
Kelly, A. E.
Khury, C. K.
Kilbourne, F. W.
Klaassen, E. J.
Kollar, J. J.
Krause, G. A.
Kreuzer, J. H.
Lange, J. T.
Leimkuhler, U. E.
Leslie, W., Jr.
Lester, E. P.
Levin, J. W.
Lino, R. A.
Liscord, P. S.
Longley-Cook, L. H.
Lowe, R. F.
MacGinnitie, W. J.
Makgill, S. S.
Marker, J. O.
Masterson, N. E.
McClenahan, C. L.
McClure, R. D.
McConnell, M. H.
McGuinness, J. S.
McManus, M. F.
McNamara, D. J.
Mohl, F. J.
Mohnblatt, A. S.
Moore, B. C.
Moore, P. S.
Morison, G. D.
Moseley, J.
Muetterties, J. H.
Murray, E. R.
Neidermyer, J. R.
Newman, S. H.
O'Brien, T. M.
Oien, R. G.
Otteson, P. M.
Patrik, G. S.
Pearl, M. B.
Perkins, W. J.
Petlick, S. A.
Phillips, H. J.
Pollack, R.
Presley, P. O.
Retterath, R. C.
Reynolds, J. J., III
Richards, H. R.
Richardson, J. F.
Roberts, L. H.
Rodermund, M.
Salzmann, R. E.
Scheibl, J. A.
Schloss, H. W.
Schultz, J. J., III
Sheppard, A. R.
Sherman, R. E.
Simon, L. J.
Skurnick, D.
Smick, J. J.
Smith, L. M.
Snader, R. H.
Squires, S. R.
Steeneck, L. R.
Stephenson, E. A.
Stewart, C. W.
Streff, J. P.
Strug, E. J.
Sturgis, R. W.
Swift, J. A.
Switzer, V. J.
Taht, V.
Tatge, R. L.
Trudeau, D. E.
Verhage, P. A.
Walters, M. A.
Ward, M. R.
Webb, B. L.
White, H. G.
White, W. D.
Williams, P. A.
Wilson, J. C.
Wiser, R. F.
Woll, R. G.
Wood, C. P., Jr.
Wood, J. O.
Wright, W. C., III
Zelenko, D. A.
Zubulake, T. J.

ASSOCIATES

Aldorisio, R. P.
Alfuth, T. J.
Antolino, M. R., Jr.
Applequist, V. H.
Baer, D. L.
Banfield, C. J.
Barrow, B. H.
Bartlett, W. N.
Bass, I. K.
Bealer, D. A.
Bell, A. A.
Beverage, R. M.
Biondi, R. S.
Bradley, D. R.
Brooks, D. L.
Buck, J. E., Jr.
Carson, D. E. A.
Cheng, J. S.
Christiansen, S. L.
Cis, M. M.
Cooper, W. P.
Copestakes, A. D.
Corr, F. X.
Crifo, D. A.
Currie, R. A.
Davis, L. S.
Davis, R. C.
Davis, R. D.
Degerness, J. A.
Diamantoukos, C.
Duperreault, B.
Durkin, J. H.
Faga, D. S.
Feldman, M. F.
Fisher, R. S.
Flack, P. R.
Gaillard, M.B.
Galiley, B. J.
Giambo, R. A.
Goldberg, S. F.
Gossrow, R. W.
Granoff, G.
Gruber, C.
Gwynn, H. M.
Head, T. F.
Hearn, V. W.
Henry, D. R.
Herman, S. C.
Herzfeld, J.
Hobart, G. P.
Hoylman, D. J.
Inderbitzin, P. H.
Ingco, A. M.
Jensen, J. P.
Johnson, L. D.
Johnson, M. A.
Johnson, W. H.
Jones, N. F.
Kolojay, T. M.
Konopa, M. E.
Livingston, R. P.
Masella, N. M.
McCarter, M. G.
Meeks, J. M.
Meyer, R. E.
Miccolis, R. S.
Moller, K. G., Jr.
Moore, B. D.
Murad, J. A.
Nelson, J. R.
Neuhauser, F., Jr.
Newlin, P. R.
Newville, B. S.
Oakden, D. J.
O'Neil, M. L.
Pagliaccio, J. A.
Perry, L. A.
Petrelli, J. L.
Pflum, R. J.
Piazza, R. N.
Pierce, J.
Plunkett, R. C.
Potter, J. A.
Powell, D. S.
Pulis, R. S.
Ratnaswamy, R.
Reynolds, J. D.
Riff, M.
Roland, W. P.
Rosenberg, M.
Sandler, R. M.
Schneiker, H. C.
Shayer, N.
Shoop, E. C.
Shrum, R. G.
Silberstein, B.
Singer, P. E.
Skolnik, R. S.
Smith, F. A.
Stein, J. B.
Stergiou, E. J.
Swaziek, R. R.
Swisher, J. W.
Taranto, J. V.
Taylor, F. C.
Thorne, J. O.
Torgrimson, D. A.
Tuttle, J. E.
Urschel, F. A.
Wade, R. C.
Waldman, R. H.
Weiner, J. S.
Weller, A. O.
Wooddy, J. C.
Woodworth, J. H.
Young, E. W.
Young, R. G.

GUESTS — SUBSCRIBERS — STUDENTS

Abramson, G. R.
*Anderson, E. V.
Anderson, R. R.
Anson, D.
Barney, H. L.
Bashline, D. T.
Brown, A. F.
Campbell, C. J.
*Canfield, P. A.
Cohen, E. J.
Ehrlich, W. S.
Furst, P. A.
Gebhardt, K. J.
Gidos, P. M.
*Guido, R. N.
Gutman, E.
*Hager, G. A.
Hanover, R. F.
*Hatfield, B. D.
Hennessy, M. E. R.
Hildebrandt, F. D., Jr.
John, R. T.
*Johnson, J. E.
Kellison, S. G.
Kramer, D.
Kramer, N. M.
*Kraysler, S. F.
Larose, J. G.
Lefkowitz, B.
Linden, O. M.
Mahler, H. C.
Mair, S. A.
McGovern, E.
McMillen, R. H.
Metzner, C. S.
Miron, M.
Pichler, K.
Pinto, M.
*Pope, D. W.
Rowland, W. J.
Rubino, F.
Silverman, J.
*Spangler, J. L.
Spencer, R. S.
Sweeny, A. M.
Tepper, D. H.
*Trescott, H. C.
*Weiss, R. H.
Wollman, M. H.
Zarnowski, J.

*Invitational Program

Respectfully submitted,

DAVID P. FLYNN,
Secretary

STATEMENT OF PRINCIPLES REGARDING PROPERTY AND CASUALTY LOSS AND LOSS ADJUSTMENT EXPENSE LIABILITIES

The purpose of this statement is to provide general guidelines for the use of actuaries engaged in the establishment and review of loss and loss adjustment expense reserves. It is a statement of the Casualty Actuarial Society's Committee on Loss Reserves. The statement consists of three parts.

I. Definitions

II. Considerations

III. Procedures

The balance sheet of the Fire and Casualty Annual Statement includes liabilities that are not subject to precise valuation. The reserves for unpaid losses (line 1, page 3 of the Annual Statement) and the reserve for unpaid loss adjustment expense (line 2, page 3 of the Annual Statement) cannot be precisely determined in advance. These reserves must be estimated. Because of their relative size and the difficulty in achieving accurate estimates of their values, these liabilities are vitally important balance sheet items. It is important that proper actuarial and statistical procedures be employed in order to improve the likelihood of reliable reserve estimates. Without reliable reserve estimates, an accurate evaluation of the financial condition of a fire and casualty insurer cannot be accomplished.

Loss reserving involves the current financial evaluation of costs associated with future contingent events, a matter of fundamental interest to actuaries. The contingencies involved are those factors which affect the cost of future payments on insured events which have already occurred. As ratemaking is another application of the same estimating process, the actuarial methodology is similar in many respects.

The definitions in the next section apply to both loss reserves and loss adjustment expense reserves.

For the purpose of this statement the terms "loss" and "claim" will be used interchangeably.

