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PROCEEDINGS

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AN INTRODUCTION TO THE NEGATIVE BINOMIAL DISTRIBUTION AND ITS APPLICATIONS

BY
LEROY J. SIMON

I. OBJECTIVE

The description, interpretation, and curve fitting of the negative binomial distribution has become a topic of great interest to American acturaries in the last few years. What is it? Where did it come from? What does it mean? How can it be used? These and many other questions have been asked by all of us. The first thing to do, of course, is to check the textbooks and references in our personal libraries. After this has been done, some questions may still remain or some new ones brought to mind.

The purpose of this paper is to present a bibliography selected especially for actuaries from the hundreds of papers and texts that deal with the subject, to organize the material, and to make a few comments on each reference so that the interested reader may choose those references which are of particular interest to him and study them in detail. Two mechanical models are also described which may be used by the reader to actually generate negative binomial distributions.

II. THE FUNDAMENTALS

If only one paper can be read, it should be Arbous and Kerrich.[1] The first part is a critical evaluation and gives a good description in non-mathematical terms of the accident proneness concept. The significant literature on the subject up to 1951 is reviewed. These authors force us to separate the concepts of accident proneness and accident liability. Accident proneness is an attribute of the individual which does not fluctuate and does not tend to increase or decrease over a long period of time. Accident liability includes accident proneness plus the effects of age, experience, fatigue, emotional state, general health, and so forth. In the mathematical section of the paper the negative binomial is developed and discussed from two viewpoints. If

[1] See Appendix A "Selected Bibliography" for complete citation of this and other references throughout the paper.

we assume that accidents happen in the form of a Poisson distribution for each isohazardous group, and that these groups appear in the population with a relative frequency which is distributed in the form of a Pearson Type III curve, then the distribution of the number of persons having 0, 1, 2, ... accidents will be in the shape of a mathematical curve which has been given the name "negative binomial distribution." A second method for deriving this distribution is to assume that everyone starts out with the same propensity toward having an accident which remains constant until an accident occurs. When an accident does occur, the future probability for that individual is changed. This development also leads to a negative binomial curve. The paper ends with a very good discussion of the bivariate negative binomial and its relationship to accident proneness. More will be said about this approach in Section VI of this paper.

A somewhat shorter presentation and review of the field has been made by Fitzpatrick. This paper gives a good, compact, and essentially non-mathematical description of various work that has been done on the accident susceptibility problem. It also contains an extensive list of references to papers which have utilized this curve.

Kendall and Stuart develop the negative binomial in two ways. The more interesting method is in discussing sequential sampling when the objective is to continue sampling until a certain number of successes has been achieved. The number of items sampled will then follow a negative binomial distribution.

In insurance terminology, Bichsel develops the negative binomial using the Poisson and Pearson Type III curves. Although the paper is in French,[2] the mathematical development can be readily followed. The insurance data are of special interest, being based on automobile accidents occuring to cars insured by a Swiss company. The conclusions drawn by Bichsel do not coincide completely with current American practices, but seem to follow from the limited sample and his very conservative assumptions on safety factors.

The development most familiar to readers of this journal is that of Dropkin (1959). This paper again uses the Poisson and Pearson Type III approach and gives examples of curve fitting to California automobile accident data. The paper also discusses the overlap between various subgroups in the study.

In an attempt to bridge the gap of intuitive feel for the negative binomial, Simon (1960) discussed the curve using the more familiar Poisson as a referent.

III. EARLY ORIGINS

Greenwood and Yule presented the basic paper which developed the theory into a mathematical model and tested it on actual accident data. This paper is a classic and is referred to by many authors. For example, Kendall and Stuart (referred to in Section II) summarize this paper very well and give the data that Greenwood and Yule used.

During the ensuing years, a number of authors followed this 1920 development and utilized this curve in describing accident phenomena. They dealt primarily with industrial accidents and were concerned, in many cases, with the psychological and sociological problems connected with the accident proneness phenomenon. If different people had a different accident prone-

[2] I have a few copies of an English translation and permission has been obtained for limited distribution.

ness, we might improve safety if we could detect it or if we could change it.

The first work in actuarial literature that has come to my attention involving the negative binomial was by Keffer in 1929 in connection with a group life experience rating plan. He developed the theory in relationship to the relative dispersion of loss ratios about their true mean. In replying to the written discussion which followed the paper he developed the equations for the mean and variance and commented on the fact that the variance exceeded that of the Poisson distribution in a manner which he interpreted to indicate the heterogeneity of the data.

A. L. Bailey first utilized the negative binomial in the Proceedings of the Casualty Actuarial Society in 1950. He compounded the Poisson with a Pearson Type III as one of the special cases in his presentation. Although the curve is referred to variously as a negative binomial, compound Poisson, contagious, Polya-Eggenberger or an accident proneness distribution, neither Mr. Bailey nor Mr. Keffer used any of these terms in their papers.

IV. APPLICATIONS

There are numerous applications of the negative binomial in the literature. Almost all of the previously mentioned papers contain one or more examples as part of the paper itself.

Bliss presents twenty-two frequency distributions of biological data and fits negative binomials to them. The paper is excellent for many reasons in addition to the data presented. First, it gives a clear explanation of the curve using the (positive) binomial distribution as a starting point. Then three methods of fitting the curve are presented: (a) using the method of moments and the mean and variance of the observed data, (b) using a very straightforward method based on the mean and the number of zero cases, (c) using the method of maximum likelihood. Two methods are discussed for testing the goodness of fit (1) the usual χ^2 and (2) a test of the third moment of the sample compared to the value predicted from the first two moments. This is of particular interest when the tail of the curve is rather short as we often find it in insurance data. Finally, a rather unusual method of developing the negative binomial is illustrated wherein the number of bacterial colonies per microscopic field follows the Poisson distribution in repeated sampling while the number of bacteria per colony follows a logarithmic distribution. In combination, the number of bacteria per field follows the negative binomial.

Another non-insurance application is by Wise who considers a quality control problem. It was possible to assume that defects occurred at random and in a Poisson manner in each batch of the material to be sampled. Different batches had a different expectation of the mean number of defects. These two facts were compounded to produce a negative binomial distribution which was used to establish the quality control limits for the process.

A very thorough study of motor accidents by Häkkinen was done as a doctoral dissertation. Not only does he comment on the mathematical aspects, but he also goes into a number of intelligence, mechanical aptitude, coordination and psychomotor tests in an attempt to isolate specific factors which lead to higher accident rates among certain individuals.

Finally, the papers of Delaporte and Thyrion, although written in French, are still easy to follow in the mathematical developments and present interesting data. In his review of the latter paper, Beard almost casually produces three bivariate negative binomial distributions (see Section VI for further discussion).

V. MODELS

It is often helpful to have some type of operating model to assist in understanding a mathematical formula. To further assist in getting an intuitive feeling for the negative binomial, two simple models have been devised. The first is to throw a six-sided die numbered as usual, and count the number of throws needed to produce six successes where a success will be defined as a "1", "2", "3" or "4" appearing face up. The distribution resulting from repeated trials of this experiment will be in the form of a negative binomial distribution. This model is suggested by the mathematical development of Feller (1957). In an experiment involving this model, about 7300 throws of a die were made and a total of six successes was achieved 809 times. The distribution is shown in Appendix B along with the theoretical expectation.

A more elaborate model was constructed to create something that may be easier to visualize as an insurance situation. Rule off a sheet of paper into S squares. Get D paper disks such as the disks punched out by an ordinary paper punch. The diameter of the disks should be small compared to the length of one side of the square. Drop the disks one at a time from a sufficient height to negate any tendency to clustering and record the distribution of the number of squares having 0, 1, 2, . . . disks on them. The resulting distribution will be in the form of the Poisson distribution. Conduct two separate experiments of this nature, the first involving 361 squares and 36 disks (representing a large group of insureds with an accident frequency of .100), and a second experiment with 49 squares and 31 disks (representing a small group of insureds with the high loss frequency of .633). Combine the results of each subsample into s single combined sample. The actual results of such an experiment conducted ten times by the author is shown in Appendix C. In repeated sampling the distribution will tend toward the probabilities shown in the theoretical column. Finally, the last column indicates the unusually close agreement with the well-known California data, which appears in Dropkin (1959) page 174. This model was suggested by David.

VI. ADVANCED TOPICS

The property and casualty actuary may find a number of extended uses of the negative binomial distribution. To properly capitalize on these, however, will require more advanced study. Some extensions of Dropkin's original paper have been made already in our Proceedings. Dropkin (1960) introduces the time element specifically into the formulas and discusses the distribution of accidents in subsequent years, given the number of accidents in some previous time period. Hewitt (1960, pp. 55-65) additionally develops expectations for the claim frequency next year, given that the person has been claim-free for 0, 1, 2 or 3 or more years. He then gets close fits to actual Canadian automobile statistics with these formulas. Simon (1961) discussed the problem of truncated distributions. In insurance this might arise when the number of claim-free insureds is not available but the distribution of policies having claims can be obtained. This paper also discusses the maximum likelihood method in fitting negative binomial curves.

An interesting and different extension was made by Hewitt (1960, pp. 41-54) when he considered the problem of mortality curve fitting over the entire life range. The negative binomial was utilized here as one of the factors.

In a highly developed mathematical-statistical presentation, Lundberg sets forth the basic tenets of random processes. The first chapter is of particular interest in its lucid description of the Polya-Eggenberger distribution through the use of an urn model where each time a black ball is drawn, a number of black balls is added to the urn and each time a white ball is drawn a number of white balls is added to the urn. This approach is then extended to a concept of a continuous set of samplings by the passage to the limit in such a fashion that (1) the number of drawings times the initial probability of success remains constant in the manner of the Poisson limit and (2) the number of drawings times the proportion of colored balls added after each drawing remains constant (i.e., there is a continuous flow of change in the probability of success as time progresses). Finally, the accident proneness approach using the Pearson Type III is shown and the two developments are demonstrated to be identical in their resulting distributions. The last chapter of the book applies the theories to accident and sickness data on the number of claims made by the same individual.

In a strictly mathematical development, Feller (1943) ties together developments by a number of authors and presents a general distribution function for combining a Poisson with any other desired distribution for inherent hazard. He then shows conditions which lead to the Polya-Eggenberger distribution and the contagious distribution. The nice, general way in which this subject is presented makes the paper valuable reading.

A very interesting approach to the analysis of data is given by Mintz when he studies the elapsed time between successive accidents. His purpose is to see if there is an indication that the time interval between successive accidents decreases with each accident. If it did, he would conclude that accident susceptibility increased for the individual with each successive accident. Conversely, if the time interval tended to increase, he would conclude that having an accident decreases the future accident susceptibility. He did not observe either effect and therefore concluded that we should retain the theory of proneness and that the individual's proneness remains relatively constant. The study was based on one year's experience of taxi drivers. There is reason to suspect that a longer period and a study of the car (under a private passenger insure-the-car automobile policy), rather than the individual driver, would probably show that inherent hazard of the car did not remain nearly so constant as the proneness of the individual. However, that is a different problem from the one being considered by Mintz, and does not detract from that work.

Bartlett's development of the negative binomial through reference to Markov chains is thought-provoking. He develops it as a "birth" process, and assuming the transition probability from one state to the next in the Markov chain increases linearly in proportion to the state that the process has reached. In accident terminology, it means that the chance of an additional accident (the next step in the Markov chain) depends upon the number which have already occurred (that is, the state the process has reached). This is the "contagion" effect and acts as a good reminder to actuaries that the negative binomial may be developed by a multiplicity of methods, only one of which is the accident proneness approach.

The bivariate negative binomial provides one of the more interesting topics for advanced study by actuaries. As previously mentioned, Arbous and Kerrich close their paper with a discussion of this two-dimensional curve. It simply means, of course, that if you take two different periods of time and tabulate, in a two-way table, the accident experience of a group that has a bivariate negative binomial distribution, each row and each column will be distributed as a (univariate) negative binomial. This approach is particularly appropriate to insurance where we are classifying people on the basis of past experience and then predicting (through rate differentials) what the future experience in these various groups will be.

A particularly startling realization of what might happen in a classification system similar to our insurance approach was given by Maritz. He fits a Poisson distribution to univariate data, but then shows that its bivariate distribution has a marked correlation between period one and period two. This serves as a warning that even though the marginal distributions may be Poisson, there may still be a significant and marked correlation in the data. Maritz then demonstrates how a bivariate distribution may have marginal distributions of the negative binomial form, but still be absolutely useless in predicting the results in period two based on the results from period one. We have all recognized this in insurance when we have emphasized that the rate differentials in something like the Safe Driver Insurance Plan *must* be based on the actual experience developed by the various classes otherwise they may possibly be completely fictitious and unfairly discriminatory differentials.

Edwards and Gurland present a rather intricate concept in a clear and careful manner. First they discuss the bivariate negative binomial. They then comment on a correlated bivariate Poisson, in which there is a correlation between the number of accidents in one period and the number in the other; but the marginal distributions are each Poissons. As a final step, they compound the correlated bivariate Poisson with a Pearson Type III curve. The resultant distribution thus incorporates the concepts of both the negative binomial and a correlation between different time periods.

The books and papers included in this review are necessarily only a few of the many references to the negative binomial in the literature. They were chosen to show the variety of uses of the distribution and to appeal particularly to actuaries. There is a great deal of exploration and application yet to do and I hope our Proceedings will contain much of the good work in the future.

APPENDIX A

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II. The Fundamentals

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APPENDIX B

Distribution of the Number of Throws of a Die
Necessary to Get Six Successes Where
the Probability of Success is Two-Thirds

Number of Throws	*Actual Results*	*Theoretical Results*
6	54	71.0
7	149	142.1
8	163	165.7
9	160	147.3
10	110	110.5
11	72	73.6
12	39	45.0
13	31	25.8
14	14	13.9
15	4	7.2
16	8	3.6
17	1	1.8
18	2	.8
19	1	.4
20	1	.2
21	0	.0
22	0	.1
	809	809.0

APPENDIX C

Combined Results
of Two Independent Poisson Distributions in
which $m_1 = 36/361$, $N_1 = 361$, $m_2 = 31/49$ and
$N_2 = 49$

Number of Accidents	*Actual Sample Results*		*Theoretical Probability*	*California Data*
	Number	*Probability*		
0	3530	.8610	.8604	.8607
1	492	.1200	.1196	.1191
2	60	.0146	.0167	.0171
3	15	.0037	.0028	.0026
4	2	.0005	.0004	.0004
5	1	.0002	.0001	.0001

DISCUSSION BY LESTER B. DROPKIN

The primary objective of this Society is the promotion of actuarial and statistical science. The furthering of any science, including our own, requires not only the discovery of new facts, new theoretical utilizations of formulas, and the exploration of new areas, but also requires the effective communication and transmittal of the results of such research. An aspect which, unfortunately, can too often be overlooked.

The vast number of papers, representing countless hours of intensive work and thought, which have been presented before this Society and which recite the discoveries of the various authors, are eloquent testimony to the manner in which the membership of this body has responded to the first requirement for the promotion of actuarial science. Until the appearance of Mr. Simon's present paper, the second requirement has been something less than wholly fulfilled. The paper by LEROY Simon stands almost uniquely alone in having as its purpose the presentation of an introductory bibliography on a particular subject area, the subject here being the negative binomial and its applications. The Society should indeed be appreciative of the extremely valuable contribution which this paper makes to our common objective.

The bibliography, and the paper itself, is organized according to several distinct areas: Fundamentals, Early Origins, Applications, Models and Advanced Topics. Within each of these areas, Mr. Simon brings together a number of particularly appropriate references from books, articles and papers. Mr. Simon, however, does much more than merely supply us with organized reading lists—although even if he had done only that it would have been of great value. The special distinction of this paper arises out of the fact that Mr. Simon has given us a real guide to these papers and books through the use of judicious and pertinent comments on each reference. As each reader brings to the paper his own personal background and range of interests, each will find that particular area which is most valuable to him.

In many instances, a reviewer of a bibliography feels freely entitled to suggest that references A, B, and C should be deleted, while references X, Y, and Z be substituted therefor. Although it is the case that this reviewer, had he undertaken the compilation of a bibliography, would have omitted some of the references and added others, the fact is that Mr. Simon has taken the task on himself, while the reviewer has not. This reviewer feels therefore that in the absence of any major disagreement with respect to the references cited, it would only overstep the boundaries of responsible criticism to interject personal opinions and preferences.

One of the difficulties in working with the negative binomial is that it may arise out of two entirely dissimilar processes. Mr. Simon has, of course, mentioned this several times in the paper. Nevertheless, and in order to avoid any possible misinterpretation, Mr. Simon could have more strongly stressed the fact that the two approaches are not merely "alternatives" in the sense that, say, calculating a rate level change by the loss ratio method is an "alternative" to using pure premiums. The two processes are, rather, "alternatives" in a much more fundamental sense. The negative binomial, viewed as a compound Poisson, assumes independence from trial to trial. On the other hand, the assumption of independence is incompatible with the "contagion" process, the second avenue of approach to the negative binomial. An excellent opportunity to explicitly bring out the difference between the two approaches was afforded when Mr. Simon set out the two models for generating the negative binomial. It was, therefore, somewhat disturbing to see Mr. Simon characterize the second model as being only "a more elaborate model" than the first.