I. DEFINITIONS

Loss reserving procedures should operate on *well defined groups of losses*, such as losses arising from the exposures associated with a particular policy period, or losses resulting from accidents occurring within a particular calendar period, or losses associated with a particular coverage, or losses occurring in a particular state, and so on.

The reserve for all claims occurring on or before a certain date, called the *accounting date*, is evaluated as of a *valuation date*. The *accounting date* may be any date selected for an accounting or statistical purpose. The *valuation date* of a reserve liability is the date as of which the evaluation of the reserve liability is made. For a particular well defined group of claims, several evaluations of the reserve liability may be made as of successive *valuation dates*. A *valuation date* may occur prior to, coincident with or subsequent to the accounting date.

The *total loss reserve* for a well defined group of losses as of a given *valuation date* is the amount that must be paid in the future to settle all such losses which have occurred on or prior to a particular *accounting date*. The true value of the *total loss reserve* can only be known when all claims in the group have been finally settled. Prior to that time the value of the *total loss reserve* must be estimated. For a specific group of claims the insurer's estimate of the *total loss reserve* will very likely change from one valuation date to another.

The *indicated total loss reserve* is an estimate of the *total loss reserve* resulting from a particular loss reserving procedure or methodology. The *carried total loss reserve* is the amount shown in a published statement or in an internal statement of financial condition.

There are five elements of the *total loss reserve*:

1. case reserves,
2. the provision for future development on known claims,
3. the reopened claims reserve,
4. the provision for claims incurred but not reported,
5. the provision for claims in transit (incurred and reported but not recorded).

Although the *total loss reserve* is comprised of these five elements, it is not necessarily derived by specifically quantifying each of the five. Each of these reserve elements will be defined in succeeding paragraphs.

For Annual Statement purposes a division is required between known claims and claims which have been incurred but not reported (IBNR). The *reserve for known claims** represents the amount of money, estimated as of the *valuation date*, that will be required for future payments on claims which have already been reported to the company. The *IBNR reserve* represents the amount which must be provided for future payments on losses which have occurred but which have not been reported.

There is not universal agreement on the proper categorization of all of the five reserve elements between known claims and IBNR. For the purpose of this statement, the *reserve for known claims* will be considered to consist of *case reserves*, the provision for *development on known claims* and the *reopened claims reserve*. The *IBNR reserve* will be considered to consist of the remaining elements.

The *case reserve** is defined to be the sum of the values assigned to specific claims by claim adjusters, reserves for known cases set by formula or some combination thereof. The term *adjusters' estimates* is used to refer to the aggregate of the estimates made by claim personnel on individual claims, based on the facts of those particular claims. *Formula reserves* are reserves established by formulas for groups of claims and are obtained from a process in which certain classifying information is provided, and the estimated reserve amounts are determined as responses to encoded instructions. Formula reserving may be applied to individual claims or to aggregations of claims with similar characteristics. When the formula reserving technique is applied to aggregations of claims, the formula reserve may be obtained, for example, through the use of any pertinent insurance statistics such as premium in force, earned premiums, number of policies or claim counts.

Development is defined as the difference, on successive valuation dates, between observed values of certain fundamental quantities which may be employed in the loss reserve estimation process. For example, the observed number of reported claims associated with losses occurring within a particular calendar period will very often be seen to increase from one valuation date to the next until the time arrives when all claims have been reported. The pattern of accumulating claims represents the *development* of the number of claims. In a similar fashion the amount of claim payments for losses occurring within a specific calendar period will also be seen to increase with successive valuation dates. In this case the pattern of accumulating payments represents the development of claim cost and is usually referred to by the term *payment development*.

*The reserve for known claims is also sometimes referred to by a variety of other labels such as the "reported reserve", the "adjusted or in the process of adjustment" or the "unpaid losses excluding IBNR".

*The term *case reserve* is occasionally used in place of the *reserve for known claims*, but when it is used in this sense it is a misnomer.

The concept of development may also be applied to incurred losses. *Incurred development* is defined as the difference between estimates of incurred cost on successive valuation dates for a well defined group of claims.

With respect to known claims this statement is particularly concerned with *incurred development*—that is, subsequent development of cost estimates on those claims reported to an insurer on or before a specific accounting date which are still open on that accounting date. *Incurred development* on such claims can be either increasing or decreasing. An observed pattern of increasing development might indicate that initial reserve estimates were inadequate. An observed pattern of decreasing development might indicate that initial reserve estimates were redundant. In providing for the *development on known claims*, an attempt is made to measure development and to compensate for the anticipated reserve inadequacy or redundancy on those claims.

The *reopened claims reserve* is a provision for closed claims on which payments will be made after the valuation date because of circumstances not foreseen at the times the cases were closed. In some instances, post-closing payments or recoveries for claims not physically reopened may be included with development on known claims.

Following typical company procedures a claim is considered to be reported when it is first recorded in the accounting records of the company. For this reason the *IBNR reserve* can be thought of as consisting of two basic elements. The first of these elements is the provision for those claims, referred to as the "true" IBNR, whose existence is completely unknown to the company. This provision represents the normal delay which occurs in reporting losses to the company. The second element is the provision for claims in transit, which are incurred and reported but not recorded. This provision represents the additional time consumed by company recording procedures. As a practical matter it might not always be feasible to measure these two elements separately, but it is important to understand the effect company reporting procedures can have on the amount of the *IBNR reserve*.

In the determination of the *IBNR reserve* it is necessary to estimate the future emergence of IBNR claims. *Emergence* refers to claims which have already occurred but which are expected to be first observed in future reporting periods. *Emergence* of IBNR and *development* on the reserve for known claims are often not differentiated. For the purpose of this statement the use of the term *development* will be confined to claims which have been reported. The *IBNR reserve* must

be sufficient to cover the ultimate value of future *emergence*. Thus, a provision must be made in the *IBNR reserve* for the *development* which may be expected to occur on IBNR claims after they have emerged.

The *loss adjustment expense reserve* is the amount needed to cover all future expenses required to investigate and settle claims incurred on or before a particular accounting date, whether reported or not. *Loss adjustment expense reserves* should be considered separately for

1. allocated loss adjustment expenses and
2. unallocated loss adjustment expenses.

Allocated loss adjustment expenses are those expenses, such as attorneys' fees and legal expense, which are incurred in connection with and are assigned to specific claims. *Unallocated loss adjustment expenses* are all other claim adjustment expenses, such as salaries, heat, light and rent, which are associated with the claim adjustment function but are not readily assignable to specific claims.

Certain kinds of adjustment expense are not easily categorized between allocated and unallocated. Independent adjusters' fees, for example, may be classified as allocated expense if the adjusters' bills provide sufficient information to enable the insurer to associate the cost of the adjusters' services with specific claims. If, however, the bills do not provide sufficient information, the insurer must classify the expense as unallocated.

Since allocated expenses are assigned to specific claims, all of the analyses performed on loss data can also be performed on allocated loss expense data. Thus, although not required by the Annual Statement, the *allocated loss adjustment expense reserve* can be divided into known reserve and IBNR components. In fact, all of the concepts discussed in the preceding paragraphs, such as *development* and *emergence*, as well as each of the five elements of the *total loss reserve*, have similar meanings with regard to the *allocated loss adjustment expense reserve*.

Although the same statistical procedures do not apply to unallocated expenses, the *unallocated loss adjustment expense reserve* can still be divided into known reserve and IBNR components, and the concept of a particular valuation date is meaningful.

II. CONSIDERATIONS

Loss reserving is fundamentally concerned with the estimation of ultimate loss costs on unpaid claims.

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

The establishment and evaluation of proper reserves is considerably improved by subdividing the entire claims experience into well defined groups. Where possible, loss data which have been relatively unaffected by changes in company procedures and operations should be used. The possibility of subdividing or combining the data so as to increase its homogeneity or to minimize the distorting effects of underlying or procedural changes on the data should be fully explored.

The actuary should be conversant with the general characteristics of the insurance portfolio for which reserves are to be established. This would normally include familiarity with the contractual guarantees and obligations under policies in force as well as other attributes, such as deductibles, policy limits and reinsurance provisions, which may have a bearing on reserving.

HOMOGENEITY

The actuary should strive to group together those claims exhibiting similar characteristics, such as comparable claim experience patterns, settlement patterns or size of loss distributions. For example, to the extent that the actuary is dealing with a heterogeneous product, such as commercial multi-peril or miscellaneous liability insurance, consideration should be given to breaking apart these products into more homogeneous groupings. Some other examples of specific considerations regarding homogeneity are the distinction between personal and commercial risks and the distinction between primary and excess coverage.

CREDIBILITY

The degree to which consideration is given to homogeneity is related to the consideration of credibility. Credibility is increased by proper homogeneous groupings on the one hand and by increasing the number of claims analyzed within each group on the other. A group of claims should be large enough to be statistically reliable. Obtaining homogeneous groupings requires refinement and fragmentation of the total data base. Clearly, there is a point at which refinement scatters data into cells too small to provide credible development patterns. Each situation requires a fresh balancing of the considerations of homogeneity and statistical credibility. Thus, line and coverage definitions suitable for the establishment of reserves in large companies can be in much finer detail than in the case of small companies. Where a very small group of claims is involved, use of external information such as industry aggregates may be necessary.

DATA AVAILABILITY

It is the actuary's responsibility to assure that the necessary data for the establishment of proper reserves are available. Frequently, however, this means working within the constraints of existing information systems while more suitable data are being developed. It is also the actuary's responsibility to be sure that the claim data used in analysis of reserves is reconcilable with company financial records.

The actuary should bear in mind the form in which the final results will have to be reported to management, to regulators or to other interested parties. If reserves are established on groups of claims which are broader than the necessary reporting requirements, procedures for assigning the reserves to the required categories must be developed.

EMERGENCE PATTERNS

The delay between the occurrence of claims and the recording of claims on the books of the company depends upon both the line of business and company practices. In general, property claims are reported quickly, whereas the reporting of liability claims may be substantially delayed. A review of company claims practices should always be made to assure that correct assumptions are being made by the actuary regarding the claims process. Perhaps even more importantly, the actuary should continually review and be made aware of claims procedures and the claims handling process. Whenever a change in claims procedure can be identified, experience should be adjusted to align it with more recent claims practice.

SETTLEMENT PATTERNS

The length of time that it normally takes for reported claims to be settled will affect the choice of the loss reserving procedure. Lines of business for which claims settle quickly are less subject to reserve inadequacies. Claims arising under Glass coverage, for example, tend to be settled quickly, and the amount of settlement is usually close to the original estimate. On the other hand, bodily injury liability claims often require a long time to settle, even when reported immediately to the company. The ultimate amount of settlement depends on the interaction of more complex variables, such as the type and severity of the injury and the intricacies of the judicial process.

DEVELOPMENT PATTERNS

In establishing reserves, substantial care should be given to reviewing the pattern of development on known cases. The company's claims procedures will affect the manner in which the case reserves change over time for any individual claim. Further, the length of time to settlement will affect the observed reserve development.

In order to correctly interpret development patterns, the actuary must also determine which reserves have been established at discounted present value, the rate of interest and the aggregate amount of discount. In ordinary circumstances if aggregate reserves have been perfectly estimated, no subsequent development will occur. If, however, such reserves have been discounted for interest, upward development will be observed equal to the aggregate amount of discount for which credit has been taken.

FREQUENCY AND SEVERITY

The same total dollars of losses may arise from a few very large claims or from many small claims. Reserve estimates will tend to be more accurate for losses resulting from a high frequency/low severity group of claims than from a low frequency/high severity group of claims. Therefore much more care should be taken in analyzing low frequency/high severity groups of claims.

If the exposure for the group of claims being considered includes the potential for claims of a magnitude not seen in past experience, judgment adjustments should be made in the reserve to reflect the possibility of such claims arising.

REOPENED CLAIMS POTENTIAL

The propensity for claims, which were believed to be closed, to reopen varies substantially among lines of business. Beyond this, precedent-setting judicial opinions and liberalizing legislation can affect the reopening of claims. Company procedures will also affect the potential for claims to be reopened. A time to be alert is when operating procedures (claims, data processing, accounting, etc.) are changing or emphasis is shifting.

AGGREGATE LIMITS

For certain insurance coverages, such as products and malpractice liability, aggregate policy limits will act to restrict total potential incurred losses and therefore reserve liabilities. In reviewing groups of claims where aggregate limits apply, audit tests of the data will reveal to what extent limit ceilings have been reached, and in what respect reserve projections may have to be modified to take this factor into account.

COLLATERAL SOURCES

For a proper evaluation of a company's total reserve position, the potential impact of salvage and subrogation on the group of claims under consideration should be evaluated even though statutory accounting may prohibit a deduction from loss reserves. In addition, the impact of coinsurance, deductibles, coordination of benefits, second injury fund recoveries, as well as any other collateral sources should be considered.

REINSURANCE

The actuary should know and consider the types of reinsurance plans and retentions currently in force. To the extent that current arrangements might differ from plans in effect during the claim experience period, the actuary should estimate the effect such differences might have on observed emergence and development patterns.

POOLS AND ASSOCIATIONS

The reserve liability within an insurance company depends in some degree on forces beyond its control, such as business obtained through participation in both voluntary and non-voluntary underwriting pools and associations. Nevertheless the actuary should be aware that the operating and reserving policies and loss development patterns of such entities may vary and therefore should be reviewed to determine if adjustments to reported reserves are warranted.

OPERATIONAL CHANGES

It is the actuary's responsibility to review the applicability of existing procedures to current business and to verify the continued applicability of past assumptions to current operations of the company. The installation of a new computer system, an accounting change, a reorganization of claims responsibility or a change in an underwriting program in a company can affect the continuity of the loss experience. When such changes are observable and measurable, appropriate compensating adjustments should be made in the procedures for calculating reserves.

CHANGES IN LOSS DISTRIBUTION

Losses may occur in all size ranges. Changes in contract provisions may limit or change the amount of actual claim against the insurance company through the use of deductibles, policy limits or the sale of excess coverage which excludes all of the primary layer of losses. Such contractual changes affect both the frequency and severity of actual claims. If the change has been occurring over time, such as in the case of a higher deductible being sold for a particular class of policies, attempts should be made to adjust past experience to reflect current circumstances.

EXTERNAL INFLUENCES

Due regard should be given to the impact of external influences. Specific considerations include the judicial environment, regulatory and legislative changes, residual or involuntary market mechanisms, and economic variables such as inflation.

REASONABLENESS

The actuary has a responsibility to consider the reasonableness of the indications produced by the reserving procedures employed. The incurred losses implied by the reserves should be measured against relevant parameters, such as premiums, exposures or number of policies, and expressed wherever possible in terms of frequencies, severities and loss ratios. No material departure from past results should be accepted without attempting to find an explanation for the variation.

A review of the foregoing considerations with regard to a specific insurance product will assist the actuary in the selection of appropriate reserve methods and in the effort to organize claim data properly.

It is not sufficient for the actuary merely to apply historical analytical procedures in the calculation of reserves. Whenever the impact of internal or external changes on claim data can be isolated or reasonably quantified, adjustment of the data is warranted before applying various reserving methods. Whenever possible, the underlying assumptions of each method should be tested statistically. It may be possible to adjust historical data so that the underlying assumptions of a method are more nearly satisfied.

III. PROCEDURES

Loss reserving has two major aspects. First, claim data must be properly organized and controlled. Second, a statistically sound method of estimating the ultimate cost of losses currently unpaid must be selected to analyze the data.

DATA ORGANIZATION

As previously mentioned, claim data should be organized into homogeneous groupings. Obtaining homogeneous groupings requires refinement of the data base. Such refinement might entail categorizing claims by line of business, class or geographic location. Generally speaking, refinement that increases homogeneity increases the credibility of the data. On the other hand, excessive fragmentation tends to decrease credibility by depriving individual groupings of enough data to be meaningful.

The categorization of claims by time unit is extremely important. The successful organization of a data base for reserving revolves around four key dates:

1. *accident date*, which is the date on which the loss occurred or, for those losses which cannot be identified with a single isolated event, the date on which the loss is deemed to have occurred;
2. *report date*, which is the date on which the loss was first reported to the company (in practice it is usually taken to be the date on which the loss was first entered in the statistical records of the company);
3. *accounting date*, which is the calendar date selected for an accounting or statistical purpose; and
4. *valuation date*, which is the calendar date as of which the loss reserve is evaluated.