Mr. Simon closes his paper with the remark: "There is a great deal of exploration and application yet to do and I hope our Proceedings will contain much of the good work in the future." There is no doubt in my mind that Mr. Simon's paper will be an essential instrument in making possible this hoped for future.

DISCUSSION BY LEWIS H. ROBERTS

We are favored to receive this bibliography on the negative binomial distribution, all the more so for its concise resumes and evaluations of references. The value of this work is much enhanced by the authors well conceived selectivity in choice of entries since so many discussions have been published on this distribution and on the related subject of accident proneness. The student who attempts to survey the entire literature is confronted with a large number of sources, many being redundant, some misleading and some irrelevant to insurance problems. The first work mentioned in this bibliography, for example, lists eighty four other references!

A point made by several writers, and properly emphasized in this paper, is the danger of estimating rate differentials from the negative binomial parameters derived from the distribution of risks by the number of claims incurred during a single period of experience. The negative binomial can arise from other causes than heterogeneity of risks, and the apparent degree of heterogeneity can be distorted by other factors.

Even the use of a bivariate negative binomial with two periods of experience does not necessarily lead to proof of heterogeneity since, as pointed out, interdependence of accidents can also yield that distribution.

The author mentions a paper by Edwards and Gurland which, because of its particular attention to the treatment of experience for separate time intervals, should be of special interest to actuaries. They show, first, that such experience can sometimes be well represented by a bivariate negative binomial. They next develop a more general function of which the negative binomial is a special case. As might be expected because of its greater generality, the latter distribution may give a better fit than the former, but at the cost of introducing at least one additional independent parameter. I hope a shorter name will be found for this distribution. These authors call it a "compound correlated bivariate Poisson."

With the mathematics of general insurance in its present stage of development, there is no ready formula for every problem. If he is to be more than just a theoretician, the actuary must draw upon the a priori knowledge provided by practical experience. The existence of classes with consistently dissimilar loss experience conclusively demonstrates that heterogeneity does exist in the general population of risks. To suppose that this characteristic stops at the boundaries of our class definitions not only imputes perfection to our class plans, but implies that the many underwriting factors which are necessarily disregarded in designing a workable classification are immaterial. The practical question is not whether a class is heterogeneous, but whether it is so to a degree that warrants a refinement of treatment. If the answer is yes, we have next the problems of how to identify, measure and reflect variations.

Studies of accident proneness distinguish between variations in personal susceptibility to accident and variations in environment. For most rating purposes (except, for example, where a risk has moved) these factors operate jointly and the distinction does not concern us. In calculating expected losses we do not need to know whether a risk is worse than average because of poor driving or because the roads in his neighborhood are hazardous. In accident prevention such distinctions are important, but in rating it is usually sufficient to measure variation without analyzing its cause. The exceptions are where a change in hazard has occurred.

On the other hand, we do need to know whether a debit based on past experience should continue beyond the next rating period. We are concerned whether an individual is more or less prone to accident for a while after one has occurred or whether he is characteristically worse or better than average. It is insufficient to show merely that his recent experience identifies him as belonging to a category of risks for which a debit is justified at the next rating. We also need to know whether his immediate expectation of loss reflects a temporary condition or whether it is representative of his expectation in the long run. The studies mentioned in this bibliography point up the difficulties in the way of answering this question but suggest avenues of approach.

The negative binomial distribution, or any other mathematical model, is at best only an idealistic simplification of reality. As such, it may enable us better to describe the essential features of a complex phenomenon, and it may thereby have some predictive value. As more accurate formulas are discovered we are tempted to over-exploit them and to rely more upon mathematics and less upon painstaking analysis of the facts in each case. This, however, does not gainsay the value of studies such as the author has recommended. To be of use, even the most thorough analysis of facts must be capable of appropriate expression. These mathematical functions not only afford means of such expression but provide a guide to analysis by suggesting what to look for in the data.

HOMEOWNERS—THE FIRST DECADE

BY

FREDERIC J. HUNT, JR.

The Homeowners policy completed its first decade of existence in 1960, the first multiple line dwelling package with an indivisible premium having been introduced in September of 1950. During this period, the Homeowners policy has grown at such a rapid rate that it now occupies an extremely important position in the industry. In the year 1960 companies wrote approximately three quarters of a billion dollars in premium countrywide.[1]

With a volume of these proportions, this policy is now an established part of the property insurance picture. It has revolutionized the business not only by its own fantastic growth but also by the precedents which it set and which are now being carried over into the commercial field. Because the policy is so well established, the birth pains connected with its early development tend to be overlooked. We propose, therefore, to retrace the history of the Homeowners policy with primary emphasis on rate making and to evaluate the original approaches and objections thereto in the light of subsequent experience.

EARLY DEVELOPMENTS

While the Homeowners was the first multiple line indivisible premium dwelling package policy in the United States, a comprehensive householders policy had been sold for many years in Great Britain. Insofar as the package and indivisible premium aspects are concerned, similar approaches were accepted parts of the insurance picture in the United States, with a variety of coverages being furnished in a single policy or endorsement for a single rate or premium. To name just a few, there were the Extended Coverage Endorsement in the fire field, the Personal Property Floater in inland marine and the Comprehensive Personal Liability Policy in casualty. The Homeowners Policy can thus hardly be described as something completely new in the insurance business. Therefore a brief summary or review of the developments leading up to the first Homeowners filing is necessary in order to understand why this policy was so long in coming and has had such a definite impact on the industry.

The insurance business in the United States, contrary to the practices in other countries, developed in a compartmentalized fashion. Originally, although many companies had broad charter powers, they tended to confine themselves by choice to a relatively narrow field of endeavor, such as insuring structures against the peril of fire only. Gradually this division between types of insurance worked its way into the statutes and regulatory policies of most states with the result that individual insurance companies could write only certain lines of insurance. The property insurance field was divided into the broad groupings of fire, marine and casualty. While a group of companies could be formed to cover the entire property insurance field, it was

[1] The 1961 Spectator Fire Insurance Index shows 1960 net premiums written of \$770,378,210 for Homeowners Multiple Peril for stock, mutual and reciprocal companies. See Exhibit I for the growth by year of Homeowners premiums.

not legally possible to write both fire and casualty coverages in a single policy in the name of a single company.

Periodically over a period of years interest was expressed in the principle of multiple line underwriting, that is, the writing of the traditionally separate lines of insurance in a single company. The National Association of Insurance Commissioners and its predecessor on more than one occasion considered the desirability of multiple line legislation.[2] However, very little progress had been made in the early 1930's, the "Nation-Wide Definition" restricting the writing power of marine companies further solidified the compartments. Finally in 1943 the Multiple Line Underwriting Committee was set up from the industry by the National Association of Insurance Commissioners. This Committee, popularly known as the Diemand Committee for its chairman, John A. Diemand, came up initially with several recommendations for statutory changes broadening the underwriting authority of fire and casualty companies.[3] At about the same time, in June 1944, the Supreme Court announced its decision in the South Eastern Underwriters Association case with this being followed by Public Law 15 which set up a moratorium during which the states were given the opportunity to set up sufficient supervision of insurance to avoid federal regulation. Most states were consequently faced in the late forties with the necessity of adopting or revising insurance statutes at a time when there was also increasing interest in multiple line legislation. The enforced ending of the status quo brought about by the required statutory changes greatly facilitated the task of those interested in multiple line underwriting. By 1949 several states had finally passed "full" multiple line statutes and it became legally possible to write a multiple line policy.[4]

THE DWELLING PACKAGE POLICY

Thus in 1949 the stage was set for the industry to pass from the talking stage to the actual implementation of policies and practices which could reap the benefits claimed for multiple line underwriting. The industry could begin moving toward the goals described by John A. Diemand in 1947:

". . . the business of insurance should be conducted in such fashion that it supplies to those who wish it the widest possible coverage, in the simplest possible contracts and at the lowest possible rates. . . .

"The policyholder wants protection against any form of loss which he might suffer with respect to his property, his person or his business. . . . The companies . . . must be able to sell at the lowest possible rates consistent with sound business practices and the right to a fair profit."[5]

There was, of course, no simple solution or single route in moving toward these goals. With respect to personal insurance, there was no automatic process by which the insuring public could be "given" broader protection at lower cost. One problem, that of demand, was very clearly set forth by Wil-

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[2] E.g., Proceedings of the National Convention of Insurance Commissioners, 1891, pp. 6, 53; 1904, p. 137; 1914, pp. 13, 14.

[3] These recommendations were for multiple line authority with respect to foreign business, reinsurance, automobile, aircraft and personal property floaters.

[4] One of the most important of these states was New York, where such a statute became effective July 1, 1949.

[5] John A. Diemand, "Dead-Line Ahead", Best's Insurance News (Fire and Casualty Edition, January, 1947) Vol. 47, No. 9, p. 21.

liam D. Winter of the Atlantic Mutual Insurance Company: "It is argued that there is no public demand for these broad policies. It is equally true that insurance has never been sought; but has been sold by the insurance companies. As better policies were developed endeavor was made to interest the public in these broad forms of protection."[6] In other words, most insureds were not actively demanding broader or better coverage, at least not until such time as they had a loss for which they were not individually reimbursed.

Another problem was that of cost. Doubts were expressed by many that packaging several coverages into a single policy would result in any material savings. Compounding this problem was the fact that many insureds had not been buying separately the various coverages which would logically be built into any true multiple line dwelling policy. Without some sort of saving, it could hardly be expected that they would be any more likely to buy these coverages simply because they were all written into a single policy form.

Thus, if a multiple line policy in the individual homeowners field was to have any success, it had to have features or benefits which were sufficient to create a demand, or, perhaps more realistically stated, it had to be a policy which could be sold.

To satisfy the foregoing, it is reasonable to say that the multiple line dwelling policy had to have either broader coverage than was available via the various individual line policies or it had to be sold at a price lower than the sum of the premiums on these individual policies, a quantity discount. Ideally, of course, the policy should incorporate both broader coverage and lower price. And since so many insureds did not carry insurance other than fire and extended coverage, a policy which furnished fire, extended coverage, burglary and liability insurance would cost them more than their existing insurance. If only a modest discount or reduction in cost from the components built into the multiple line policy were possible, the policy would cost so much more than the average insured's existing coverage that it would be attractive only to those relatively few insureds who were already fully covered.

However, a policy which had broader coverage and a lower price still had to comply with the basic legal requirement that "rates shall not be excessive, inadequate or unfairly discriminatory." The multiple line dwelling policy had to be a product which could be sold not only to the insuring public but also to the state regulatory agencies. It had to be so designed and supported that it could be approved by the state insurance departments.

THE FIRST HOMEOWNERS FILINGS

The first true "Homeowners Policy," in the sense that the words are used today, was developed by the Insurance Company of North America. This policy was formally filed with the Insurance Department of Pennsylvania on August 11, 1950 and approved effective September 11, 1950.

This policy, which was called "Homeowners Policy Multiple Form," was a true multiple line contract providing coverage previously available only under separate policies and described as Fire, Extended Coverage, Theft, Personal Liability, and Medical Payments. Since this was the first real answer

[6] William D. Winter, "Multiple Line Underwriting—Why Not Here?", Best's Insurance News (Fire and Casualty Edition, January, 1949) Vol. 49, No. 9, p. 27.

to the problem of taking advantage of multiple line opportunities and at the same time coming up with a saleable product, the filing letter submitted with this policy represents a valuable document in any consideration of Homeowners rating.

Purposes: The basic reasons for the existence of a Homeowners policy are clearly set out in this filing under the heading "Purposes and Advantages."

> Multiple line legislation . . . makes it possible to give the householder better insurance coverage than any that is presently available.
>
> Recent studies by agents and insurance companies show that fixed costs in selling and handling insurance contracts are of such size that small policies are written at a loss both to agent and company. This means that the more modest property owner loses, too, because if there is not profit to agent and to company, there is no incentive to reach the uninsured and under-insured property owner.
>
> A multiple line policy combining several coverages into one contract has the following advantages:
>
> 1. It makes possible significant savings which can be passed on to the policyholder.
> 2. It provides broader and more convenient coverage through packaging.
> 3. It overcomes cost problems presently facing agent and company.
>
> These advantages become available when the policy is simplified and standardized as a fixed package which permits unit processing. It is believed that the coverage combination herein proposed accomplishes these objectives and will meet with wide acceptance. This can be proved, however, only through actual experience and it may be desirable to modify the package somewhat after testing.

Coverage: By present day Homeowners standards, the "Homeowners Policy Multiple Form" was intentionally kept quite simple in order to facilitate the establishment of the package principle and to pave the way for the more comprehensive forms which soon followed. The coverage options were limited and there was little flexibility. Fire and Extended Coverage were provided on the dwelling in amounts of $6,000, $8,000, $10,000 or $12,000 only with contents coverage at 30% of these amounts. Theft coverage was from within the dwelling and for a single limit of $1,000 while liability coverage was only with respect to the premises and for single limits of $10,000 bodily injury and property damage and $250 medical payments.

Basic Principles and Support of Rating Plan: As was well recognized in the filing, this package had not had the test of actual experience and the possibility of modifications was kept in mind. However, there are certain basic principles in this first filing which have continued to play a vital part in Homeowners rate making down to the present day. Among these are the indivisible package premium and the sizeable package discount. These points are covered in the "Support of Rating Plan" section of the filing letter. Because of the newness and controversial nature of the package discount, the arguments in support of the 20% reduction from components are probably covered more comprehensively than was ever necessary in formal filings made after the ice had been broken, and are thus of particular interest.

> Since this rating plan is to be used in connection with what is for rating purposes an entirely new kind of insurance, no past experience of this or any other insurer is available. The applicant has, therefore, relied upon its judgment, based upon the *past* experience of the North American Companies in handling separately the coverages that are combined in the policy. . . .
>
> The sum of tariff premiums for the component coverage was reduced by 20%, the justification for which is set forth in detail as follows:

Although expenses are usually expressed as a percentage of premium income, many expenses are approximately constant per policy regardless of the size or type of the policy. This makes the true cost of small policies relatively heavy and packaging provides a means of reducing these expenses.

In order to determine the correct premium to be charged for the policy, it is necessary to express the expenses in a more accurate form than is usually employed. For this purpose, expenses must be subdivided into three groups.

(1) those which are best expressed as a constant per policy,

(2) those which are best expressed as a percentage of the premium income,

(3) overheads on (1) and (2).

The expenses in group (3) can then be distributed appropriately between groups (1) and (2), and the total expenses then take the form of a constant plus a percentage of the premium income.

A detailed analysis of the expenses of the fire business of the North America Companies shows that for 1949 those expenses which are best expressed as a constant per policy represented 5.95% of the net premiums written, or $3.16 per policy. A conservative estimate of the constant per policy costs of a policy written in the Burglary Department is $4.00 and in the Liability Department, $3.50.

When fire, theft and liability coverages are combined in one policy, the cost of handling the combination policy, provided it is rated as a single contract, is little, if anything more than that of a single policy in any of the departments that now handle separately the coverages combined in the policy. Thus, an allowance of $4.00 per policy should prove adequate for the policy under consideration.

For the remaining costs, it is reasonable to take the mean of the expense ratios of the individual contracts, except for commission, where the rate payable is determined, and Inspections and Payroll Audits, which are not applicable to this policy. In obtaining the mean expense ratio the proportions 4-2-1 have been used for fire, theft and liability, as these are the average proportions in which the individual components are combined. These costs are shown in the following table, which is based on the figures published in the North America Companies' Insurance Expense Exhibits for 1949. All ratios are to net premiums written.

Expense Ratios for Homeowners Policy Multiple Form

	Fire Companies	Indemnity Company		Proposed for Homeowners Policy
	Fire	Burglary & Theft	Liability other than Auto	
Commission				20%
Other acquisition expenses incurred	7.89%	7.70%	7.80%	
General expenses incurred (excluding Inspection & Payroll Audit)	6.89%	10.04%	8.91%	
Total	14.78%	17.74%	16.71%	
Expenses best expressed as a constant per policy	$3.16 or 5.95%	$4.00 or 9.50%	$3.50 or 6.05%	$4.00
Expenses best expressed as a percentage of the premium	8.83%	8.24%	10.66%	9.00%
Taxes	2.93%	2.89%	2.79%	3.00%

The average term of the policies included in the above computation is 2.4 years and an inspection of the proposed Premium Chart shows that it is reasonable to expect an average premium (when reduced to this term) of $75.

On the basis of this average, the total permissible expense ratio will be 37.33% and hence, if profits and contingencies absorb approximately 5% of the premiums, the permissible loss ratio will be 57.67%.

Packaging not only produces savings in handling costs; it also provides improved risk selection which will result in improved loss experience. When an insured buys individual policies to cover against specific hazards, it must be assumed that in each instance he is exposed to such loss to at least an average degree. When, however, an indivisible package is purchased, the same risk cannot be expected to show severe exposure for each of the coverages provided. In the policy it is estimated that losses under the package will be reduced by at least 10% from the sum of the individual policies.

The loss ratio (including loss costs) under the individual components has in the past been less than 50%, so it is to be expected that the losses under the package policy, if the full component premiums were charged, would be less than 45%. With a permissible loss ratio of 57.67%, the component premiums must be reduced by

$$\frac{57.67 - 45}{57.67} = 22\%$$

or, say 20%, to provide a premium which is not excessive.

This filing also established the use of premium groups, whereby a single average premium group was used in place of the individual premiums of similar size produced by different component rating categories. This enabled a considerable simplification via reduction in the size of the premium chart which would otherwise have been required.

The filing finally set forth that judgment and the experience of the component coverages should not be permitted to support the premium indefinitely. It was, therefore, proposed that statistical records be kept which could be accumulated for the purpose of testing the adequacy of the premiums in the filing. In other words, the intention was that the plan would be self-rating when an adequate volume of experience had developed.

Homeowners Intermediate and Comprehensive Policies: This first policy was joined by two companion policies filed by the same company just two months later in November 1950. One was the "Homeowners Intermediate Policy" which was very similar to the "Homeowners Multiple Form" but increased the number of building amount options between $6,000 and $12,000, broadened the theft coverage from the building to the premises and expanded the liability to a full Comprehensive Personal Liability basis.

The other new package was called the "Homeowners Comprehensive Policy" and was designed to cover larger amounts and a greater variety of risks. It provided for amounts of building fire insurance from $10,000 to $50,000 in intervals of $2,500, with contents increased to 40% of the amounts (compared to the 30% in the "Multiple Form" and "Intermediate"). Theft coverage was provided in an amount equal to the fire coverage on household and personal property with 10% of this coverage applying worldwide. Options were made available for broadening the Comprehensive Personal Liability and Medical Payments Coverage with respect to limits, incidental professional occupancy and additional dwellings.

Theft Charge: An important feature of this policy was the treatment of theft. The filing stated: "The basis for the component charge for the theft coverage is that contained in the Burglary Manual . . . modified to reflect enforced insurance to value." In arriving at the total theft component charge, only

20% of the contents limit was used for the premises coverage and 10% for off premises. These percentages were used because it was felt that they would produce a correct premium for the theft risk, having in mind that persons would be required under the package concept to carry theft limits very much nearer to the full value of their property than was customary when a separate theft policy was written.

Package to be Self-Rating: While the original Homeowners filing provided that the package should be self-rating, the Homeowners Comprehensive Policy filing stated in a more positive manner the intention not to rely on components in the future and to treat the package as a separate entity statistically. The pertinent paragraphs are:

> The applicant's judgment at the outset has been related to existing fire and casualty rates for the types of coverage provided by the policy. It must be emphasized, however, that these existing rates are merely used as a basis of departure and that they will not, in the future, determine the premiums at which the policy will be sold.
>
> It will be necessary in the future, because the initial rating plan is experimental, to alter that plan if and when the applicant has acquired sufficient statistics to prove by experience the necessity for such an alteration. For this purpose the applicant proposes to maintain a statistical plan.

Statistical Plan: While no statistical plan was actually filed, the company did proceed to accumulate its experience in accordance with a statistical plan which treated the basic premium as indivisible and provided codes to identify policy form, construction, protection, policy amount and territorial zones within the state. Cause of loss codes were provided to identify losses as to coverage.

MULTIPLE PERIL INSURANCE RATING ORGANIZATION

Background and Organization: Following these initial filings, at least one other company[7] came out with a Homeowners Policy and the industry was faced with the necessity for action with respect to dwelling packages. At the same time problems both as to filing and rating methods were being encountered elsewhere in the multiple peril field with the "Manufacturers Output" Policy.

A growing segment of the insurance industry was considering it desirable to develop a more uniform approach to the entire problem of multiple line packages. However, superimposing the development of such packages on an organizational setup which had been developed over the years to handle insurance on a compartmentalized basis was no simple task. Mr. Louis R. Burbach, Vice President of the Atlantic Mutual Companies, in discussing packages before the Mutual Insurance Advisory Association on November 14, 1950, said in part with respect to the rating aspect:

> Other than a company acting independently and supported by a forward-looking supervisory official, who has the power to establish a rate for such a package as the all risk dwelling cover or the output policy? . . .
>
> A possible alternative might be the broadening of the charters and licenses of each rating organization to embrace all lines of property and liability insurance. This, however, immediately injects complications from the company point of view. Companies cannot very well be represented by two or more rating organizations on

[7] The Eastern Underwriter (February 9, 1951), Vol. 52, No. 6, p. 21.

a single line of insurance because this inevitably would result in using different and therefore discriminatory rates for the same type of insurance.[8]

As one answer for the handling of the package policies, a group of stock companies began discussions in the fall of 1950 which culminated on May 23, 1951 in the organization of the "Multiple Peril Insurance Rating Organization," more commonly known as "MPIRO." The initial membership included Home Insurance Company, Insurance Company of North America, Springfield Fire and Marine Insurance Company, Fireman's Fund Insurance Company, Fire Association of Philadelphia, Aetna Insurance Company, The Employers' Fire Insurance Company, Pearl Assurance Company, Limited, St. Paul Fire and Marine Insurance Company, The Phoenix Insurance Company, The National Fire Insurance Company, The American Insurance Company, The Bankers Fire and Marine Insurance Company, The American Surety Company and Zurich General Accident and Liability Insurance Company, Limited.

Purposes: The object of MPIRO was described in a statement to the National Association of Insurance Commissioners at their June 1951, meeting in Swampscott, Massachusetts, as being limited to the making and filing, under state regulatory laws, of underwriting rules, classification of risks, policy provisions, forms, rates, premiums and rating plans as required by law and to compiling and analyzing statistical and other data in order to accomplish the foregoing. This was to be accomplished, on a nationwide basis, with respect to all risk, multiple peril and other policies written for an indivisible premium for which the members or subscribers had not delegated rating and filing authority to any other rating organization.[9]

MPIRO Dwelling Committee: In order to attain the MPIRO objectives, various committees were set up, including a "Rating Committee for Householder's Comprehensive Dwelling Policy" which, for convenience, we shall call the Dwelling Committee. The chairman of this committee was Bradford Smith, Jr. of the Insurance Company of North America, and the other members during most of the formative period leading up to the introduction of the organization's Homeowners Policies were the Employers' Fire Insurance Company, Fireman's Fund Insurance Company, Home Insurance Company and Providence Washington Insurance Company.

The Dwelling Committee first met on November 8, 1951 and covered considerable ground, reaching agreement on a number of basic points.[10] The first policy was to be on a named peril basis rather than all risk. It was to include, with respect to the building, fire, extended coverage and additional extended coverage perils and additional living expense, but to exclude earthquake. Liability coverage was to be equivalent to that contained in the comprehensive personal liability policy. Contents was to be covered for the same perils as the building, including theft on and off premises. As a means of inducing proper amounts of coverage, coinsurance was considered but dropped in favor of making the amount of contents insurance automatically a certain percentage of the

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[8] The Weekly Underwriter (November 18, 1950), Vol. 163, No. 21, pp. 1135, 1138, 1139.

[9] The Eastern Underwriter (June 8, 1951), Vol. 52, No. 23, p. 20. Proceedings of The National Association of Insurance Commissioners, 1951, pp. 520-522.

[10] MPIRO—Dwelling Committee Minutes—November 8, 1951.

building insurance. There was to be a minimum amount on the building and coverage above this minimum was to be available only in round figure brackets. Deductibles were to follow the practices of the components initially although consideration was to be given to the desirability of an across-the-board deductible. The initial efforts were to be aimed at developing a contract for the owner-occupied dwelling. The first thought was to provide an annual rate and it is interesting to note that the committee felt that the majority of companies seemed in favor of a continuous policy. Insofar as rating was concerned, the best initial approach was considered to be a buildup of rate by components, considering the rates on the various perils when covered separately, adjusting for any truly demonstrable saving in expense and arriving at tables of indivisible rates or premiums. While details of any statistical plan were deferred, it was agreed that such a plan should attempt to relate loss cost to exposure and should maintain loss information by cause.

Following a series of fifteen meetings plus many hours of effort between meetings (and materially assisted by subcommittees made up of underwriters, accountants, statisticians and qualified actuaries from the member companies of the Committee), the Dwelling Committee by June 1952, had reached the point where it could submit a definite report recommending a comprehensive policy form with rates, rules and statistical plan together with a request for permission to develop a more limited (basic) policy.[11] These policies were to cover on a named peril basis for a single premium with a single expiration date "the normal hazards encountered by a person who owns his own home and lives in it." They were designed for the mass market rather than the "carriage trade." The reasons given for choosing the named perils rather than "all risks" approach were that "all risk" necessitated too large a premium for ready saleability and that the Committee wished to avoid some of the difficulties of the personal property floater field. After establishing the named perils policies, the Committee did wish to consider developing an "all risk" coverage.

The "Comprehensive Form" was to cover fire, extended coverage, additional extended coverage and theft on both real and personal property associated with the principal residence as well as comprehensive personal liability coverage and medical payments. The policyholder was to be required to take all the perils provided. Amounts of coverage were to be mandatory with premiums stated for bracketed amounts of coverage with the key figure being the amount of coverage on the dwelling ranging from \$8,000 to \$50,000. Additional property coverages (all stated as percentages of the dwelling amount) were to be 10% on appurtenant private structures, 40% on household and personal property on premises, 4% on household and personal property off premises (subject to \$1,000 minimum) and 20% additional living expenses. Comprehensive personal liability and medical payments limits were to be \$10,000 and \$250 respectively with increased limits optional for an additional premium. The "Basic Form" was to be the same as the Comprehensive except for eliminating additional extended coverage and the \$1,000 minimum on off premises coverage, reducing additional living expenses to 10% and treating the auxiliary property coverages other than contents as an optional application of the dwelling insurance. The policies were

[11] MPIRO—Report of Householder's Comprehensive Dwelling Policy Rating Committee —June 11, 1952.

to be written only for a three-year term as a compromise between the lack of rate responsiveness in five-year terms and the expense of annual policy writing.

Rating Plan: With respect to rating methods, the Committee felt that when the policies had been on the market long enough to provide credible data, they might be rated largely on the basis of that experience. However, as a starting point they recommended using the cost of the various coverages at existing annual tariff rates for bureau companies, adjusted for differences in coverage. A term factor of 2.5 was to be used to produce the three-year premium, since a study of the distribution of existing business indicated that it represented a close approximation to the effective premium level for the coverages involved. The premiums thus produced from components were then to be reduced 20% for anticipated savings divided equally between expenses and losses. The expense savings were based on a comparison of the costs of one policy and premium with the several polices and premiums which would otherwise be required to duplicate the coverage, with consideration having been given to the savings to be realized in the areas of policy writing; premium transmittal and collection; checking, accounting and filing; statistical premium cards; and premium calculation. The loss savings and improved experience were anticipated from better insurance to value, better selection of risk (the owner-occupant), reduction of adverse selection by requiring coverage of all perils provided at predetermined amounts, and certain restrictions in coverage. After computing premiums for all combinations of component rate classifications, the premiums which were reasonably close were to be grouped and rounded to the nearest $3 to simplify the premium chart.

Premium Computation: Included in the report was a sample premium computation giving the details and explanation of the proposed rating method. The regular fire, extended coverage and additional extended coverage rates were applied to the full building and premises contents amounts. However, since fire rates provided ten percent outbuilding coverage, only ten percent of the regular rates were applied to the outbuilding limit to cover the fact that the coverage was a separate item of insurance in the package. Similarly, only ten percent of the rates were applied to that part (one-half) of the additional living expense already provided in the fire rules, while the full rates were applied to the remainder. The 100% blanket residence theft rates were applied to only 20% of the contents amount (subject to a $1,000 minimum amount). For the off premises coverage the tariff fire and allied lines rates were applied to the difference between ten percent of the premises contents amount (the coverage contemplated in the fire rules) and the $1,000 minimum limit incorporated in the policy. The rate for theft away from premises without coverage in autos was applied to the full off premises limit. The charge for liability coverage was the regular comprehensive personal liability premium. Only one-tenth of the tariff charge for residential property of others in the custody of the insured was included since this exposure applied for the average insured only for brief periods of time such as while traveling or on vacation rental premises.

Installment Plan: Because of the relatively large average premium which would be developed in packaging the various coverages, an installment payment plan was considered essential. For ease of computation, an installment charge of 3⅓% of the premium was recommended with the installments to be one-third of the premium plus 10% at inception and one-third at each of the two subsequent anniversaries. To fit in with this plan, all basic premiums were rounded to $3 as mentioned above.

Credit for Existing Insurance: Recognizing that prospects for the package would be likely to have existing policies for one or more of the coverages, the Committee considered the credit to be given for such coverage. It strongly recommended that existing insurance be cancelled as the simplest and most economical answer to the problem. To provide for those cases where there were good reasons for not cancelling, it was suggested that credit be allowed on the basis of 80% of the unearned tariff premiums for certain existing insurance. By applying the 20% package discount to the premium credit, the credit would, of course, be less than the return premium available under short rate cancellation of such existing insurance.

Statistical Plan: Finally the report included a statistical plan. This plan provided for the premium to be reported on an indivisible basis and classified as to policy form, additional liability coverages, state, construction, protection and rating zone. Term, expiration and dwelling amount were to be shown and losses were additionally to be coded as to cause, coverage and deductible or size.

Background Studies: Certain of the rating considerations leading up to the Committee's June 1952, report are covered in the published minutes and indicate the thorough manner in which the Committee arrived at its recommendations. For example, in arriving at the charge for the on premises theft component, only 20% of the on premises contents limit was used (subject to a $1,000 minimum amount). However, before agreeing on this procedure the Committee considered the value of the elimination of mysterious disappearance, the value of the theft exposure involved for the amounts above those on which the premium charge was computed (based on a study of theft claims paid by an individual company) and the value of the addition of a limited unattended automobile cover. Since the evaluation of these items produced a final premium only one percent less than the standard tariff rates it was decided to use these standard rates without modification. Before deciding on the installment plan, two other plans were also considered.[12]

Homeowners A and B: Following their report to the organization, the Dwelling Committee proceeded with preparations for actual filings. One of its first decisions was to use the now familiar designations "Homeowners Policy A" and "Homeowners Policy B" in place of "Basic" and "Comprehensive." This was decided on for reasons of simplicity and ease of reference and also with the further development of a Homeowners series in mind. It was then decided that the only basic differences between Policies A and B would be that A would not include additional extended coverage and would have only 10% of the building amount as the additional living expense amount. The other limitations of A which had originally been recommended were discarded because they did not seem justified by the relatively small reductions they would produce in the premiums.

[12] MPIRO—Dwelling Committee Minutes—February 13, 28 and 29 and April 15, 1952.

The "Floor" Plan: A problem which was encountered at about this point in the development of the filings was the realization that the rating plan produced premiums which in some of the higher premium groups were less than that charged for the specific fire and allied lines coverages in the package. Two distinct views were expressed in this connection. One was that a "floor" should be built into the rating plan so that no premium should be less than that charged for the specific fire and allied lines coverages plus a percentage load. The other view was that, since the rating plan was developed step by step and accounted for all exposures, comparisons with other rating structures were irrelevant. After discussion, the first view prevailed and the rating plan was modified to provide that the premium developed by the Homeowners rating procedure should be increased where necessary so as to exceed in all cases the premium for specific fire and allied lines coverages.[13]

With all the major rating decisions behind them the Dwelling Committee was finally ready in the summer of 1952 to proceed with the filing of the formal Homeowners program. The filings were initially restricted to a relatively small number of states selected because of their location and importance in order to permit experimentation under various conditions. During the month of October 1952, the Homeowners A and B policies were put into effect in the states of California, Colorado, Delaware, and Pennsylvania.

Revised Statistical Plan: Shortly after these filings the Dwelling Committee, along with consideration of additional individual state filings, undertook a re-evaluation of its originally proposed statistical plan. In the interests of simplification and reduced handling and processing costs, a revised statistical plan was proposed which dropped the information necessary for development of policy year data. It also reduced the digits required to report policy form, policy amount, construction and protection from seven to three and the cause of loss digits from four to one.

Status—1953: By the end of 1953, the Homeowners A and B policies were in effect in at least nineteen states. While this left many states where the policies were not yet available, the Homeowners had not only arrived but was really rolling. One company had, by this time, already written over four million dollars in Homeowners premiums.