Claims with report dates equal to or prior to a particular accounting date would be classified as known or reported claims with respect to the accounting date, but claims with report dates later than a particular accounting date and with accident dates equal to or earlier than the accounting date would be classified as IBNR with respect to the accounting date.

The preceding paragraph gives the precise but narrow definition of IBNR made in Section I. Unfortunately, some confusion exists regarding what the proper definition of IBNR should be. A more liberal definition is often used in which IBNR denotes a provision for both late reported claims and future development on known claims.

The confusion regarding the definition of IBNR can result from the differing strategies companies may employ in approaching the loss reserve problem. There are two principal strategies, and each leads to a preference for a particular method of organizing claim data, which can in turn lead to the particular definition of IBNR that is used.

All companies compile claim data by *accident period* (accident year, accident quarter, accident month, etc.) i.e., all claims with accident dates falling within a particular fiscal period are grouped together. Claim information by accident year is required for various Annual Statement schedules.

Many companies also compile claim data by *report period*, which requires that all claims with report dates falling within a specified fiscal period be grouped together.

The two principal strategies usually employed are the report period approach and the accident period approach. When a report period approach is used, an attempt is made to measure the upward or downward development on claims which have already been reported to the company and to use that measurement to estimate the aggregate reserve redundancy or deficiency on those claims. To determine IBNR, additional analysis by accident period is required in order to measure the emergence of IBNR.

When a pure accident period approach is used, report dates are ignored and an attempt is made to estimate directly the ultimate cost of all claims, whether reported or not, arising from accident periods prior to the valuation date. This approach results in an estimate of the total loss reserve. The total loss reserve is then apportioned between reserves for IBNR and known claims on a suitable basis.

The use of accident period techniques can, under certain circumstances, lead to a seemingly broader definition of IBNR than is used in this statement of principles. If, for instance, an accident period approach has been used to estimate directly the total loss reserve and IBNR is obtained simply by subtracting the case reserve from the total, the provision for future development on known claims will automatically be included with IBNR. In these circumstances the provision for reopened claims will also be included with IBNR.

The method of assigning report dates to reopened claims can also lead to confusion in the treatment of such claims for reserving purposes. Because reopened claims are generated from claims previously reported and closed, it is generally agreed that the provision for this liability should, by definition, be included with the reserve for known claims.

Some companies, however, consider the reopened claim reserve to be part of the IBNR reserve. Instead of recording the original report dates for reopened claims, new report dates are established by these companies. Since the report date determines the distribution of claims between known and unknown, reopened claims will take on the appearance of IBNR claims in the data used in the calculation of the IBNR reserve.

LOSS RESERVING TECHNIQUES

Detailed discussion of the technology and applicability of current loss reserving practices is beyond the scope of this statement. Selection of the most appropriate method of reserve estimation is the responsibility of the actuary. A competent actuary will ordinarily examine the indications of more than one method before arriving at an evaluation of an insurer's reserve liability for a specific group of claims.

Many useful works are available in actuarial and insurance accounting literature. Notable examples are contained in the reading list that follows this section. The reading list is not all inclusive. Some actuaries may be using valid techniques that are not documented in the literature.

It should be kept in mind that the definitions used in this statement are not necessarily consistent with the implied definitions in some of the articles contained in the reading list.

SUPPLEMENTAL READING LIST

GENERAL READING

1. Ruth Salzman, "Estimated Liabilities for Losses and Loss Adjustment Expenses", Chapter 3 of Robert Strain's *Property Liability Insurance Accounting* published by IASA (Insurance Accounting and Statistical Association) by The Merrit Company Insurors Press Products.

This chapter reduces reserving procedures to their basic elements. It also identifies and describes various quantification methods in general terms. Pages 29 to 48 are particularly applicable.

2. David Skurnick, "A Survey of Loss Reserving Methods", *PCAS (Proceedings of the Casualty Actuarial Society)*, Vol. LX, 1973, page 16.

This article, which covers both loss reserving and loss adjustment expense reserving, is a comprehensive and definitive survey, with commentary, of the important material published on reserving since 1933.

3. Michaelbacher, F. G. and Roos, N. R. *Multiple-Line Insurers, Their Nature and Operations*, pp. 181-202, McGraw-Hill Book Company (1970).

This is a general text recommended by the Casualty Actuarial Society as study material for its examinations.

CASUALTY ACTUARIAL SOCIETY

Most articles appearing in the *Proceedings of the Casualty Actuarial Society (PCAS)* are reviewed in the same volume or in the following volume by one or more members of the Society. The following articles are considered to include all discussions, although the page references refer only to the article.

1. Balcarek, R. J. "Reserves for Reopened Claims on Workmen's Compensation", *PCAS*, Vol. XLVIII, 1961, p. 1.
2. Balcarek, R. J. "Effect of Loss Reserve Margins in Calendar Year Results", *PCAS*, Vol. LII, 1966, p. 1.

This paper is not intended to describe a specific procedure or practice. It is intended to show the effect that haphazard variations in reserve adequacy can have on underwriting results.

3. Berquist, J. R. and Sherman, R. E. "Loss Reserve Adequacy Testing: A Comprehensive, Systematic Approach", *PCAS*, Vol. LXV, 1977.

4. Bornhuetter, R. L. and Ferguson, R. E. "The Actuary and IBNR", *PCAS*, Vol. LIX, 1972, p. 181.

5. Ferguson, R. E. "Actuarial Note on Workmen's Compensation Loss Reserves", *PCAS*, Vol. LVIII, 1971, p. 51.

Ferguson's paper is concerned with the proper use of annuity functions in determining the correct apportionment of Workmen's Compensation annuity type reserves between reinsurer and reinsured.

6. Fisher, W. H. and Lange, J. T. "Loss Reserve Testing: A Report Year Approach", *PCAS*, Vol. LX, 1973, p. 189.

7. Fisher, W. H. and Lester, E. P. "Loss Reserve Testing in a Changing Environment", *PCAS*, Vol. LXII, 1975, p. 154.

8. Harwayne, F. "Estimating Ultimate Incurred Losses in Auto Liability Insurance", *PCAS*, Vol. XLV, 1958, p. 63, and "Some Further Notes on Estimating Ultimate Incurred Losses in Automobile Liability Insurance", *PCAS*, Vol. XLVI, 1959, p. 59.

Although not concerned specifically with loss reserving, Harwayne's articles illustrate a mathematical approach to estimating ultimate claim costs.

9. McClenahan, C. L. "A Mathematical Model for Loss Reserve Analysis", *PCAS*, Vol. LXII, 1975, p. 134.

10. Resony, A. V. "Allocated Loss Expense Reserves", *PCAS*, Vol. LIX, 1972, p. 141.

11. Simon, L. J. "Distortion in IBNR Factors", *PCAS*, Vol. LVII, 1970, p. 64.

Simon's paper deals with the problem of estimating IBNR when exposures are expanding rapidly.

12. Tapley, D. A. "Month of Loss Deficiency Reserves for Automobile Bodily Injury Losses Including Reserves for Incurred But Not Reported Claims", *PCAS*, Vol. LXIII, 1956, p. 166.

13. Tarbell, T. F. "Incurred But Not Reported Claim Reserves", *PCAS*, Vol. XX, 1933, p. 275. Reprinted in *PCAS*, Vol. LVIII, 1971, p. 83.

INSURANCE ACCOUNTING AND STATISTICAL ASSOCIATION

1. Brian, R. E. "Formula Reserving for Loss Expense", *PIASA (Proceedings of the Insurance Accounting and Statistical Association)*, 1967, p. 498.

2. Petz, E. F. "Testing and Evaluating Loss Expense Reserves", *PIASA*, 1974, p. 693.

3. Sampson, R. D. "Establishing Adequacy of Reserves on Slow Closing Lines—Use of Paid Loss Formulae", *PIASA*, 1959, p. 306.

4. Scheibel, J. E. "Developments in Formula Reserving Methodology", *PIASA*, 1970, p. 550.

5. Singer, P. E. "IBNR Reserves Including Reopened Cases", *PIASA*, 1959, p. 240.

6. Slifka, R. S. "Testing of Loss Adjustment (Allocated) Expense Reserve", *PIASA*, 1968, p. 291.

SOCIETY OF ACTUARIES

Articles appearing in the *Transactions of the Society of Actuaries (TSA)* include all discussions in the same or subsequent volumes, although page references refer only to the article.

1. Bragg, J. M. "Health Insurance Claim Reserves and Liabilities", *TSA*, Vol. XVI, 1964, p. 17.

COMMITTEE ON LOSS RESERVES

Martin Adler
James R. Berquist
Warren P. Cooper
Charles A. Hachemeister
James A. Hall, III
Harry R. Richards
William A. Riddlesworth
Richard H. Snader
Donald E. Trudeau

REPORT OF THE SECRETARY

This year, as every year of late, the Casualty Actuarial Society Board of Directors and committees have been very active. As I sifted through some 800 pages of agendas, minutes and notes, it was very difficult to select those items that would inform the membership and yet not be overly long and boring.

As our Society increases in size, it is natural that the activity should also increase. More members means more people to be active in more areas. The challenges facing the CAS and the businesses we serve are getting more complex and changes are coming with ever increasing intensity and rapidity. These challenges have also required the participation by more of our members—and the CAS has risen to the challenge. If the last year needed a label, I would call it the year the CAS stepped out of itself and began to deal with our publics.

The Board met four times in 1978. March 13-14 at the Royal Orleans Hotel in New Orleans; May 21 at the Loews Paradise Island Hotel in the Bahamas; September 11-12 at Hilton Head, South Carolina; and November 15 at the Waldorf-Astoria in New York. In addition, some members of the Board met in Orlando on February 10-11 with the executive committees of the American Academy of Actuaries, the Conference of Actuaries in Public Practice, the Canadian Institute of Actuaries, the Fraternal Actuarial Association and the Society of Actuaries.

Besides the two regular meetings of the CAS, the membership was involved with the Society of Actuaries in a joint special interest meeting in New York on April 9-11. This may be one reason that the attendance at this meeting is the lowest for a fall meeting in the last five years. In addition, the five local affiliates of the CAS reported on well attended meetings and enthusiastic participation. The number of man-hours spent in committee meetings and writing reports must have set a new record although no one could keep an accurate count.

A few of the major activities of the year:

Reorganization of the actuarial profession in North America—This topic absorbed much time and effort of CAS members. The CAS has provided leadership in developing the issues. In so doing, others have been convinced that reorganization is not a solution to temporary problems in the profession. The CAS members on the Steering Committee on Reorganization, the Joint Committee on Committees and other joint committees have exerted a powerful and positive influence in the profession.

Certification of loss reserves for casualty companies was another important topic for 1978. CAS members as individuals and as members of CAS committees and American Academy members again raised the issues in public and private forums. The CAS booklet "Statement of Principles Regarding Property and Casualty Loss and Loss Adjustment Expense Liabilities" was part of this effort and is already in its second 1500 copy printing. The topic of certification has also brought needed debate among actuaries on defining the public policy roll of the profession, the exclusivity, or lack thereof, of the profession, the policing of the professional conduct of members and the independence of the actuary. All of these subjects have received greater emphasis this year, within and without the CAS.

Continuing education of members received greater attention this year. The Committee on Continuing Education took a larger roll in planning the programs and selecting participants for the spring and fall meetings, as well as a major roll in the joint special interest meeting with the Society of Actuaries in April. About 60 members of the CAS participated in panels, workshops and concurrent sessions of that meeting. Many other members attended that meeting. The "Call Paper" program at the Boca Raton meeting was judged a success and a second "Call Paper" meeting will be held at the Broadmoor next spring. Refresher study kits are being planned to aid members in increasing their knowledge through self-study. Questionnaires sent to members have aided in planning programs of interest and in getting panel members and leaders.

Education and examination of future members was a major area of effort. Besides the continuing process of refining the syllabus and examination procedures and grading, several other activities need mentioning. The local affiliates are providing valuable feedback from students on the form and substance of the exams. The Committee on Career Enhancement led a drive to collect funds for minority scholarships. Almost $7,000 had been collected by September of 1978. The CAS E. & E. Committee worked with the Society of Actuaries, the American Society of Pension Actuaries and the Joint Board for the Enrollment of Actuaries to produce a common basic actuarial exam for enrolled actuaries. This exam will be jointly sponsored and will become a part of the examination structure of the three actuarial bodies in 1980. The textbook on casualty contingencies should be published in the next year. The Actuarial Education and Research Foundation has accepted a CAS recommendation to sponsor the development of a textbook on loss distributions. Over $15,000 has been donated for this project so far. The CAS has appointed members to work with the Society of Actuaries to develop a new life contingencies textbook. An ad hoc committee to study the structure and functions of the E. & E.

Committee was formed to take a "Big Picture" look at the whole process. The Society of Actuaries will take over complete administration of Parts 1, 2 and 3 to relieve the CAS of this expense.

The Sites Committee, Editorial Committee, Committee on Review of Papers, and the Finance Committee were also busy with their important contributions to the CAS, which are more visible to the membership.

Thirty-six new Associates were admitted to the CAS during 1978, almost double the 20 new members admitted in 1977. Total membership now stands at 785 with 388 Fellows and 397 Associates. For the first time in several years, the number of candidates for examinations has decreased—3,255 in 1978 versus 3,443 in 1977.

As I leave the office of Secretary, I would also like to thank all of the officers, Board members, and committee chairmen for their help to me over the last three years. Without their help and that of Edee Morabito of the New York office and my own secretary Randy Pietroski, I could not have handled this assignment. I leave this office with mixed emotions as I give you my last—

Respectfully submitted,

DARRELL W. EHLERT
Secretary

REPORT OF THE TREASURER

The audited financial statement for the fiscal year ended September 30, 1978 showed assets of $222,886.14 up $14,922.53 for the year. Liabilities were $65,681.28 down $2,618.72. The major liabilities are examination expenses for jointly administered exams, printing expenses for the 1977 *Proceedings* and secretarial services provided to the CAS by the National Council on Compensation Insurance.

Membership equity increased $17,541.25 to $157,204.86. This amount includes the Michelbacher Fund of $32,218.45 up $3,328.59 for the year, the Dorweiler Fund $7,158.70 up $313.40 and Surplus of $117,827.71 up $13,899.26.

The Michelbacher and Dorweiler Funds were increased by interest earned and by $1,126.69 received as royalties on Mr. Michelbacher's books.

Surplus was increased primarily by sales of *Proceedings* exceeding estimates and through growth in the number of students signing up for examination parts four through ten.

One new investment was made during the year. In May, a one-year time savings account matured for $28,521.81 and $25,000 of this was placed in a U.S. Treasury Note paying 7.75% maturing on April 30, 1980. This plus our $100,000 note purchased last year paying 7.5% maturing in May 1981 are our principal investments.

The operating budget for next year has been set at the breakeven level. Both receipts and disbursements will be reduced by a procedural change which will result in examination fees for jointly administered exams being remitted directly to the Society of Actuaries' office. This will also reduce investment income slightly. The National Council's fee for secretarial services increased somewhat as we expect printing expenses will. Receipts should be higher in the dues and exam fees areas.

The level of membership dues will be unchanged. Fellowship dues are $70.00. Associateship dues are $50.00 for the first five years and $70.00 thereafter. Residents outside the United States and Canada will pay $50.00.

The Casualty Actuarial Society is involved with the Society of Actuaries in a jointly sponsored program to encourage actuarial careers among qualified minority students. As a result of a solicitation made to property-casualty companies, $6,900

was raised which will be used to further the announced goals of the program. The amount received for the scholarship program has been set up in a special fund which does not affect our operating accounts, budget or surplus.

The CAS is still looking for a way to permit those wishing to make a contribution to the Society to receive a tax deduction for doing so. Consistent with this goal, we have filed with the IRS to establish a trust, to be known as the Casualty Actuarial Society Trust, which will qualify for exemption under Code Section 501(c)(3). The proposed effective date of the Trust is 1-1-79. We will inform the membership when approval is received from the IRS.