INTERBUREAU AND THE CDP

While this paper is concerned with rating and other aspects of the "Homeowners" package, we must recognize that this package did not initially meet with complete acceptance within the industry and was, in fact, actively opposed by an influential group which disagreed with handling the multiple line dwelling policy as a new kind of insurance on an indivisible premium basis. A group of stock companies formed the Interbureau Insurance Advisory Group to develop packages which could be filed jointly by the rating organizations responsible for the several components. The group developed in 1954 the "Comprehensive Dwelling Policy" which first became effective in Connecticut on August 18, 1954.[14] This policy, better known as the "CDP," was

[13] MPIRO—Dwelling Committee Minutes—July 24 and August 1, 1952.
[14] The National Underwriter (May 13, 1954), Vol. 58, No. 19, pp. 1, 26, 27; The Eastern Underwriter (August 6, 1954), Vol. 55, No. 32, p. 20.

designed for the same insured as the Homeowners—namely the owner occupant of a one or two family dwelling—but was on a named peril divisible premium basis. To qualify for the premium discounts in the rating plan, certain minimum requirements had to be met, including the purchase of at least three coverage groups—fire and allied perils coverage on dwelling and contents, premises theft coverage and comprehensive personal liability coverage. Coverages available on an optional basis included off premises theft, theft of specific items on a scheduled basis, specific glass coverage and a named perils personal property floater, with premium modifications applicable to the required coverages extended to these optional coverages. Other minimum requirements were 80% insurance to value for fire insurance and 30% insurance to value (subject to a $1,500 minimum amount) for on premises theft.

This policy was intended to have a high degree of flexibility, with no percentage or mandatory relationships between the various coverages, leaving the insured relatively free to purchase amounts of insurance in any one coverage group to fit his personal needs. With this emphasis on divisible premiums, optional coverages and optional amounts, the CDP was in a sense an approach to packaging exactly opposite to that incorporated in the Homeowners policy.

The CDP took an important place in the multiple line picture. Some measure of the influence of its adherents can be gained by listing the members of Interbureau at the time of the first filing. They were Aetna Life Group, America Fore Group, Atlas Group, Caledonia Group, Century Insurance Company, Commercial Union Group, Crum & Forster Group, Excelsior Insurance Company, Hanover Group, Hartford Group, London & Lancashire Group, Loyalty Group, New Amsterdam Group, New Hampshire Group, North British Group, Ohio Farmers Companies, Phoenix of London Group, Royal Exchange Group, Royal Liverpool Group, Scottish Union Group, Standard of Detroit Group, Sun Insurance Group, Travelers Group, Union Insurance Society of Canton, Ltd., United States Fidelity & Guaranty Company, and Yorkshire Group.

SUBSEQUENT DEVELOPMENTS

Competition: Following the introduction of the Homeowners A and B Policies, the dwelling package field was far from static. MPIRO was not operating in a vacuum but was being subjected to competitive pressures both from the CDP and from the independent market which from 1953 included one large insurer[15] who had originally been a member of MPIRO.

The Floor Plan Revised: One feature of the MPIRO rating plan which in practice soon exhibited undesirable effects was the "floor plan." In states such as Georgia where there were relatively high fire rates, strict application of the floor plan produced premiums so high that the saleability of the package was affected. In addition the action of other markets in due course applied continuing pressure to this plan but there was considerable opposition to any material changes. Finally, after study by a special committee it was decided

[15] The Insurance Company of North America. MPIRO Special Meeting Minutes, April 8, 1953.

as a compromise to determine the floor plan premium by using the tariff fire and extended coverage rates on the dwelling and the tariff fire rates on the contents. By fall of 1955 the floor plan was apparently completely dropped since the Rating Committee was instructed to work out competitive premiums keeping in mind only maintenance of NBFU town gradings.[16]

Policy C: Policy C, the third in the Homeowners series, was introduced by the Insurance Company of North America in the fall of 1954. This policy was designed to round out the package program by making complete "all risk" coverage available in one policy, incorporating the "All Physical Loss" form[17] with respect to the building and the Personal Property Floater with respect to the contents. It varied from Policies A and B by setting the contents amount at 50% of the building amount and the minimum liability limits at $25,000 with $500 medical payments. The minimum building amount which could be insured was set at $15,000 or almost double the minimum amount of $8,000 in Policies A and B. These minimums reflected the anticipated needs of the type insured to whom this policy was expected to appeal and also represented an effort to avoid some of the problems of the Personal Property Floater by a minimum contents amount of $7,500. The rating method used was described as follows:

> Policy C is rated on a base of Policy B premiums plus a loading, which is applied on a nationwide basis, for the additional perils covered under Policy C. This loading was computed in three steps: (a) the increased charge for the All Physical Loss form on the dwelling above the cost of fire, extended coverage and additional extended coverage already included in Policy B; (b) the difference in cost between a personal property floater for 50% of the dwelling amount and fire, E.C., A. E. C. and theft for 40% of the building amount as included in Policy B; and (c) the increased cost of $25,000 Liability and $500 Medical Payments over $10,000 Liability and $250 Medical Payments included in Policy B. As the basic exposures of fire and windstorm are included in the premiums for Policy B, this increased cost worked out to be almost the same figure countrywide and amounts to $87.00 for three years, and this is the figure added to all Policy B premiums up to $35,000. Above that figure the loading increases slightly to a high of $105.00 for a $50,000 dwelling.[18]

There were some doubts on the part of individual members of MPIRO as to the wisdom of coming out with this policy, including questions as to the adequacy of the profit margin, the confusion that might be created by another new package and the possible cleavage in the industry which might result from differences over the jurisdiction of rating organizations.[19] However, by

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[16] MPIRO Executive Committee Minutes, January 14, 1954, September 22, 1954 and September 22, 1955.

[17] In 1951 the Fireman's Fund Insurance Company had introduced in California a broadened form of dwelling cover (eventually called the special homeowners comprehensive or "SHO" policy) which insured the dwelling against "all physical loss" subject to certain exclusions. By the spring of 1954 this form was being used in other parts of the country and was being copied by other companies. In July 1954, the Inter-Regional Insurance Conference recommended the adoption of an "All Physical Loss" form for attachment to the standard fire policy, with the resulting coverage producing the equivalent of the SHO policy.

The National Underwriter (November 29, 1951), Vol. 55, No. 48, p. 1; (March 25, 1954), Vol. 58, No. 12, p. 5; (July 1, 1954), Vol. 58, No. 26, pp. 1 & 24.

[18] Letter dated November 1, 1954 from Insurance Company of North America to Insurance Commissioner, State of Rhode Island.

[19] MPIRO Executive Committee Minutes, December 20, 1954 and February 18, 1955.

March 1956, MPIRO was in a position to announce its Homeowners C policy with coverages and premiums comparable to those already on the market.

Tenants: Completing the Homeowners series in approximately its present form, Chubb & Son introduced a tenants policy in the fall of 1954. This policy was limited to apartment tenants and covered fire, extended coverage, additional extended coverage, theft and comprehensive personal liability. The off premises limit was set at 10% of the premises contents amount, with personal baggage off premises being covered on an all physical loss basis. Additional living expense coverage was set at 20% of the premises contents amount. A $20 deductible applied to all physical losses except those caused by fire. The policy could be written for contents amounts ranging from $1,000 to $50,000. The only options were for increased liability limits. Rating was simple, consisting of a flat annual charge of $25 plus a rate applied to the contents amount. This rate was lower for larger amounts of insurance and also varied by rating territories within each state.[20]

This was followed in 1955 by the tenants program of the Insurance Company of North America with separate policies and rates for apartment and dwelling risks.[21] The policies, while not identical in coverage, both generally duplicated for the tenant the coverage furnished by Homeowners Policy B. As with the Chubb policy, additional living expense coverage was set at 20% of the premises contents amount but the off premises coverage, while 10% of the premises contents coverage, was subject to a minimum amount of $1,000. The basic rating approach was to use the premium grouping method of Homeowners with a minimum number of territories and groups in each state.

Effective March 15, 1956, MPIRO came out with its tenants facility. Rather than using a separate policy, coverage was furnished by means of a form designed to be attached to the regular Homeowners Policy B with the coverage being comparable insofar as possible to that policy. The minimum premises contents amount available was $4,000. The premium chart format was very similar to that in general use today with premiums shown for various rate intervals and contents amounts. The chart was entered using the tariff fire and extended coverage rates applicable to the risk.

Broadened Coverages and Rate Changes: During the period from 1952 to 1956, in addition to the development of the above packages there was also considerable activity with respect to available coverages. In Pennsylvania, for example, the first MPIRO A and B policies had a mandatory wind deductible. However, this deductible was optional in the component fire policy and full coverage was available in other dwelling packages. As a result, MPIRO found it necessary by July 1953 to put its deductible on an optional basis. Gradually other changes were made to make the Homeowners more flexible with the changes in some cases having been initiated by independent companies and in other cases by MPIRO. In March 1955 the Special Building Endorsement providing "all physical loss" coverage on the dwelling was made available for attachment to Policy B. In the spring of 1956, provisions were

[20] The National Underwriter (September 30, 1954), Vol. 58, No. 39, pp. 2 & 33; The Eastern Underwriter (October 1, 1954), Vol. 55, No. 40, pp. 16 & 21.

[21] The National Underwriter (February 9, 1956), Vol. 60, No. 6, pp. 2, 30, 31.

made for purchasing additional contents coverage on A and B. Odd amounts of insurance were permitted by interpolation of the premium chart, with this change having been brought about largely because of the insistence of mortgagees on specific amounts of insurance. Later in the year, B policies were available with the broad form perils built in replacing the more limited additional extended coverage perils and with the deductible applicable to certain of the broad form perils on an optional basis.

Also during this time there were a number of premium changes, many reflecting changes in the component rates. Others, however, were the result of the competitive situations, with MPIRO responding to the pressure of both the independent market and increases in discount in the CDP program.

Homeowners and the CDP: While the CDP was introduced as an alternative to the Homeowners Policy, it was not long before its companies were writing both forms. By 1955 Interbureau had set up its own Homeowners statistical plan and during 1955 companies serviced by that organization wrote over sixteen million dollars in Homeowners premiums, using filings made on their behalf by the various state rating organizations. This sixteen million was a very sizeable figure, considering the fact that only forty-three million dollars in premiums were written by the MPIRO companies who had strongly committed themselves to the indivisible package. At the same time, since the CDP was actually filed by the rating organizations responsible for the individual components, it was available for use by any companies belonging to those organizations, including those who also might belong to MPIRO. The result was that an increasing number of companies wrote both the Homeowners and the CDP, with most companies having adopted this practice by 1956.

Statistics: Statistical problems were created by the fact that the MPIRO and Interbureau Homeowners statistical plans, while very similar, were not identical. Furthermore, neither organization could collect data from non-member companies except for the few instances where they had been appointed statistical agent by an individual state. The Actuarial Bureau of the National Board of Fire Underwriters was brought into the picture and agreed to serve as statistical agent for Homeowners business for all stock companies subscribing to the Actuarial Bureau as well as members of MPIRO and Interbureau. In addition, other stock companies were allowed to report to the Actuarial Bureau in accordance with its appointments as statistical agent in most states. A uniform statistical plan was drawn up for use by all subscribers, although items coded under the MPIRO and Interbureau plans were accepted for 1956 because the uniform plan was not issued until March 1956. The National Board plan was essentially the same as that used by MPIRO. Because the National Board's collection of data commenced with all premiums written and losses paid after January 1, 1956 without reference to the effective date of the policies involved, they actually included the run off of losses on premiums previously reported to the other organizations. As a result the National Board did not initially have available the necessary information for producing data on an earned premium-incurred loss basis. For the years 1956, 1957, and 1958 they did make their compilations available to the rate advisory organization for incorporation with its previously compiled information as to premiums in force and losses outstanding so that advisory group was able to produce composite experience figures. However, Homeowners data was not actually published by the National Board itself until the calendar year 1959 results.

Multi-Peril Insurance Conference (MIC): In the spring of 1956, the fact that so many companies were finding it necessary to write the packages of both MPIRO and Interbureau was creating more and more problems. In May MPIRO set up a committee to meet with Interbureau representatives to discuss the possibility of consolidation. The end result of the various ensuing discussions and meetings was a definite decision in the fall of that year to merge the two groups, with the merger finally being consummated on May 1, 1957. The resulting organization was the Multi-Peril Insurance Conference (better known as MIC), which was intended to act in an advisory and research capacity for its members and their rating bureaus. Standing committees were established to handle the various areas contemplated and included a dwelling committee.

The MIC Dwelling Committee: The MIC Dwelling Committee had as its initial assignment the development of a single package policy to replace the existing Homeowners and CDP, with this package to make maximum utilization of the simplicity of the Homeowners and the flexibility of the CDP. By the summer of 1958 the Committee had concluded the initial phase of its project and was ready with a program which resembled in many respects the old Homeowners program. [22] The "new" MIC program included five form options which were referred to by number rather than letter. However, Form 1 was equivalent to Policy A, Form 2 to Policy B, Form 3 plus 4 to Policy B plus Special Building Endorsement, Form 4 to Tenants and Form 5 to Policy C. Options not previously available in the MPIRO—MIC program were provisions reducing Form 1 and 2 contents to 30% of the building amount and for increasing outbuilding and additional living expense coverage. The theft coverage included in Forms 1, 2, 3 and 4 was considered approximately the same as the personal theft coverage available in a separate policy and charges were provided for approximating broad theft coverage in Forms 2 and 4 on an optional basis.

To the extent that existing package experience was credible, it was to be utilized in determining the rate levels under the "new MIC" program. A credibility table was set up based on premium volume with "seasoning" factors for reducing the indicated credibility when less than five years' experience was available. However, for the purpose of adjusting rate relativities with respect to town grading, construction, building amount, territory and any other rating variables, the individual package premiums were recomputed from components using rating methods very similar to those in the original Homeowners. While a heavy discount was used in determining these formula premiums (the three-year rate was to be 40% off three times the annual rate, i.e., 1.8 annuals, except for the Personal Property Floater element of

[22] That the resemblance was close is illustrated by the following statement of Curtis M. Elliott, insurance professor at the University of Nebraska:

"The 'so-called new homeowners' is not really a combination of the old homeowners and the comprehensive dwelling policy as it is so advertised. . . . It is nothing more than a slightly changed homeowners."

The National Underwriter (October 31, 1958), Vol. 62, No. 44, p. 30.

Form 5), they, of necessity, still had to be compared with existing premiums in order to determine what further adjustment was required to accomplish the rate level change indicated by the experience. An illustration of the evolution of this approach is contained in the filing made by the bureau companies in New York in the fall of 1961. In this case the component annual rates were multiplied by three and then reduced by ⅓ rather than 40% since this produced formula premiums which were fairly close to the level in the existing Homeowners program.[23]

Probably the most important consideration with which MIC was faced was a definite and continuing competitive situation.[24] In recognition of this fact it was contemplated that the rate level would be established on the basis of a 54% permissible loss ratio which, with 6% for profit and catastrophes and 6% for loss adjustment, leaving 34% for all other expenses. These ratios were determined on a judgment basis, with the 34% expense ratio presumably being selected as the maximum the MIC companies could allow without losing still more ground to increasing competition. That the expense ratio was not developed from actual experience can be seen by referring to Exhibit II which shows stock company expenses of approximately 42% in both 1956 and 1957.

The 1958 Statistical Plan: In connection with the "new" program, the National Board put into effect a "1958 Statistical Plan" to provide for the separate compilation of business under this program. In addition to assignment of a separate major peril code, provision was made for segregation of the Form 3 plus 4 business (the old B plus Special Building Endorsement) and also the reporting of business by rating zone, a feature of the old plan which had never actually been put into effect.

The "New" MIC Program: The "new" MIC program was put into effect in some twenty states between November 1958 and April 1959. However, much of the independent market did not follow the program and in fact soon acted to re-establish their competitive advantages by reducing premiums and broadening coverages insofar as the named perils packages were concerned. With respect to the C Policy (many of the independents chose to continue using the original letter designations for the packages), one company sought to avoid increasing the already high premium level by incorporating a so-called "full" deductible applicable to all physical damage perils other than fire and lightning. The deductible amount was $100 and, on an optional basis, could be reduced to a $50 deductible.

The "New, New" MIC Program: With competition continuing in spite of its new program and generally reduced premiums, MIC discontinued further filings, restudied the situation and came out with what was inevitably dubbed the "new, new" program. This program first became effective in Indiana on August 31, 1959. In addition to generally lower premiums for equivalent coverage, the principal change was to adopt the mandatory "full" deductibles

[23] Exhibit "D" attached to filing dated November 22, 1961 which was submitted to New York Insurance Department by New York Fire Insurance Rating Organization.

[24] The letter submitting the November 22, 1961 New York Fire Insurance Rating Organization filing emphasized this situation with such comments as ". . . . under present competitive conditions . . ." and ". . . bureau companies have not been competing successfully in the Homeowners market. . . ."

of $50 or $100 on Form 5 and an optional $50 "full" deductible on the other forms. The reduced premiums were undoubtedly influenced by the moves of other companies but also must have taken full advantage of the increased credibility created by the availability of more complete premium and loss data.

Inter-Regional: While not of particular concern insofar as rating is concerned, mention should be made of the fact that, effective February 1, 1960, there was a merger of the various fire rate advisory organizations, as a result of which MIC was merged into the Inter-Regional Insurance Conference. However, this appears to have had no effect on rate advisory and research procedures, with the former MIC organization continuing to function as a department within Inter-Regional.