Respectfully submitted,

WALTER J. FITZGIBBON, JR.
Treasurer

FINANCIAL REPORT

FOR FISCAL YEAR ENDED SEPTEMBER 30, 1978

INCOME

Dues	$ 40,306.22
Exam fees	70,499.93
Meetings and registration fees	37,821.25
Sale of *Proceedings*	13,795.82
Sale of Readings	2,330.92
Invitational program	3,377.00
Interest	10,024.71
Actuarial Review	266.40
Miscellaneous	-176.72
Total	$178,245.53

DISBURSEMENTS

Printing and stationery	$ 37,991.62
Secretary's office	39,485.03
Examination expenses	43,020.85
Meeting expenses	39,817.03
Library	36.12
Math. Assoc. of America	1,500.00
Insurance	1,763.00
Miscellaneous	732.62
Total	$164,346.27

Increase in surplus	$ 13,899.26

ACCRUAL BASIS ACCOUNTING STATEMENT
AS OF SEPTEMBER 30, 1978

ASSETS	9/30/77	9/30/78
Bank accounts	$ 97,025.61	$ 89,277.71
U.S. Treasury Bond	4,325.00	4,325.00
U.S. Treasury Notes	99,535.00	124,535.00
Accrued income	7,078.00	4,748.43
	$207,963.61	$222,886.14
LIABILITIES, SURPLUS AND OTHER FUNDS		
LIABILITIES		
Secretarial services	0	10,371.70
Printing expenses	43,835.00	28,500.00
Examination expenses	17,265.00	18,735.00
Actuarial Educ. & Research Fund	5,000.00	0
Joint Minority Scholarship Program	2,000.00	0
Meeting expenses	0	974.58
Minority Education Fund	0	6,900.00
Other	200.00	200.00
	$68,300.00	$65,681.28
MEMBERS' EQUITY		
Michelbacher Fund	$ 28,889.86	$ 32,218.45
Dorweiler Fund	6,845.30	7,158.70
Surplus	103,928.45	117,827.71
	$139,663.61	$157,204.86
Total	$207,963.61	$222,886.14

WALTER J. FITZGIBBON, JR.
Treasurer

* * * * * *

This is to certify that the assets and accounts shown in the above financial statement have been audited and found to be correct.

Financial Committee
R. B. Foster, Chairman
H. E. Curry
S. L. Perreault
P. A. Verhage

1978 EXAMINATIONS—SUCCESSFUL CANDIDATES

Examinations for Parts 4, 6, 8 and 10 of the Casualty Actuarial Society Syllabus were held May 3 and 4, 1978 and examinations for Parts 5, 7 and 9 were held November 2 and 3, 1978. Parts 1, 2 and 3, jointly sponsored by the Casualty Actuarial Society and the Society of Actuaries were given in May and November. Those who passed Parts 1, 2 and 3 were listed in the joint releases of the two Societies sent out in July 1978 and January 1979.

The Casualty Actuarial Society and the Society of Actuaries jointly award prizes to the undergraduates ranking highest on the General Mathematics examination.

The winner of the $200 prize for the May 1978 examination was Philip N. Strenski. $100 prizes were awarded to Howard J. Marans, Michael E. Neiderfer, Joseph M. Sher, and Michael L. Stein. The $200 prize was awarded to Joshua D. Bernoff for the November 1978 examination. The additional $100 prize winners were Howard J. Karloff, Dennis J. Monaco, Denise M. Ridolfi, and Tim J. Steger.

The following candidates successfully completed the requirements for Fellowship and Associateship in the May 1978 Examinations.

NEW FELLOWS

Bell, Linda L.
Beverage, Richard M.
Cheng, Laurence W.
Fagan, Janet L.
Irvan, Robert P.
Neidermyer, James R.
O'Brien, Terrence M.
Patrik, Gary S.
Pearl, Marc B.
Reynolds, John J., III
Sherman, Richard E.
Swift, John A.
Venter, Gary G.
Wiser, Ronald F.
Wood, Charles P., Jr.

NEW ASSOCIATES

Baer, Debra L.
Brooks, Dale L.
Corr, Francis X.
Currie, Ross A.
Davis, Lawrence S.
Gaillard, Mary B.
Henry, Dennis R.
Johnson, Marvin A.
Perry, Loren A.
Philbrick, Stephen W.
Pulis, Ralph S.
Taranto, Joseph V.
Urschel, Frederick A.

1978 EXAMINATIONS

Following is a list of successful candidates in the examinations held in May 1978

Part 4

Abramson, Gary R.
Allin, Larry V.
Bashline, Donald T.
Bear, Robert A.
Berens, Regina M.
Bertrand, Francois
Biller, James E.
Brandt, Maynard A.
Burger, George
Camp, Jeanne H.
Campbell, Catherine J.
Cheng, C. Phillip
Cimini, Edward D., Jr.
Cohen, Elliot J.
Cohen, Howard L.
Connell, Eugene C.
Crete, Jean-Louis
Dawson, John
Dean, Curtis G.
Dornfeld, James L.
Douglas, Frank H.
Easton, Richard D.
Edwalds, Thomas P.
Ehrlich, Warren S.
Engles, David
Faix, Paul J.
Faltas, Bill
Foster, Robert G.
Friedberg, Bruce F.
Goldfarb, Irwin H.
Gorman, Deborah A.
Gottheim, Eric F.
Hale, Jonathan B.
Hallstrom, Robert C.
Halpert, Aaron
Hayne, Roger M.
Hennessy, Mary E.
Herder, John M.
Hibberd, William J.
Hu, David D.
Jacobus, Jay A.
Jaso, Robert J.
Johnson, Judy A.
Johnson, Richard E.
Klawitter, Warren A.
Koch, Leon W.
Kolk, Stephen L.
Kollmar, Richard
Lafrance, Jacques
Lange, Dennis L.
Larsen, Michael R.
Lederman, Charles M.
Leong, Winsome
Linden, Orin M.
Lobosco, Virginia R.
Mahler, Howard C.
Martin, Paul C.
McGovern, Eugene
Mealy, Dennis C.
Miller, Ronald R.
Milligan, Alfred W.
Montigney, Brian A.
Moody, Andrew W.
Moore, Gregory A.
Morgan, William S.
Ogden, David F.
Pachyn, Karen A.
Pastor, Gerald H.
Pelly, Brian G.
Philbrick, Stephen W.
Pinto, Emanuel
Porto, Edward J.
Prill, Donna A.
Pruiksma, Glenn J.
Ransom, Gary K.
Rau, Frank J., Jr.
Sansevero, Michael, Jr.
Sarosi, Joseph F.
Seguin, Louis G.
Sherman, Ollie L., Jr.
Stadler-Hrbacek, Elisabeth
Stanco, Edward J.
Tohno, Tetsuo
Tucker, Warren B.
Varca, John J.
Vitale, Lawrence A.
Walker, Glenn M.
Wasserman, David L.
Watkin, Mark
Wess, Clifford
Wiseman, Michael L.
Yonkunas, John P.
Youngerman, Hank
Yuan, Hui-Lin
Yunque, Mark A.
Zicarelli, John D.

Part 6

Austin, John P.
Baer, Debra L.
Brooks, Dale L.
Brown, Nicholas, Jr.
Brutto, Richard S.
Callahan, James J.
Christie, James K.
Corr, Francis X.
Cundy, Richard M.
Currie, Ross A.
Davis, Lawrence S.
Dodd, George T.
Duffy, Thomas J.
Dussault, Claude
Edie, Grover M.
Eramo, Robert P.
Evans, Glenn A.
Feeley, Elaine E.
Fiebrink, Dianne C.
Foote, James M.
Furst, Patricia A.
Gaillard, Mary B.
Ghezzi, Thomas L.
Hanover, Richard F.
Henry, Dennis H.
Henry, Dennis R.
Higgins, Barbara J.
Horowitz, Bertram A.
Jameson, Stephen
John, Russell T.
Johnson, Marvin A.
Kleinman, Joel M.
LaRose, J. Gary
Lee, Yoong S.
Limpert, John J.
Liuzzi, Joseph R.
Lo, Richard W.
Lotkowski, Edward P.
Mahler, Howard C.
Mathewson, Stuart B.
Mueller, Conrad P.
Murphy, William F.
Niswander, Ray E.
Pelletier, Charles A.
Perry, Loren A.
Pulis, Ralph S.
Ragan, Evelyn T.
Robertson, John P.
Sawyer, Sally W.
Taranto, Joseph V.
Taylor, Thomas F.
Truttmann, Everett J.
Urschel, Frederick A.
Weaver, James C.
Wilson, Randall J.
Woods, Patrick B.
Youngner, Ruth E.

Part 8

Alfuth, Terry J.
Bartlett, John W.
Bayley, Thomas R.
Bealer, Donald A.
Belvin, William H.
Beverage, Richard M.
Bradley, David R.
Christiansen, Stephan L.
Conger, Robert F.
Crowe, Patrick J.
Dahlquist, Ronald A.
DiBattista, Susan B.
Ford, Edward W.
Haner, Walter J.
Herzfeld, John
Ingco, Aguedo M.
Johnston, Thomas S.
Kozik, Thomas J.
Lombardo, John S.
Lowe, Stephen P.
Marino, James F.
McCarter, Michael G.
McConnell, Charles W., II
McHugh, Ronald J.
Meeks, John M.
Meyer, Robert E.
Meyers, Glenn G.
Miller, Robert A., III
Morell, Roy K.
Nash, Russell K.
Neidermyer, James R.
Nickerson, Gary V.
Philbrick, Stephen W.
Pratt, Joseph J.
Purple, John M.
Reichle, Kurt A.
Roth, Richard J., Jr.
Rowland, William J.
Schneider, Harold N.
Shayer, Natalie
Silberstein, Benny
Venter, Gary G.
Weissner, Edward W.
Westerholm, David C.
White, Frank T.
Wisecarver, Timothy L.

Part 10

Aldorisio, Robert P.
Asch, Nolan E.
Bass, Irene K.
Beer, Albert J.
Bell, Linda L.
Beverage, Richard M.
Bishop, Everett G.
Buck, James E., Jr.
Cheng, Laurence W.
Degerness, Jerome A.
Dolan, Michael C.
Eddy, Jeanne H.
Fagan, Janet L.
Irvan, Robert P.
Kolojay, Timothy M.
Lattanzio, Francis J.
Ledbetter, Alan R.
Miller, Michael J.
Oakden, David J.
O'Brien, Terrence M.
Patrik, Gary S.
Patterson, David M.
Pearl, Marc B.
Pierce, John
Reynolds, John J., III
Rosenberg, Martin
Sherman, Richard E.
Swift, John A.
Taylor, Frank C.
Teufel, Patricia A.
White, Frank T.
Wiser, Ronald F.
Wood, Charles P., Jr.

The following candidates successfully completed the requirements for Fellowship and Associateship in the November 1978 Examinations.

NEW FELLOWS

Aldorisio, Robert P.
Asch, Nolan E.
Bartlett, William N.
Bishop, Everett G.
Buck, James E., Jr.
Degerness, Jerome A.
Dorval, Bernard
Eddy, Jeanne H.
Eland, Douglas D.
Hafling, David N.
Hoylman, Douglas J.
Jean, Ronald W.
Jerabek, Gerald J.
Lehmann, Steven G.
Nelson, Janet R.
Newlin, Patrick R.
Oakden, David J.
Pierce, John
Schumi, Joseph R.
Shoop, Edward C.
Stergiou, Emanuel J.
Taylor, Frank C.
Teufel, Patricia A.

NEW ASSOCIATES

Austin, J. Paul
Belvin, William H.
Biller, James E.
Christie, James K.
Cundy, Richard M.
DiBattista, Susan T.
Drummond-Hay, Eric T.
Duffy, Thomas J.
Dussault, Claude
Evans, Glenn A.
Foote, James M.
Furst, Patricia A.
Ghezzi, Thomas L.
Harrison, Eugene E.
Heckman, Philip E.
Higgins, Barbara J.
Jameson, Stephen
Javaruski, John J.
Johnston, Thomas S.
Kleinman, Joel M.
Lafontaine, Gaetane
Lo, Richard W.
Lotkowski, Edward P.
Mahler, Howard C.
Mathewson, Stuart B.
McConnell, Charles W., II
McGovern, William G.
Mulder, Evelyn T.
Murphy, Francis X., Jr.
Myers, Nancy R.
Nickerson, Gary V.
Niswander, Ray E., Jr.
Parker, Curtis M.
Robertson, John P.
Rowland, William J.
Schwartz, Allan I.
Wilson, Randall J.
Zicarelli, John D.

1978 EXAMINATIONS

Following is a list of successful candidates in the examinations held in November 1978.

Part 5

Amundson, Richard B.
Austin, J. Paul
Berens, Regina M.
Bertrand, Francois
Boison, Leroy A., Jr.
Brown, Robert L.
Camp, Jeanne H.
Campbell, Catherine J.
Chernick, David R.
Chou, Li-Chuan
Ciezadlo, Gregory J.
Cimini, Edward D., Jr.
Clark, David G.
Clinton, R. Kevin
Colvin, Samuel P.
Dean, Curtis G.
DeLiberato, Robert V.
Doellman, John L.
Doran, Phyllis A.
Douglas, Frank H.
Doyle, Michael J.
Easton, Richard D.
Edwalds, Thomas P.
Engles, David
Erie, Steven L.
Fahrenbach, Jack
Faix, Paul J.
Fallon, Patricia D.
Fiebrink, Dianne C.
Fitz, Loy W.
Fitzpatrick, Kathleen M.
Friedberg, Bruce F.
Friedman, Howard H.
Gannon, Alice A.
Gogol, Daniel F.
Gorman, Deborah A.
Greco, Ronald E.
Hale, Jonathan B.
Halpern, Nina S.
Hayne, Roger M.
Heller, David M.
Howard, C. Douglas
Huber, Debra S. R.
Johnson, Judy A.
Kelly, Martin K.
Lally, Mary-Ellen
Lange, Dennis L.
Larsen, Michael R.
Lee, Stephen
Leo, Carl J.
Leong, Winsome
Leung, Kung L.
Lobosco, Virginia R.
Ludwig, Stephen J.
Lynch, John J.
Malik, Sudershan K.
Mealy, Dennis C.
Mellia, Joanne C.
Miller, Ronald R.
Moeller, Victoria L.
Montigney, Brian A.
Moody, Andrew W.
Muleski, Robert T.
Munt, Donna S.
Murphy, Edward J., Jr.
Murphy, William F.
Murr, Rebecca A.
Newton, Brian R.
Nichols, Richard W.
Nikstad, James R.
Ostergren, Gregory V.
Pachyn, Karen A.
Pelletier, Bernard A.
Pence, Clifford A., Jr.
Priester, David C.
Pruiksma, Glenn J.
Remis, David E.
Ryan, John P.
Scott, Diane D.
Seguin, Louis G.
Sherwood, Douglas L.
Silverman, Mark J.
Stiefel, Stanley M.
Suchoff, Stuart B.
Tom, Darlene P.
Visner, Steven M.
Vitale, Lawrence A.
Wade, John E.
Walker, David G.
Walker, Leigh M.
Washburn, Monty J.
Weidman, Thomas A.
Withers, David A.
Yunque, Mark A.
Zolnowski, Raymond M.