Individual Company Changes: While there have been subsequent changes in premiums and some modifications of the liability coverage, for the industry (at least that part of it represented by the rating bureaus) the general Homeowners picture through 1961 has remained as it was with the advent of the "new, new" program. Individual companies in the independent market, of course, continue to be a strong factor in the overall picture and have introduced procedures whose effect on the industry cannot yet be fully measured. The merit rate principle so popular in the automobile field was put into effect in Massachusetts in December 1958 by one company with a 10% credit allowed on renewals, where the expiring policy had been claim free. This feature has been adopted in other states and by other companies. Several companies have also adopted economy type packages including such features as continuous policies, direct billing, machine policywriting and premium payment options more frequent than annual. One company has included in its Homeowners program a Tenants C comparable to Policy C with this package also now available on an industry basis in Texas. These are all indications that the Homeowners field is far from static and can be expected to continue to change.

CONCLUSION

The Past: The Homeowners package has been subjected to almost continuous pressures of various types from the time it was first introduced. However, a review of the early filings and other material reveals that there has been startlingly little change in many of the basic concepts which at that time seemed so controversial. The fixed percentage relation of contents amount to building amount, the indivisible premium, the breakdown of losses by cause and the minimum set on building amount are still features of the policies today. The original package discount and the furnishing of burglary limits equal to the full contents with the charge based only on a percentage of the coverage have not only been justified but seem like very modest estimates compared with those in effect today. The position that the package premium level should be adjusted on the basis of its own experience is an established practice, with bureau companies having indicated that an annual review of such experience is a basic part of their rating program.

In addition to the basic principles which the Homeowners package established for itself, its development has had important effects on other segments of the business. Its very introduction required in many states the upsetting and amending of long existing rating and filing practices—easing the way for further valid changes in such practices. Such features as the premium payment plan and grouping of premiums led to or eased the way for simplified premium installment plans, modification of the term rules and simplified protection gradings for dwelling. The newness of the package encouraged independent action and, in some instances, permitted independence for the first time because existing organizations had not had an opportunity to preempt the field.

The Homeowners concept can be considered to have stood the test not only of time but also of experience. As mentioned earlier, the total industry written premium volume in 1960 reached three quarters of a billion dollars, attesting to the widespread acceptance of this type package. As shown in Exhibit II, the countrywide experience of companies entered in New York for the period from 1956 (the first year Homeowners was a separate line in the annual statement) through 1960 has fluctuated somewhat but overall has produced operating ratios well within 100%. Thus the discounts and partial charges which were an important part of the original rating plans definitely did not produce inadequate premiums.

The Future: With the substantial rate reductions which have been commonplace in recent years in some parts of the Homeowners line, increasing concern has been expressed as to the future of personal multiple line business. As shown in Exhibit II, the industry operating ratio for the five years ending in 1960 was 94.6% and for 1960 alone was 97.0%, with corresponding figures for stock companies 96.8% and 98.2% respectively. These figures, while indicating a past profit, give small comfort for a future at reduced rate levels. However, there are two aspects which shed a better light on the situation.

First, while the "new" and "new, new" programs have resulted in materially lower premiums in most states for Forms 1 and 2 ("A" and "B"), there has been a general tendency to overlook the fact that the effective rate level for Form 5 ("C") has been increased by the incorporation of a mandatory "full" deductible without fully compensating premium reductions. In some states the Form 5 changes were accompanied by an actual dollar increase in premiums so that the combined effect of the deductible and premium increase was a really substantial increase in rate level. Thus, the Form 5 changes acted in most instances as an offset and greatly softened the effect of the Form 1 and 2 reductions on the overall rate level.

Second, the "new" and "new, new" programs contemplate a combined loss and loss adjustment expense ratio of 60%. As shown by Exhibit II, this figure has not been reached by any segment of the industry in any year through 1960 and, on an overall basis, there is a margin of several points. These figures are not adjusted for rate changes but do include an appreciable volume of business written under the new programs. However, it should also be noted that the new rate levels are predicated on an allowance of 34% for expenses other than loss adjustment. Thus the stock companies on the basis of actual experience can look forward to operating on a non-profit basis unless they reduce their expenses.[25]

[25] When the three leading independent stock companies are subtracted from the stock totals in Exhibit II, the expense ratio for the remainder increases by over a point and would produce an actual loss with a 60% loss and loss expense ratio.

No review of the Homeowners picture would be complete without pointing out that, while the policies have been a success on an overall basis, there has been a marked variation by policy form. This is clearly illustrated by Exhibit III. The most troublesome has been Policy C (Form 5) and, as shown above, strong steps have been taken to improve the situation via premium increases and coverage reductions. In addition, most companies have adopted increasingly stringent underwriting requirements. However, it will also be noted that year after year Policy B consistently has shown higher loss ratios than Policy A, with the difference ranging from three and one half to almost eight points. A partial answer is indicated by the "New Basis" results shown in Exhibit IV, where Form 3, the equivalent of the old Policy B with Special Building Endorsement, is showing decidedly poorer experience than Form 2. Form 1 (the old "A") is nevertheless still showing the best results of all the forms. On the basis of the early results under the new program it would appear that some increase is required in the price differential between Forms 1 and 2 with increases also being made in the specific charges for the Special Building Endorsement. While progress had been made with Form 5, the same early results indicate a complete solution has not been reached. The 58.2 loss ratio does reflect full coverage business written under the first phase of the new program but at the same time has no allowance for unreported losses.

Homeowners is here to stay but, as with any line of insurance, there are and will be problems. Under the pressures of competition, premiums have been reduced and there is no indication of a situation developing whereby premiums will become excessive or have any "fat." At the same time there is no indication that losing money has become fashionable and rates will inevitably go up (or expenses will be cut or both) if there are clear indications of unfavorable experience. In the process of growing in the short space of ten years to an annual premium volume of three quarters of a billion dollars, Homeowners has had an interesting and profitable past. Its present importance from the premium volume standpoint will force continued careful consideration of its rates and coverages with the result that its future is bright both as to interest and profit.

Exhibit I

Homeowners Written Premiums (1)

1950	$ 30,000	(2)
1951	777,000	(2)
1952	1,317,000	(3)
1953	2,906,000	(3)
1954	15,587,000	(3)
1955	83,490,000	(4)
1956	178,912,000	(5)
1957	240,680,000	(5)
1958	344,710,000	(5)
1959	522,604,000	(5)
1960	763,765,000	(5)

(1) All forms including predecessors of A, B and C.
(2) Written by Insurance Company of North America.
(3) Combined figures of MPIRO and Insurance Company of North America. For MPIRO, 10% of 1952-1953 total allocated to 1952 and 90% to 1953.
(4) National Underwriter (April 4, 1957), Vol. 61, No. 14, p. 1
(5) Stock and mutual companies from Best's Aggregates and Averages.

Exhibit II

Countrywide Homeowners Experience 1956-1960 (1)

		Net Premiums Written	Net Premiums Earned	Loss & Loss Adj. Exp. Ratio to Earned	Other Acq.& General Ratios to Earned	Other Acq.& General Ratios to Written	Comm.&Taxes Ratio to Written	Loss & Loss.Adj. Ratio to Ea.	Other Expenses Ratio to Wr.	Total Operating Ratio
Stock	1956	139,139,641	63,166,651	57.1	28.1	12.8	29.3	57.1	42.1	99.2
	1957	179,490,033	121,158,639	58.4	18.6	12.6	29.3	58.4	41.9	100.3
	1958	256,212,251	191,190,690	56.9	15.7	11.7	29.3	56.9	41.0	97.9
	1959	371,597,715	264,885,314	51.8	15.7	11.2	28.4	51.8	39.6	91.4
	1960	538,551,056	389,641,231	58.7	15.6	11.3	28.2	58.7	39.5	98.2
	1956-1960	1,484,990,696	1,030,042,525	56.5	16.8	11.6	28.7	56.5	40.3	96.8
Mutual	1956	27,385,465	12,978,477	45.2	41.7	19.8	17.5	45.2	37.3	82.5
	1957	39,153,903	27,062,458	47.1	27.8	19.2	18.5	47.1	37.7	84.8
	1958	53,308,365	42.133,763	46.1	21.0	16.6	19.4	46.1	36.0	82.1
	1959	79,943,352	60,766,880	42.8	19.9	15.1	20.3	42.8	35.4	78.2
	1960	107,949,357	86,146,611	53.3	19.4	15.5	21.8	53.3	37.3	90.6
	1956-1960	307,740,442	229,088,189	48.0	22.1	16.4	20.2	48.0	36.6	84.6
Ad.Prem.Coop.	1956	445,662	178,770	48.9	42.0	16.8	8.2	48.9	25.0	73.9
	1957	713,582	455,268	45.9	27.8	17.7	10.8	45.9	28.5	74.4
	1958	1,124,229	780,845	49.2	24.2	16.8	11.6	49.2	28.4	77.6
	1959	1,637,905	1,179,900	52.5	22.7	16.4	13.3	52.5	29.7	82.2
	1960	2,282,214	1,776,043	57.2	20.4	15.9	15.2	57.2	31.1	88.3
	1956-1960	6,203,592	4,370,826	53.0	23.4	16.5	13.0	53.0	29.5	82.5
Reins. Co.	1956	4,123,295	1,909,495	46.0	5.8	2.7	39.6	46.0	41.9	87.9
	1957	7,131,052	4,743,414	48.5	4.3	2.9	39.4	48.5	42.3	90.8
	1958	10,169,242	7,589,135	46.3	3.9	2.9	39.5	46.3	42.4	88.7
	1959	21,288,842	15,216,330	48.8	3.0	2.1	40.0	48.8	42.1	90.9
	1960	28,691,291	21,967,614	58.3	3.0	2.3	40.7	58.3	43.0	101.3
	1956-1960	71,403,722	51,425,988	52.4	3.4	2.4	40.1	52.4	42.5	94.9
Total	1956	171,094,063	78,233,393	54.8	29.8	13.6	27.6	54.8	41.2	96.0
	1957	226,488,570	153,419,779	56.1	19.8	13.4	27.7	56.1	41.1	97.2
	1958	320,814,087	241,694,433	54.7	16.3	12.3	27.9	54.7	40.2	94.9
	1959	474,467,814	342,048,424	50.1	15.9	11.5	27.5	50.1	39.0	89.1
	1960	677,473,918	499,531,499	57.7	15.7	11.6	27.7	57.7	39.3	97.0
	1956-1960	1,870,338,452	1,314,927,528	54.8	17.2	12.1	27.7	54.8	39.8	94.6

(1) Developed from the Loss and Expense Ratio Tables published by the New York Insurance Department.

Exhibit III

Homeowners Country-wide Experience By Form
"Old Basis" (1)

Inception	Written Premiums (2)	Earned Premiums	Losses Incurred (3)	Earned-Incurred Ratio
A Through 1955	26,458,911	6,582,288	2,937,233	44.6
1956	35,562,702	15,150,144	6,454,570	42.6
1957	48,835,895	27,392,010	11,206,483	40.9
1958	62,961,871	44,579,090	17,935,198	40.2
1959	68,559,994	64,983,161	21,835,629	33.6
1960	41,983,138	66,112,703	24,859,595	37.6
Total	284,362,511	224,799,396	85,228,709	37.9
Inception				
B Through 1955	41,979,330	9,608,015	4,937,049	51.4
1956	64,352,103	27,607,644	12,755,558	46.2
1957	93,998,424	51,853,581	24,606,460	47.5
1958	135,995,527	88,493,126	42,339,029	47.8
1959	154,088,864	136,379,754	51,194,509	37.5
1960	114,022,902	149,256,026	63,326,883	42.4
Total	604,437,150	463,198,146	199,159,488	43.0
Inception				
A&B Through 1955	68,438,241	16,190,303	7,874,282	48.6
1956	99,914,805	42,757,788	19,210,128	44.9
1957	142,834,319	79,245,591	35,812,943	45.2
1958	198,957,398	133,072,216	60,274,227	45.3
1959	222,648,858	201,362,915	73,030,138	36.3
1960	156,006,040	215,368,729	88,186,478	40.9
Total	888,799,661	687,997,542	284,388,196	41.3
Inception				
C Through 1955	20,942,120	2,329,143	1,499,665	64.4
1956	49,811,858	17,640,238	12,609,095	71.5
1957	47,716,359	33,781,927	30,927,789	91.6
1958	63,050,323	49,510,219	36,855,015	74.4
1959	64,914,352	64,137,282	35,980,853	56.1
1960	39,416,420	62,161,943	39,251,406	63.1
Total	285,851,432	229,560,752	157,123,823	68.4
Inception				
Ten. Through 1955	—	—	—	—
1956	2,561,380	313,775	297,690	94.9
1957	4,593,105	1,895,781	998,055	52.6
1958	6,792,984	4,092,855	1,958,958	47.9
1959	8,571,290	6,549,070	3,244,408	49.5
1960	6,800,307	7,975,869	4,100,971	51.4
Total	29,319,066	20,827,350	10,600,082	50.9
Inception				
Tot. through 1955	89,380,361	18,519,446	9,373,947	50.6
1956	152,288,043	60,711,801	32,116,913	52.9
1957	195,143,783	114,923,299	67,738,787	58.9
1958	268,800,705	186,675,290	99,088,200	53.1
1959	296,134,500	272,049,267	112,255,399	41.3
1960	202,222,767	285,506,541	131,538,855	46.1
Total	1,203,970,159	938,385,644	452,112,101	48.2

(1) Experience of stock companies under National Board of Fire Underwriters "1956 Statis-Plan" and earlier statistical plans. Developed from figures compiled by Multi-Peril Incurance Conference, Inter-Regional Insurance Conference and Actuarial Bureau of National Board of Fire Underwriters.

(2) No adjustment has been made to reflect rate changes.

(3) Figures do not include any allowance for incurred but not reported losses.

Exhibit IV

Homeowners Countrywide Experience By Form
"New Basis" (1)

		Written Premiums (2)	Earned Premiums	Losses Incurred(3)	Earned Incurred Ratio
Form 1 ("A")	1958	37,500	--	25,217	--
	1959	23,573,016	4,466,512	1,759,493	39.4
	1960	70,454,388	27,533,803	13,045,378	47.4
	Total	94,064,904	32,000,315	14,830,088	46.3
Form 2 ("B")	1958	137,135	--	33,668	--
	1959	42,701,155	8,145,119	3,527,009	43.3
	1960	133,875,875	54,733,839	28,596,920	52.2
	Total	176,714,165	62,878,958	32,157,597	51.1
Form 3 ("B+")	1958	109,546	--	31,280	--
	1959	14,939,146	3,183,290	1,869,666	58.7
	1960	78,998,137	25,132,884	14,585,792	58.0
	Total	94,046,829	28,316,174	16,486,738	58.2
Forms 1, 2, 3 ("A&B")	1958	284,181	--	90,165	--
	1959	81,213,317	15,794,921	7,156,168	45.3
	1960	283,328,400	107,400,526	56,228,090	52.4
	Total	364,825,898	123,195,447	63,474,423	51.5
Form 4 ("Tenants")	1958	9,304	--	1,239	--
	1959	2,447,898	456,481	256,793	56.3
	1960	10,291,483	3,510,766	1,945,629	55.4
	Total	12,748,685	3,967,247	2,203,661	55.5
Form 5 ("C")	1958	3,348	--	436	--
	1959	8,973,062	1,464,614	732,302	50.0
	1960	15,185,213	7,222,174	4,326,482	59.9
	Total	24,161,623	8,686,788	5,059,220	58.2
Total	1958	296,833	--	91,840	--
	1959	92,634,277	17,716,016	8,145,263	46.0
	1960	308,805,096	118,133,466	62,500,201	52.9
	Total	401,736,206	135,849,482	70,737,304	52.1

(1) Experience of stock companies reporting to the Actuarial Bureau of National Board of Fire Underwriters under its "1958 Statistical Plan".

(2) No adjustment has been made to reflect rate changes.

(3) Figures do not include any allowance for incurred but not reported losses.

DISCUSSION BY ERNEST T. BERKELEY

I had hoped that somebody would write a paper on this subject to put together a coherent, chronological record of the chain of the many events involved in the development and growth of the Homeowners policy, thus providing a convenient, informative reference for the person with a casual or minimum knowledge of the subject and also the person who may have actually played a part in the shaping of this history but who needs a knowledge of collateral events to put his contribution in proper perspective.

Mr. Hunt has written such a paper and has done an excellent job of it. The theme is developed in an orderly manner and is well documented. This is another valuable paper for the Society and I am sure it will be appreciated by a large number of readers.

Under the section headed "Basic Principles and Support of Rating Plan," the paper cites the analysis of expenses made by the Insurance Company of North America and included in its Homeowners filing with the Pennsylvania Insurance Department on August 11, 1950 to support the discount of 20% applied to the sum of the tariff premiums for the component coverages. This stirs memories!