Part 7

Bashline, Donald T.
Beer, Albert J.
Belvin, William H.
Biller, James E.
Boyd, Lawrence H.
Brown, Nicholas M.
Burg, David R.
Christiansen, Stephan L.
Christie, James K.
Cohen, Howard L.
Connell, Eugene C.
Cundy, Richard M.
Dawson, John
DeConti, Michael A.
DeGarmo, Lyle W.
Demers, Daniel
DiBattista, Susan T.
Driedger, Karl H.
Drummond-Hay, Eric T.
Duffy, Thomas J.
Dussault, Claude
Eddy, Jeanne H.
Evans, Glenn A.
Flanagan, Terrence A.
Foote, James M.
Furst, Patricia A.
Ghezzi, Thomas L.
Giambo, Robert A.
Gottheim, Eric F.
Hallstrom, Robert C.
Harrison, Eugene E.
Heckman, Philip E.
Heersink, Agnes H.
Hennessy, Mary E.
Herder, John M.
Herzfeld, John
Hibberd, William J.
Higgins, Barbara J.
Horowitz, Bertram A.
Hu, David D.
Jameson, Stephen
Javaruski, John J.
Jerner, Donald C.
Johnson, Larry D.
Johnston, Thomas S.
Judd, Steven W.
Kleinman, Joel M.
Knilans, Kyleen
Kozik, Thomas J.
Lafontaine, Gaetane
LaRose, J. Gary
Lederman, Charles M.
Lee, Young S.
Limpert, John J.
Lo, Richard W.
Lotkowski, Edward P.
Mahler, Howard C.
Mathewson, Stuart B.
McConnell, Charles W., II
McDaniel, Gail P.
McGovern, William G.
Mulder, Evelyn T.
Murphy, Francis X., Jr.
Nickerson, Gary V.
Niswander, Ray E., Jr.
O'Neil, Mary L.
Parker, Curtis M.
Pastor, Gerald H.
Pei, Kai-Jaung
Piersol, Kim E.
Racine, Andre R.
Ransom, Gary K.
Robertson, John P.
Roman, Spencer M.
Rosa, Domenico
Rosenberg, Martin
Rowland, William J.
Ryan, John P.
Sansevero, Michael, Jr.
Schott, Barbara
Schwartz, Allan I.
Sherman, Ollie L., Jr.
Sobel, Mark J.
Taylor, Frank C.
Varca, John J.
Waldman, Robert H.
Walker, Glenn M.
Wasserman, David L.
Wess, Clifford
Westerholm, Sharon W.
Wilson, Randall J.
Wolf, Philip M.
Yatskowitz, Joel D.

Part 9

Aldorisio, Robert P.
Asch, Nolan E.
Baer, Debra L.
Bartlett, William N.
Bayley, Thomas R.
Bishop, Everett G.
Brown, Joseph W., Jr.
Buck, James E., Jr.
Cheng, Joseph S.
Cis, Mark M.
Conger, Robert F.
Covney, Michael D.
Dahlquist, Ronald A.
Degerness, Jerome A.
Dorval, Bernard
Egnasko, Gary J.
Eland, Douglas D.
Faga, Doreen S.
Ford, Edward W.
Hafling, David N.
Henry, Dennis R.
Hoylman, Douglas J.
Jean, Ronald W.
Jerabek, Gerald J.
Kist, Frederick O.
Lattanzio, Stephen P.
Lehmann, Steven G.
Lerwick, Stuart N.
Lowe, Stephen P.
Meeks, John M.
Miccolis, Jerry A.
Miccolis, Robert S.
Moore, Bruce D.
Morgan, Stephen T.
Nash, Russell K.
Nelson, Janet R.
Newlin, Patrick R.
Oakden, David J.
Philbrick, Stephen W.
Pierce, John
Schumi, Joseph R.
Shoop, Edward C.
Shrum, Roy G.
Stergiou, Emanuel J.
Teufel, Patricia A.
Thibault, Alain P.
Tierney, John P.
Torgrimson, Darvin A.
Tuttle, Jerome E.

OBITUARIES

Walter C. Green
1978

Walter C. Green, an Associate of the Casualty Actuarial Society died October 7, 1978. Mr. Green became an Associate of our Society in 1927.

In addition to the Casualty Actuarial Society, he was also an Associate of the Society of Actuaries, a member of the American Academy, and also a Fellow of the Conference of Actuaries in Public Practice and the Fraternal Actuarial Association.

Mr. Green was a long time resident of the Salt Lake City area, working in the W. C. Green and Associates Consulting Actuarial firm until his retirement. Following his retirement, he continued to live in the Salt Lake City area.

Joseph Linder
1901-1978

Joseph Linder, a fellow of the Casualty Actuarial Society, died April 12, 1978. After completing his Fellowship in 1924, Mr. Linder spent his actuarial career as a Consulting Actuary. He became an Associate in the Society of Actuaries in 1929, and was also a Fellow of the Conference of Actuaries in Public Practice, and a Charter Member of the American Academy of Actuaries.

Mr. Linder was employed by Woodward, Fondiller and Ryan in 1924, and became a partner in 1930. After a brief stay with merchants Mutual Casualty Company in 1932, he joined the actuarial firm of S.H. and Lee J. Wolfe in New York. He became a partner in that firm in 1938, and stayed with that firm and its successor, Wolfe, Corcoran & Linder until 1964. In 1965 he became affiliated with A. S. Hansen, Inc.

Mr. Linder held offices in the Society on several occasions including two terms as Vice President. He wrote two papers and also contributed several reviews and discussions.

Kenneth R. Ori
1943-1977

Kenneth R. Ori, an Associate of the Casualty Actuarial Society died November 16, 1977. Ken was raised in Illinois and received his bachelors degree from Illinois State University. He received a masters degree in mathematics from Illinois State University in 1968. In addition, Ken also did one year of additional graduate work at the University of Arizona.

Mr. Ori joined State Farm Insurance Company in 1969, eventually rising to Assistant Actuary prior to his leaving the company in 1977.

Joseph A. Plunkett
1931-1978

Joseph A. Plunkett, an Associate of the Casualty Actuarial Society, died March 22, 1978. He became an Associate of our Society in 1967.

Mr. Plunkett was a 1952 graduate of Notre Dame. Following graduation he served in the U.S. Marine Corps attaining the rank of First Lieutenant.

He joined American Re-Insurance Company in 1964 after having extensive experience in the insurance industry. He served as head of the Company's Actuarial operation before assuming the position of Chief Underwriting Officer.

Mr. Plunkett is survived by his wife and two sons.

NEW ASSOCIATES ADMITTED MAY 1978: Front Row left to right: James D. Hurley, Michael A. McMurray, Jerome E. Tuttle, Michael A. LaMonica, John M. Purple, President P. A. Williams, William F. Wilson, Robert F. Conger, Mark Whitman, Michael R. Antolino, Jr., Frank T. White. Back Row left to right: Jonathan White, John W. Bartlett, Gary J. Egnasko, Alain P. Thibault, Stuart N. Lerwick, Mark A. Doepke, William R. Andrus, Timothy L. Wisecarber, Guy Cloutier, Edward W. Ford, Edward W. Weissner, Russel K. Nash, Donald P. Skrodenis.

NEW FELLOWS ADMITTED MAY 1978: Front Row left to right: Joseph O. Marker, Urban E. Leimkuhler, Owen M. Gleeson, Wayne R. Ashenberg, Albert J. Quirin, Kenneth R. Frohlich, President P. A. Williams, Jane C. Taylor, Richard I. Fein, David E. Renze, George G. Gertles. Back Row left to right: Bruce Petersen, Timothy L. Graham, Steven Petlick, Bruce C. Bassman, Thomas M. Hermes, Robert A. Daino, Albert B. Carbaugh, David L. Miller, Thomas L. Gallagher, Patrick J. Grannan, Peter L. Lindquist. Roger W. Bovard, Walter C. Wright, III. Not present were: Donald J. Eldridge, Philip L. Engel, Richard C. Ernst.

NEW ASSOCIATES ADMITTED NOVEMBER 1978: Front Row left to right: Dale L. Brooks, Debra L. Baer, Mary B. Gaillard, Ralph S. Pulis, Ross A. Currie. Back Row left to right: Loren A. Perry, Marvin A. Johnson, President P. A. Williams, Frederick A. Urschel, Dennis R. Henry, Francis X. Corr, Joseph V. Taranto. Not present were: Lawrence S. Davis and Stephen W. Philbrick.

NEW FELLOWS ADMITTED NOVEMBER 1978: Front Row left to right: Marc B. Pearl, John J. Reynolds, III, Gary S. Patrik, Janet L. Fagan, Linda L. Bell, Laurence W. Cheng, Terrence M. O'Brien. Back Row left to right: Richard E. Sherman, James R. Neidermyer, John A. Swift, Robert P. Irvan, President P. A. Williams, Richard M. Beverage, Ronald F. Wiser, Charles P. Wood, Jr. Not present Gary G. Venter.

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