In the "Rating Plan" section of the paper which deals with the rating methods developed by the Dwelling Committee (that is the Rating Committee) at the Multiple Peril Insurance Rating Organization in the latter part of 1951 and the early part of 1952 just prior to the launching of the Homeowners policy program, reference is made to the application of a 20% discount to the sum of the component premiums. Following this there is a brief explanation of the reasons for the discount, both as to expense savings and loss savings. Many of the details have necessarily been omitted and I thought some of them might be of interest.

On March 6, 1952 the Dwelling Committee of MPIRO through its Chairman, Mr. Bradford Smith, Jr. of the Insurance Company of North America, appointed a Subcommittee of actuaries consisting of:

Company	Represented by
Insurance Co. of North America	Mr. L. H. Longley-Cook, Chairman
Home Insurance Company	Mr. Arthur Roedel
The Employers' Fire Insurance Co.	Mr. E. T. Berkeley

This is where I first came on stage in the Homeowners show.

The Subcommittee was instructed to investigate the question of expense savings involved in the issuance of a Homeowners policy on an indivisible premium basis and report back.

In its study the Subcommittee followed the same general lines as the Insurance Company of North America did in its earlier analysis, that is, dividing expenses into three groups for fire, burglary and theft and liability:

(1) Those best expressed as a constant per policy
(2) Those best expressed as a percentage of premium
(3) Overhead on (1) and (2)

This basic information enabled us to express expenses for fire, burglary and theft, and liability as a constant amount per policy plus a percentage of premium and then by combining these indications in the proper proportions we were able to arrive at estimated expense figures for the Homeowners policy which were necessary for discount determination.

Each member of the Subcommittee undertook a study of this type for his own company for the year 1950 but, due to some unavoidable delays, by the time the Subcommittee's report was made it was possible to use the year 1951 instead. This study was a time-consuming and painstaking job, and still a very rewarding one.

The results obtained by each of us, working completely independently, were very similar.

In our report to the Dwelling Committee, dated May 29, 1952, we did not and, in fact, could not recommend a specific discount factor to be applied to the sum of the component premiums because of a number of variables which we were not asked to evaluate. Rather we recommended certain discounts which depended on the values placed by the Dwelling Committee on the following elements:

1. Commissions
2. Provision assumed to be contained in the manual premiums for losses and loss adjustment expense
3. Provision to be made for profit and contingencies
4. The saving in loss experience (if any) as a result of packaging

After consideration of all factors the Dwelling Committee concluded that the loss savings could be estimated at 10% and the expense savings at 10%, thus making the 20% discount referred to in the paper. These figures are associated with a 20% commission and a 6% provision for profit and contingencies.

The pertinent discount tables as set forth in the Subcommittee's report are shown below:

A. If no saving in loss experience as a result of packaging:

	Provision in Manual Premiums for Loss and Loss Adjustment Expenses	
	50%	55%
Commission Assumed	*Discount*	
20%	17%	9%
25%	9%	0%
30%	0%	—

B. If there is a 5% saving in loss experience as a result of packaging:

	Provision in Manual Premiums for Loss and Loss Adjustment Expenses	
	50%	55%
Commission Assumed	*Discount*	
20%	21%	13%
25%	14%	5%
30%	5%	—

C. If there is a 10% saving in loss experience as a result of packaging:

Commission Assumed	*Provision in Manual Premiums for Loss and Loss Adjustment Expenses* 50%	55%
	Discount	
20%	25%	17%
25%	18%	10%
30%	10%	1%

The total discount figure of 20% as finally agreed upon is the same as that arrived at by the Insurance Company of North America two years earlier and serves to confirm the soundness of that company's original analysis.

Several other instances come to mind where a committee of actuaries or statisticians was given a special assignment.

First there was the Actuarial Subcommittee appointed in 1954 to study the so-called "Floor Plan" problem in the State of Georgia. As the paper indicates, the final decision was to determine the floor plan premium by using the tariff fire and extended coverage rates on the dwelling and fire tariff rates on the contents.

Then there was the Statistical Committee appointed in 1955 to develop a Homeowners Statistical Plan for promulgation by the Actuarial Bureau of the National Board of Fire Underwriters as statistical agent.

Finally came the Actuarial Subcommittee appointed in 1958 to develop a rating procedure shortly after the consolidation of MPIRO and Interbureau into MIC. The essential features of this procedure are given in the paper and need not be repeated here. One item that may be of some interest is the premium volume required for 100% credibility which the Subcommittee recommended be set at $5,000,000 of earned premium. This recommendation was not the result of a real study of the problem—due to lack of time—but was based on the standards then existing in several states. Credibility factors for premium volumes less than $5,000,000 were set forth in a special table. The so-called "seasoning" factors for reducing the indicated credibility when less than five years' experience was available were not part of the report of the Actuarial Subcommittee.

In its report the Actuarial Subcommittee suggested that the problem of credibility should be studied more thoroughly at a later date with a view to putting it on a more solid actuarial basis but, so far as I know, this has never been done. The lack of continuity in Actuarial Committee membership, the changing character of the organizations responsible for Homeowners, and the gradual maturing of the rate-making procedure have all been contributing factors.

The question of credibility and the treatment of catastrophes in Homeowners rate-making, together with some related problems, need actuarial study and I am hopeful that, at least when the history of the second decade of Homeowners is written, it will include an account of the satisfactory disposition of these items.

The author of the paper has given a very informative account of the rating procedure used initially by the Insurance Company of North America for determining premiums on its Homeowners policies but has omitted any description of the method employed by that company to arrive at later rates on the basis of actual experience. Perhaps it was felt that the inclusion of this material would lengthen the paper beyond reasonable bounds and that a separate paper would be a more suitable vehicle. In any case, I think that such a presentation would be most interesting and would serve to round out the history of the first decade.

I notice also that no direct reference has been made to commission on Homeowners policies, presumably because the expense ratio used in the rate-making procedure is of the same indivisible form as the premium. Nevertheless, it is a factor of great importance—although somewhat variable in size—and sometime it deserves a place on the pages of history. Maybe, as the author seems to imply, this is not the time or the place. Possibly it belongs in the story of the second decade along with credibility and catastrophes, after it has been given specific recognition in the making of rates.

SIZE, STRENGTH AND PROFIT

BY

By LEROY J. SIMON

I. INTRODUCTION

It has seemed almost axiomatic in America that the bigger something is, the better it is. There is a natural association of *big* with *strong* and of *small* with *weak*. This has permeated our way of life to such an extent that we often accept the conclusion without consideration of the conditions surrounding the specific situation. This paper will statistically test two of our commonly held "truths" in the insurance industry about size, strength and profit.

Generally speaking, we feel that the larger insurance companies tend to be somewhat more efficient. However, many of the larger companies have found that the advantage of size in terms of efficiency does not increase without bound. There comes a point when the size of the unit is simply too unwieldy to be properly handled expediently, and the company begins to break its organization down into smaller units. Homogeneous units of a simple nature will be decentralized leaving the head office with the more complex operations. Ultimately this may lead so far as to create nearly autonomous regional home offices. We have also observed that specialty companies, which tend to be smaller, have often been capable of producing good, efficient operations. Because of these conflicting lines of reasoning, it was felt that an objective study of the facts would be worthwhile.

The first important fact to remember is that while the operating ratio (i.e., the sum of the loss ratio and the expense ratio) of a company is commonly used as an indicator of profitability, it can also be misleading. I'm sure that if we had the choice between getting the profits of a $10,000,000 company with a 95% operating ratio or a $100,000,000 company with a 99% operating ratio we would choose the latter. Ratios, therefore, may be deceptive, but in this study underwriting profit only is to be considered, and ratios were believed to be the only practical method of studying the profitability phenomena despite their limitations. Secondly, discussions of size and profit are almost always carried out in the context of their effect on rate levels and rate competition. Since rates are made on a basis which uses losses and expenses expressed as a percent of premiums, it is natural to measure profitability by a ratio to premium. Finally, we must remember that on a purely logical basis it can be argued easily that big companies *must* be more profitable than small companies, since if this were not true, the big company would not let itself get big. This is perhaps a corollary of the first point, and it sets an *a priori* limit on the iconoclastic findings of any study. This tacitly assumes that the profit motive is sufficiently strong and linked to the other objectives of the company that profitable operations are necessary to the satisfactory operation of the organization. Let's hope we never reach a point where this ceases to be true.

II. SURVEY OF THE FIELD

A search of the literature shows that Hedges[1] made an extensive study of the fire operations of 58 leading companies licensed in New York. This was an interesting study that covered a long period of time and illustrated the great overlap in fire expense ratios between large, medium and small companies. He touched upon the question of profitability only indirectly in saying that ". . . such relationship as exists between claims and underwriting ratios is direct, not inverse." From the data presented, I'm sure that he realized that "such relationships as exists" between the loss ratio and the expense ratio could not be found from the data. The χ^2 test shows that the weak tendency indicated in the data could very easily have arisen by chance from a population in which the correlation was zero and there is a strong counter-tendency found in one section of the table.

Hedges again discussed this subject and amplified it a little in a prepared statement before the Senate Antitrust and Monopoly Subcommittee.[2] In illustration of the thesis that large companies had lower fire expense ratios, the following information was presented:

Company	Premium Volume	Expense Ratio
K	$ 600,000	50%
L	1,000,000	47%
M	4,000,000	45%
N	16,000,000	43%
O	32,000,000	42%

Using the same source and the same year, it was easy to construct a counter-example as follows:

Company	Premium Volume	Expense Ratio
K′	$ 500,000	39%
L′	1,000,000	41%
M′	6,000,000	44%
N′	16,000,000	46%
O′	75,000,000	47%

Harwayne[3] has also studied the relationship between size and expenses. He concluded ". . . even the smallest 'average' company may expect the actual expense and profit allowance [in the automobile bodily injury rates] to at least cover its actual expenses." *But,* "It is apparent that the allowance for profit or contingencies is not enough to cover the added costs incurred

[1] Bob A. Hedges, "Evaluation of property insurance companies' expense ratios," *The Journal of Insurance,* 25, pp. 1-16 (1959)

[2] "Hearings before the Subcommittee on Antitrust and Monopoly of the Committee on the Judiciary, United States Senate, 86th Congress, 1st Session, pursuant to S. Res. 57." Part 2, pp. 1108-1117 (1960)

[3] Frank Harwayne, "Observations on the latest reported stock insurance company expenses for 1960," *Proceedings of the Casualty Actuarial Society,* 48, pp. 109-120 (1961)

by the least efficient companies."[4] No mention is made of the variation in the loss experience among the companies.

While these studies have considered the expense ratio and its relationship to size of company, the opinion is often expressed that as the size of the company increases, its control over the loss ratio is decreased. First of all, the underwriter loses his intimate knowledge of the geographic area, the types of hazards and the individual risks which he is underwriting. Further, in the effort to increase volume, underwriting standards are modified and often lowered slightly. Underwriters and agents in companies which underwrite each risk individually are very familiar with the opposing pressures of production and quality. Underwriters who do class underwriting are similarly pressed to accept new classes or increase lines on old ones.

Another difficulty with these studies is that they are on an individual company basis as contrasted with the fleet basis. This sometimes makes the results appear rather distorted or shows somewhat less than the complete picture. For example, inter-company reinsurance can produce unrealistic commission ratios due to ceding commissions. A consolidated fleet report would correct this type of problem.

The previous studies have been on individual lines of business (within an individual company) which also carry some special problems into the analysis. Expense allocations to line of insurance are conducted within the regulatory framework but the assignment to function is much more accurate than to line. The very difficult allocation problems will be solved with varying degrees of precision by the individual companies, which introduces a disturbing factor into inter-company comparisons. Then, too, a given size company may find itself treated as small in one line but large in another. This is undesirable in many ways and precludes reaching meaningful conclusions on a company basis.

III. SIZE AND PROFIT

The first study, therefore, was to investigate the combined effect of expenses and losses on an all-lines fleet basis and its relationship to premium size. The raw data was collected under the following conditions: (1) A company or fleet of companies under a common management was treated as a single unit and will be referred to as "company" hereafter. (2) "Best's Insurance Reports" containing 1960 statistics was used. (3) Only companies with more than $10,000,000 net written premium were included. (4) Factory mutuals, companies whose principal business was reinsurance and companies whose main line of business was accident and health in an affiliated

[4] When Mr. Harwayne goes on in the same paragraph to question whether the savings of the most efficient carrier ought not be passed on to the policyholder, he is expressing the thought which faces every company management. If one devises a very efficient method of conducting a certain phase of the insurance operation and this leads to lowered costs, then management must decide among many alternatives such as: (1) reduce the rates; (2) offer broader protection; (3) plow the money back into research and development; (4) pay dividends to policyholders; (5) allow surplus to increase; (6) increase stockholder's dividends; (7) raise commissions; (8) increase expenses through bonuses or higher salaries. As long as the operation of the companies is to remain in the hands of the owners represented by the management they elect, then the decision as to which combination of alternatives to choose must remain in the hands of that management.

life company were excluded. (5) The company profit ratio was calculated by subtracting the following ratios from unity: (a) losses and loss adjustment expenses to net earned premium; (b) underwriting expenses to net written premium; (c) dividends to policyholders to net earned premium. (6) Net written premium was recorded as a measure of size. (7) Surplus to policyholders was recorded (in fleet operation it was necessary to properly reflect ownership of subsidiary companies). (8) The ratio of Surplus to Net Written Premium was calculated. The last two items are used in the second study.

Applying the first four rules above produced a group of 180 companies representing 13.5 billion dollars in premium or approximately 90% of the property and casualty industry. The next objective was to calculate certain descriptive statistics on this population. If it is a fact that the profit ratio, (5), increases as size, (6), grows larger, then there should be a positive correlation between these two items. The size of the correlation indicates the strength of the relationship. As shown in Appendix A, the correlation between premium size in millions of dollars and profit ratio for the entire group of companies was only .052. This is such a weak relationship that it would be of no value at all in predicting a company's profit ratio from the company's size.

There are times when a true correlation will be masked if two dissimilar groups are thrown together. It was natural here to question whether there might be a difference between stock and non-stock companies, since their methods of operation are sometimes widely different. Correlations here were not much better with the stock companies having .042 and the non-stock .104.

To illustrate how meaningless these small correlations really are, a special study of the non-stock companies was made to see how well profit was correlated with the *last* three digits of premium. It will readily be agreed, I'm sure, that the last three digits of premiums should be a random variable and thus have a zero correlation with profit. As shown in the appendix, the correlation for these 72 companies is —.144. Thus on this data, there is a closer correlation (the minus sign is of no special significance here and only the size of the number is important) between the *last* three digits of premium and profit than there is between the *first* three digits (millions of dollars) of premium and profit. This is a rather clear indication that correlations of this magnitude have no meaning.

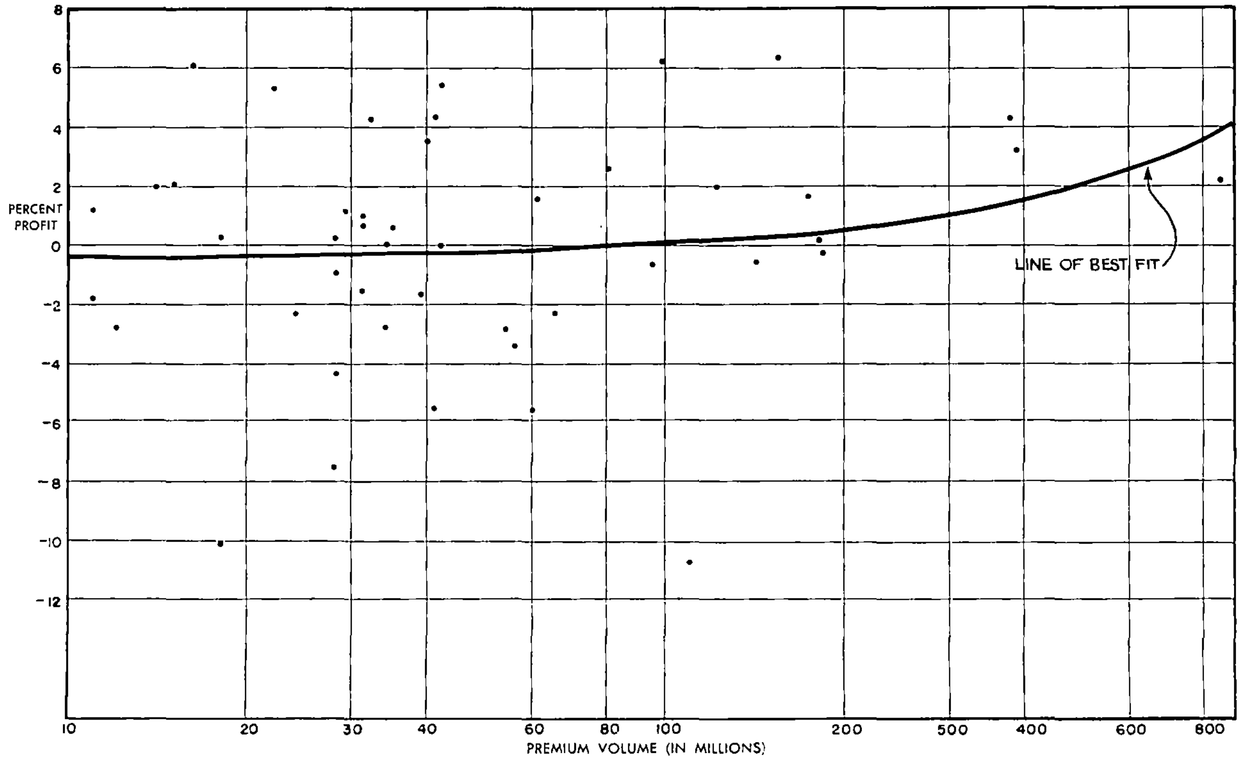
Pursuing this idea of subdivision a little further, it was noticed that the stock company group contained a number of companies that had a rather high concentration of business in one line. Therefore, the stock company group was divided between multiple line companies and specialized companies. This latter group includes many cases of what we would not ordinarily call a "specialty company" in the sense of writing only one line of insurance. However, they tended to specialize or to have their results dominated by a single major line of insurance (e.g., Automobile, A & H, Workmen's Compensation, etc.) constituting 50% or more of their net premium written. Here again, the correlations were weak, being .211 for the multiple line companies and .108 for the specialized companies.

Finally, the multiple line group was subdivided between Group A—companies who were not members of the National Bureau of Casualty Underwriters, and Group B—companies who were members of the National Bureau of Casualty Underwriters. This division may be considered by some to be rather arbitrary since the National Bureau is a rate making organization for casualty lines, and these companies include property insurance, workmen's compensation and accident and health lines as well. However, there tends to be a certain homogeneity of approach within a management group which leads it to belong to a number of bureaus if it belongs to one. The Group A correlation is again very small at .194. To get a clearer picture of this correlation refer to the Scatter Diagram. On the other hand, the Group B correlation of .489 is the largest encountered in the study. It can be calculated from the statistics in Appendix A that the average premium size of Group B companies is 161 million which is considerably larger than the average size of 92 million in Group A. This means that a direct comparison of the two correlation coefficients is not strictly proper within the context of this study. While the .489 figure looks rather large, it must be remembered that this means that size only accounts for 24% (that is, $.489^2$) of the variation in the profit ratios. Thus, even among these 21 companies (the most homogeneous group in the study) we find that size is of very little value in predicting operating results.

With the four finest breakdowns of the data each indicating a positive relationship, it would be in order to emphasize what was said at the close of Section I. Companies of a larger premium size are naturally *expected* to be more profitable than smaller companies, otherwise we would find many holding companies which would establish autonomous managements to operate artificially created smaller companies. In other words, big companies would not allow themselves to get big. However, we did find the results in agreement with our logic since the correlations are positive. At the same time, we have found that premium size is an almost insignificant factor in determining the profit ratio.

SCATTER DIAGRAM

RAW DATA OF STOCK COMPANIES — GROUP A
PREMIUM VOLUME PLOTTED ON LOGARITHMIC SCALE



IV. SIZE AND STRENGTH

Periodically some writer or speaker takes up the banner of the "small" company (although we usually find this crusading voice coming from quite a different quarter). He exhorts us to beware of this or that change because it will hurt the small company. What compassionate listener would not like to be protector of the defenseless, champion of the underdog? But is it really the small that need the protection or is it the weak? Immediately we can see that it is quite a different problem if we speak of weak, declining companies who are operating with archaic methods and making unsound management decisions. We all know a number of companies which have aggressive, modern, competent managements. Some of these companies are small and some are large. To test these subjective feelings statistically, my attention turned next to a measurement of strength and its relationship to premium size.

One of the commonly used measurements of a company's ability to withstand adversity is the ratio of the surplus to policyholders to the net written premium. Although this does not give a complete picture and contains a number of pitfalls, certain precautions were taken in this study to avoid some of the difficulties. Only stock, multiple line companies not owned by a foreign parent company were included. In this way a relatively homogeneous group was obtained and the surplus could be determined for each. This resulted in 54 useable companies. Appendix B presents the statistics and indicates a correlation coefficient of .154. Here again one of our favorite balloons is burst. The expected positive correlation is found, but there is certainly no significant relationship between size and strength. The small, strong company is more than just a convenient ideal to refer to; it is a statistical reality. Conversely, the big, weak company is also present and perhaps more regulatory attention must be directed to this quarter. Now we see how badly we have been misled, because it isn't the small company that needs to be protected, *it is the policyholder.* And he needs to be protected against the financially weak company regardless of its size.

V. CONCLUSION

In summary then we have observed two important facts. Within the limits of the study, we find that no meaningful relationship, exists between the premium size of a company and its profitability or between the premium size of a company and its strength as measured by the ratio of surplus to net premium written.

A study like this whets the appetite and leaves many avenues open for further study. Will different years behave similarly? Was this true prior to the S.E.U.A. decision? What about companies under ten million in net written premium? Is there a relationship between strength and profit?

The economic structure of our industry has not received sufficient attention from the actuary. Basic studies of the role of the regulated independent company, the operation of combinations of companies and the effects of mergers might be of great assistance in our effort to attain a better understanding of the industry and the more effective ways of promoting progress.

Appendix A

X_i = Millions of dollars of Net Written Premium
Y_i = Profit ratio
Z_i = Last three digits of Net Written Premium

The subscripts "i" define different groups of companies:

1 = Stock, Multiple Line—Group A (i.e., not NBCU member)
2 = Stock, Multiple Line—Group B (i.e., NBCU member)
3 = Stock, Specialized
4 = Non-Stock
12 = Stock, Multiple Line (i.e., combined 1 and 2)
123 = All Stock (i.e., combined 1, 2 and 3)
1234 = All Companies (i.e., combined 1, 2, 3 and 4)

	Number of Cases	*Sum of Scores*	*Sum of Squares*		*Number of Cases*	*Sum of Scores*	*Sum of Squares*
X_1	47	4,319	1,358,045	Y_1	47	2.0	697.72
X_2	21	3,384	1,055,942	Y_2	21	−43.4	322.60
X_3	40	1,667	318,125	Y_3	40	136.5	2,181.65
X_4	72	3,706	703,044	Y_4	72	90.2	1,730.44
X_{12}	68	7,703	2,413,987	Y_{12}	68	−41.4	1,020.32
X_{123}	108	9,370	2,732,112	Y_{123}	108	95.1	3,201.97
X_{1234}	180	13,076	3,435,156	Y_{1234}	180	185.3	4,932.41
Z_4	72	34,097	21,425,759				

	Sums of Cross Products	*Correlation Coefficient*
X_1Y_1	5,218.0	.194
X_2Y_2	−1,663.4	.489
X_3Y_3	7,913.1	.108
X_4Y_4	7,650.0	.104
$X_{12}Y_{12}$	3,554.6	.211
$X_{123}Y_{123}$	11,467.7	.042
$X_{1234}Y_{1234}$	19,117.7	.052
Z_4Y_4	29,408.0	−.144

Appendix B

V_{12} = Millions of dollars of Net Written Premium of Stock, Multiple Line Companies.
W_{12} = Ratio of Policyholders Surplus to Net Written Premium of Stock, Multiple Line Companies.
N_{12} = Number of Companies = 54

$\Sigma V_{12} = 6{,}517$

$\Sigma V^2_{12} = 2{,}280{,}925$

$\Sigma V_{12}W_{12} = 5{,}198.70$

$\Sigma W_{12} = 38.97$

$\Sigma W^2_{12} = 34.98$

Correlation Coefficient = .154

DISCUSSION BY ROBERT A. BAILEY

Mr. Simon's paper is indeed thought-provoking and raises many questions for further study. His study of the relationship between size, strength and profit is thorough and is based on data painstakingly compiled in such a way as to eliminate the many shortcomings that so often characterize the data used in studies of profit by size of company.

As he mentions, big companies must have some advantage over smaller companies or else big companies would not allow themselves to get big. But he shows that the advantage from size alone is small and that other factors are more important. It is evident that small companies are able to succeed from the very fact that all big companies grew out of small companies that succeeded. We should take to heart Mr. Simon's point that rather than be so concerned with the plight of the small company we should be more concerned with the weak company, and that it is the small policyholders that need to be protected, not the small companies.

We all realize that the relationship between size and profit is weak but as yet no attempt has been made to analyze the exact nature of this relationship. I believe it would be a valuable addition to Mr. Simon's important paper to try to develop a mathematical model for the relationship between size and profit, a model which recognizes other important factors in addition to size as suggested by Mr. Simon. Such a model would enable us to determine how much correlation we might expect.

It is impossible to derive the exact nature of the relationship between size and profit because the data at hand is limited—limited by the fact that there are only 180 company groups with $10,000,000 of premium or more. However, using general reasoning together with the data in Mr. Simon's paper, I would like to propose a formula and then compare the coefficients of correlation derived from the actual data by Mr. Simon with the expected values derived from the formula.

Let us assume that the profit ratio is the net result of three elements

1. a factor reflecting the type of company or the type of management
2. a factor proportional to the premium size and
3. a factor reflecting the purely random variations in the loss (and even expense) ratios.

Let us express these three elements as follows:

$$P = A + BS + U_s$$

where P is the profit ratio expressed as a percent

S is the size in millions

U_s is a random variable, mean $= 0$, variance $= C/\sqrt{S}$ for each S

A, B, C are constants for each type of company or type of management.

The variance of U_s would be expected to be C/S in the usual statistical applications since U_s is the ratio of the profit to the size. But a large company is not the same as the sum of several smaller companies because a larger company will accept larger risks and uses different reinsurance arrangements. Because of this, the variance of the profit ratio decreases more slowly than in proportion to $1/S$. I have arbitrarily chose $1/\sqrt{S}$ because it produces reasonable results as pointed out later.

Now let us assume we take an infinitely large sample of companies all of the same type, and let us also maintain exactly the same distribution by size as in each of Mr. Simon's groups. What will the correlation coefficient be in terms of A, B and C?

$$r_{PS} = \frac{\dfrac{\sum PS}{n} - \dfrac{\sum P}{n} \quad \dfrac{\sum S}{n}}{\sqrt{\dfrac{\sum P^2}{n} - \left(\dfrac{\sum P}{n}\right)^2} \;\sqrt{\dfrac{\sum S^2}{n} - \left(\dfrac{\sum S}{n}\right)^2}}$$

Since A, B and C are constants,

$$\frac{\sum P}{n} = A + B\,\frac{\sum S}{n}$$

$$\frac{\sum PS}{n} = A\,\frac{\sum S}{n} + B\,\frac{\sum S^2}{n}$$

Obtaining the variance of P by parts (the sum of the variances within each size plus the variance between the sizes), we obtain

$$\frac{\sum P^2}{n} - \left(\frac{\sum P}{n}\right)^2 = \frac{1}{n}\sum\frac{C}{\sqrt{S}} + B^2\left[\frac{\sum S^2}{n} - \left(\frac{\sum S}{n}\right)^2\right]$$

Substituting and simplifying we obtain

$$r_{PS} = \frac{\sqrt{B^2\left[\dfrac{\sum S^2}{n} - \left(\dfrac{\sum S}{n}\right)^2\right]}}{\sqrt{\dfrac{C}{n}\sum\dfrac{1}{\sqrt{S}} + B^2\left[\dfrac{\sum S^2}{n} - \left(\dfrac{\sum S}{n}\right)^2\right]}} = \frac{1}{\sqrt{1 + \dfrac{\sigma U^2}{B^2\,\sigma S^2}}}$$

It can be seen from this formula that the correlation coefficient would equal 1.000 if $C = 0$, that is, when there is no random variation in the profit ratios. To the extent that C is greater than zero, the correlation coefficient will be less than 1.000.

Now let us let $C = 79$. This gives us a standard deviation of the profit ratio of $\pm$ 5 percentage points for $S = 10$ million and $\pm$ 1.6 percentage points for $S = 1000$ million. These values are about what we would normally expect. Let us also assume that $B = .005$. This means that a 1000 million dollar company would have about 5 percentage points more profit than a 10 million dollar company.

With these assumptions we would obtain the following expected results corresponding to the actual results obtained by Mr. Simon for each of his seven groups. (Mr. Simon kindly furnished me the data necessary to calculate $\Sigma 1/\sqrt{S}$. All the other necessary data is included in his paper.)

Group	$\Sigma 1/\sqrt{S}$	Correlation Coefficient Actual	Correlation Coefficient Expected
1	7.40098	.194	.199
2	2.38759	.489	.252
3	8.44241	.108	.096
4	13.98084	.104	.107
12	9.78857	.211	.218
123	18.23098	.042	.180
1234	32.21182	.052	.154

The actual correlation coefficient for any group would vary either up or down from the theoretical expected value because of the limited number of companies in each group and the resulting lack of steadiness. Furthermore, as more and more groups are combined into one big group, the assumption that the constant A in the formula is constant becomes less valid and the actual correlation would tend to be smaller than the expected value. This is what Mr. Simon meant when he said, "There are times when a true correlation will be masked if two dissimilar groups are thrown together." The effects of this can be seen by comparing the actual and expected values for Group 123 and for Group 1234.

There are undoubtedly other formulas which would produce expected values just as close to the actual values. The formula proposed in this review is only one of many possible ones and was selected on the basis that it was simple, reasonable and consistent with the data available. A larger volume of data would be required to test how accurately the proposed formula describes the relationship between size and profit.

It is hoped, however, that the proposed formula will provide a framework within which we can further Mr. Simon's important contribution toward evaluating objectively the relationship between size, strength and profit.

DISCUSSION BY CLYDE H. GRAVES

In summarizing his study "Size, Strength and Profit" Mr. Simon stated, "Within the limits of the study, we find that no meaningful relationship exists between the premium size of a company and its profitability or between the premium size of a company and its strength as measured by the ratio of surplus to net premiums written."

I believe this statement will come as a surprise to many as I confess it did to me. I think of the Allstate, State Farm, Nationwide, Travelers, Aetna, Hartford, Liberty Mutual and Insurance Company of North America as large companies, making large profits and being towers of strength, and it comes as a shock to learn that there is no meaningful relationship between premium size and profitability, nor between premium size and strength. The shock was so great that I even calculated some coefficients of correlation myself to check on Mr. Simon's statement.

One item in the expense provisions which I felt would have a definite relationship to size was "general expense." The larger the company the smaller would be the ratio of general expense to premiums. I used the 1961 Loss and Expense Ratios published by the New York Insurance Department and calculated the correlation between "X" and "Y". With "X" representing net premiums written (countrywide) and "Y", general expense ratio, the following coefficients of correlation were determined:

r i j—where "i" represents type of company and "j", line of insurance:

Type of Company	Line of Insurance
1—Stock	1—Fire
2—Mutual	2—Extended Coverage
	3—Homeowners
	4—Workmen's Compensation
	5—General Liability
	6—Automobile BI Liability

The 12 coefficients of correlation calculated are:

r 11	=	—.116
r 21	=	—.217
r 12	=	—.071
r 22	=	—.133
r 13	=	—.178
r 23	=	—.271
r 14	=	—.074
r 24	=	—.198
r 15	=	—.025
r 25	=	—.050
r 16	=	—.531
r 26	=	—.639

It is to be noted that all the coefficients of correlation are negative, indicating that for all lines of insurance and types of company, the larger the company the smaller the ratio of general expense to premiums. However, only for Automobile BI are the coefficents of any size.

Other items of expense, such as taxes, commissions, are directly related to premiums and, therefore, it would not be expected that the ratio of these expenses to premiums would vary by size of company. Loss adjustment expense ratios, which are directly related to losses, and loss ratios themselves, would not necessarily vary by size of company. Therefore, on reflection, perhaps it is not too surprising after all that Mr. Simon arrived at his conclusion.

DISCUSSION BY CHARLES C. HEWITT, JR.

Mr. Simon has been a leading contributor to our Proceedings both in quantity and quality. It is, therefore, with some regret that I report that, in this reviewer's opinion, his recent work entitled "Size, Strength and Profit" falls considerably short of his other current and earlier efforts. I hasten to assure Mr. Simon's reading public that a conclusion to the effect that the author is slipping is unwarranted. In this paper Mr. Simon has tackled the unhappy job of "unscrewing the inscrutable." "Roy" comes out second best only because of his selection of topic and not for lack of ability or effort.

In this instance the "inscrutable" consists of two major questions. One, can we define what is meant by the terms "size," "strength" and "profit" as they apply to non-life insurers? Two, can we measure each of these three terms?

With mathematical instincts, Mr. Simon tackles the second question as being the juicier of the two. He selects the following measures:

1. Size—net written premiums.
2. Strength—ratio of policyholders' surplus to net written premiums.
3. Profit (Ratio)—Unity less the sum of:
   a. loss & loss adjustment expense ratio (to earned)
   b. underwriting expense ratio (to written)
   c. policyholder dividend ratio (to earned)

Still begging the question of definitions, the author then adapts the semantics of his conclusions to fit his chosen measures of size, strength and profit.

To be fair, had I been the prime mover, I might have done almost exactly the same thing. However, as a reviewer with critical responsibilities, I cannot accept such convenient definitions of terms without further analysis.

As respects SIZE:—net written premiums measure both "sales activity" and "amount at risk." Does Mr. Simon mean that the biggest company is the one with the most sales or the one with the most at risk? Or neither? What about assets? Liabilities? Surplus? Numbers of personnel? Square feet of office space? Number of blank forms on hand, or on order? "He's being ridiculous?" you say. But am I? You see until we define "size," *no* measure of "size" has significance. The author defines size by *one* measure and leaves the meaning to be inferred by the reader. Even his *one* measure contains at least two distinct inferences (sales activity and amount at risk); the reader of this review may supply others.

As respects company STRENGTH:—I feel Mr. Simon has hardly scratched the surface either by definition or by selection of measure. The ratio of surplus to net written premiums is a good first estimate, but no more. There are a multitude of measures of company strength, most of them interrelated. One Boston writer, now glorified in song by our own lyricist, Matt Rodermund, has written a whole book on the subject.[1] I suggest that each of you who works for a company ask each one of the following persons what he feels constitutes company strength—your:

1. President
2. Chief Underwriter
3. Chief Claims Attorney
4. Investment Head
5. Controller
6. Agency Supervisor
7. Personnel Director

And I'm prepared to suggest that each answer will be right. You would then (I trust) conclude, as I do, that company strength is no more capable of definition than of measurement.

Superficially, PROFIT is easy to define and to measure. The trouble is that Mr. Simon doesn't really mean "profit." He's talking about "efficiency"—at least he starts out with "efficiency," but by the end of the paper the word "efficiency" is gone and all that's left is, as with the Cheshire cat, the grin. Thus the real problem is to define and to measure efficiency, and I'm not about

[1] *"Fundamentals of Fire and Casualty Strength"*—*Roger Kenney.*

to tackle that one in a review. Now the efficiency of separate functions within a particular company may be measured, if the goals are clearly established; but to have *one* over-all measure for all functions applicable to companies with differing goals is asking too much.

Just so I'm not accused of being naive, let's agree that profit is a common goal. Parenthetically, most of you might prefer to qualify this goal so as to make it read, "Profit with reasonable stability." My real question, however, is "Does underwriting profit constitute a proper measure of success?"

> Company A's primary interest is the production and protection of funds for the use of its investment department.
>
> Company B has an affiliated profitable agency plant for which it must provide a market.
>
> Company C is founded by one or more non-insurance principals to reduce insurance purchasing costs.

Is any single measure going to bespeak the efficiency of these and other insurers? I think not.

Mr. Simon's immediate predecessors in this area are Messrs. Hedges and Harwayne (citations may be found in the original paper). All were undoubtedly motivated by a common desire to cast light into a dark, or at best cloudy, area. I am sorry to report that each author with naught but honest intentions gives us results that are inconclusive at best. To the extent that some persons may have been misled by the earlier works, Mr. Simon's paper does serve as a thought-provoking counterbalance.

AUTHOR'S REVIEW OF DISCUSSIONS

It is a pleasure, indeed, to find such a lively interest taken in this paper. This did not come as a complete surprise, because it was recognized that this subject could not help but be controversial.

"The size of a company is much less important in determining its profit ratio than is the quality of its management," read the opening sentence of the news release on this paper last May. "Small, strong companies are just as prevalent as large, strong companies. At the same time, there are weak companies of all sizes," it went on. This fairly well summarizes the principal themes of the paper. The statistical aspects of the paper lend credence to these statements and tend to refute their counterparts which would be that (1) big companies are profitable companies because they are big and (2) small companies have to be protected from the competitive aspects of free enterprise because they are weak.

If we would all agree that we would not use the words "size", "strength" and "profit" because they lack precise meaning, then I would be satisfied. But since this is not the case and we do use the words in sentences similar to those you have just read, I have given them specific definitions in the paper and then measured them. Since they are usually compared—one with the other—I measured their relationship. Thus, to the person who will agree that the terms have no meaning, I will say, "We cannot argue." But to the one who uses these terms, I say "Please read my paper carefully."

It is interesting to note that Roger Kenney has referred to this paper in his column in the *United States Investor* for July 30, 1962. On page 31 he quotes my paragraph, "The small, strong company is more than just a convenient ideal to refer to; it is a statistical reality. Conversely, the big, weak company is also present and perhaps more regulatory attention must be directed to this quarter. Now we see how badly we have been misled, because it isn't the small company that needs to be protected, *it is the policyholder.* And he needs to be protected against the financially weak company regardless of its size." Mr. Kenney then continues, "To this statement, we utter a solemn 'Amen.' "

Due to the relatively small number of cases involved in this study, no test was made of either the linearity of the regression or the homoscedasticity of the variances. If it could be shown that either of these two usual assumptions involved in the Pearson product moment correlation were not true, then we would want to investigate the data from some other viewpoints. In reviewing the table on page 51, we must bear in mind that the last column can be reproduced by other pairs of values for B and C such that $C:B^2 = 79:(.005)^2$. At the same time we must recognize that there are definite limits on our choices of C because the choice must produce reasonable results.

My reviewers have done a fine job of pointing up a number of difficulties in trying to make unequivocal statements about the interrelationship of these size, strength and profit factors in the insurance industry. It is this uncertainty that underscores the fact that we must not be deluded into blindly believing that "the bigger something is, the better it is," and that we may interchange as synonyms *"big* with *strong* and *small* with *weak."* It is all too easy to say that if all other things were equal these things would be true, and then forget that in this area, all other *things are never equal.*

INVITATIONAL ADDRESS — MAY 23, 1962

TOMORROW'S ACTUARY

BY

HENRY S. BEERS

I considered it to be a real privilege to accept the invitation to make this talk to the Casualty Actuarial Society. Although my actuarial training was in the life insurance field, I have long had collaterial interests in the areas your Society encompasses. For 35 years I worked very closely with the late E. E. Cammack who was a charter member of the Casualty Actuarial and Statistical Society of America, as it was at first known. For a long time most of my work was devoted to the Ætna Life's group insurance operations and, as you all know, group insurance operations with their accompanying problems of experience-rating and retrospective premium determination present some problems that are very close to those you face in Workmen's Compensation and Liability areas.

As one of the Actuarial officers of the Ætna Life Insurance Company, I have, of course, always had a lively interest in the fortunes of our affiliated Ætna Casualty and Surety Company; and I have from time to time over the years even been given the privilege of trying to help grapple with one or another problem of the casualty or property business. About six years ago these collateral interests and occasional concerns became direct, real, and continuing ones. I won't say that, as President of the Ætna Life Affiliated Companies, I have been able to give any valuable personal guidance to our casualty actuaries; but I've had a lot more general exposure to some of the problems that concern them; and this has led to an increasing conviction on my part that their success in analyzing and understanding these problems will affect importantly the future success and growth of our casualty and property affiliated companies.

The membership of your Society contains, I am proud to say, substantial representation from the Ætna Life Affiliated Companies. We have 9 Fellows and 4 Associates of the Casualty Actuarial Society in our employ, which, I believe, makes our organization rank among the top two or three in terms of numbers of your membership employed.

The number of persons on our Casualty Actuarial staff and our continuing interest in the further extension of that staff are evidence of our Companies' real interest in the growth of the actuarial profession and the application of actuarially-trained personnel to our Company problems.

I have been asked to talk about "Tomorrow's Actuary." To do so means making some predictions. That's dangerous; but, just between us actuaries, it is a danger I am used to just as you are. What is the actuary's occupation but the making of carefully considered predictions of what will happen tomorrow based on a careful scientific analysis of what happened yesterday, plus common sense?

Editor's Note: Mr. Beers is a Fellow of the Society of Actuaries. Shortly after presenting this address he became Chairman of the Boards of Directors of the Ætna Life Affiliated Companies.

I hope that all here know that a great deal of each component is necessary in making predictions; first, scientific analysis of what has happened; second, common sense, to take into account future changes, either gradual or abrupt, that may be beyond mathematical analysis.

If the actuary by his very nature is constantly concerned with predicting tomorrow, it may be doubly dangerous to predict "Tomorrow's Actuary." It goes without saying that each of my hearers can, without discourtesy, disagree with anything, or everything, that I say; because in that part of the process of prediction which does not depend upon scientific analysis of yesterday's happenings, what is one man's common sense is another man's common nonsense—whence horse races, not to mention competitive differences in insurance premiums and policy provisions.

Maybe the basic question suggested by the title of my talk could be "Will there be a tomorrow for actuaries?" To this I give an unqualified "Yes!" I believe in the strength of our political and economic system and its ability to endure. And so long as it endures there will be a need for protection against the financial consequences of events whose frequency is predictable in the aggregate but unpredictable in the individual case. So long as this need for protection exists, there will be a growing need for actuaries.

I cannot refrain from digressing at this point to the extent of saying that the continuance of competitive free enterprise in the field of insurance cannot be taken for granted. Our history with respect to Workmen's Compensation, Disability Insurance under Social Security, National Service Life Insurance in peacetime, Compulsory Automobile Insurance, Compulsory Employee Disability Insurance, and our current controversy over Medical Care for the Aged, all give only too vivid examples of how government—state or provincial, or federal—may move, or try to move, into insurance. It has become obvious that insurance will not just *automatically* remain in the domain of free enterprise.

To keep insurance in the domain of free enterprise we must first see to it that the insurance industry does a thorough job of anticipating the insurance needs of the public and of meeting those needs through well-constructed reasonably-priced insurance. If we do our job *well,* there will be no real pressure for government action, and we should be in a prime position to resist purely political pressures; if we do our job poorly, we will have a lesser likelihood of avoiding government interference or displacement. As an industry, we have a basic responsibility for initiating successful private voluntary action to satisfy the insurance needs of the public. As individuals of professional competence in a highly technical area, we have the additional responsibility of contributing our skills to the evaluation of the technical merits of proposed legislation, state or provincial, or federal. Both Today's Actuaries, and Tomorrow's Actuaries, must play their parts in this continuing struggle to preserve the free institution of voluntary insurance.

I will not attempt here to predict what the technical and scientific revolution we are now going through will generate in the way of specific insurance needs of tomorrow. There were a lot of insurance companies in existence both 50 and 100 years ago, but could anyone in 1862, or even in 1912, have predicted the rise of Workmen's Compensation insurance, or of Automobile insurance, or of Homeowners policies? How many years ago could you have imagined Uninsured Motorists Coverage, or Falling Aircraft protection? It is not very long ago that I would have called an actuary crazy if he had talked of Nuclear Energy Liability or Property coverage.

I shall direct my attention not to the list of perils to be insured against but rather to the *manner* in which insurance needs may possibly be met by Tomorrow's Actuary, adopting a very flexible quantitative definition of tomorrow's nearness to today.

I feel that we are moving toward a basic realignment of insurance operations. I can visualize tomorrow's insurance company as being organized horizontally rather than vertically. By that I mean that the traditional vertical separations into life, annuity, health and accident, casualty, fidelity, surety, fire, marine, and all the other traditional lines may be supplanted by a horizontal orientation. The major categories of insurance could conceivably be limited to two: personal, and corporate.

Among the personal lines might well be such coverages as life insurance, annuities, health and accident, automobile, residence fire and other forms, personal liability and property coverages—all those forms of insurance which are bought by a prudent individual in his capacity as an individual. The corporate category might include what we now specify as the group life and health insurances, group annuities, workmen's compensation, general liability lines, bond lines, and coverage of corporate property against fire, theft, marine and other perils—all those coverages which are now bought by a prudent corporation manager in his capacity as a corporation manager.

It is not hard to forsee that the present trend toward packaging will continue. It may even prove to be possible some day to package all the personal lines for the family (considering the individual for this purpose as a single-person family). If a single policy contract can then embrace all of the coverages now sold separately, the next step will be to provide flexibility to enable this package policy to fit many varying needs—the urban dweller versus the rural, the apartment-dwelling subway rider versus the home-owner driving his own automobile, the young family versus the mature—and it will be desirable to build into each policy a good deal of flexibility to provide changing types of coverage and changing amounts of coverage, as the family's needs change. For a present example of this, observe how the so-called "family" life insurance policy covers new babies automatically, sometimes even without extra premiums, or how some life insurance policies contain options to buy stated additional amounts of insurance every 5th year, or how automobile insurance policies cover additional or replacement cars by simple endorsement or even automatically. One is tempted to look forward to the day when all of this will be done by means of an administratively simple long-term policy under which the varying protection will be integrated with varying needs—and nearly every insurance need is a varying one, whether for death benefits, or disability or medical care insurance, automobile coverages, property lines, or retirement benefits; and ability to pay varies too, so the premium structure needs flexibility also.

When I referred to an administratively simple long-term varying benefit policy, I was of course assuming administrative machines and methods that do not exist today; although I think they are discernible on the horizon.

Obviously, I am being very visionary. You can all see many problems that would have to be solved before anything like this could come to pass. Some of these problems are actuarial, some legal, some legislative, some administrative, some agency. All of these problems are difficult, most of them presently insuperable. But don't forget the famous boast of the smart-aleck engineers, "Difficult problems solved instantaneously. Impossible ones take a little longer." The competitive race goes to those who solve "impossible" problems. That, in my opinion, is what actuaries are for.

I have talked of the personal coverages of the future. What about the corporate coverages? I see the problems as being analogous in general but quite different in specifics. The corporate coverages will have to have greater flexibility, there will be more "tailor-making," and there will inevitably be corporate insurance needs outside the range of personal coverages. There may not be much similarity between the corporate and the personal coverages either in the whole of the package or in its constituent parts.

If the future development of our business does in fact involve realignment into these horizontal categories, very serious differences in present-day marketing channels will have to be reconciled. Today the greater part of the personal life insurance lines are sold through an agency organization just about as different as it can be from the organization for selling casualty and property coverages to individuals or to corporations. I am not going to be so rash as to predict how the personal lines of the future will be sold, but I have no fear in predicting that any integration of today's separate organizations into unified marketing channels for tomorrow will require careful and continuing quantitative and qualitative analysis of what we are doing. The *quantitative* part of this analysis—the reduction of diverse kinds of data to dollars which can be compared, the conversion of large masses of statistics from shapeless incoherence to meaningful summaries, the application of modern mathematical tools to the problems of management decision-making—all this quantitative work will be the special function of the actuary, tomorrow just as it is today. The change that will be forced on us will be more *qualitative* analysis, based on a deep understanding of other fields, especially the field of insurance marketing. Actuaries will have to learn about the problems of selling and about the needs and attitudes of salesmen. They will have to take always into account that completely essential part of the insurance business which concerns itself with getting business onto the books and keeping it there. I don't know whether I need to make myself unpopular by suggesting the addition of marketing to the curriculum burdens of the future, but I'm sure that the Actuary of Tomorrow will have difficulty in getting far without an adequate knowledge of this subject.

I turn now to a different facet of the Actuary of Tomorrow.

The Actuary of Tomorrow will in my opinion be subjected to quite different study and examination training from that which burdens current aspirants for Fellowship. One element of change should be a drastic reduction in the number of years of study and in the volume of data to be absorbed in the process of separating those students who are worthy of membership from those who are unworthy. I forsee increasing use of new techniques for learning the technical tools of the trade and new tests for determining whether a student has grasped those tools and whether he has the mental attitude and equipment which are appropriate for the actuarial profession. A very great deal has been done in the past to simplify preparation of examinations and selection of worthy candidates. I am confident that a great deal more can and will be done in the future.

Even the mathematical content of the training of Tomorrow's Actuary will undergo considerable transformation.

Generally, the numerical solution of any mathematical problem involves a balance between the pure mathematical theory and the available means of computation. In actuarial mathematics during much of my experience the limiting factor has been the inadequacy of the computation facilities rather than the inability to develop proper theory. The development of refined theory has been held back by the limitations of computation ability. To paraphrase slightly some language that seeps out of our data-processing areas, actuarial mathematics has been "computation-bound." Until about seventy years ago the actuary had to express his algebra in forms which would allow a sufficient degree of approximation with no more than a reasonable amount of mental arithmetic, using logarithm tables to reduce the labor of multiplying and dividing, or finding roots and powers.

By the commencement of my own working lifetime the use of logarithms had practically but not quite disappeared, because of the advent of what we considered "high-speed calculators," such as the hand-cranked Monroe and the much more rapid but still hand-cranked "Millionaire." This led to a shift of emphasis in life actuarial mathematics from approximation formulas suitable for logarithms to the use of original arithmetical data and low-scale summations of such data into commutative functions—suitable for adding and multiplying machines—and formulas calling for square roots became completely impractical!

We are now going into a further development of the tools of the trade, which will again mean a shift in the emphasis of our mathematical training. With modern computing facilities the arithmetical work involved in the reduction of the most complicated probabilities to usable numbers can be performed in something close to what the engineers call "real time." As a result we see pressures to spend more of the students' time on learning to handle computers and less on the development of algebraic devices to avoid computation.

An example of the change in emphasis relates to the classic problem of determining a yield rate for the amortization of bonds. We used to use a thing called a "Makeham formula" by which the application of the facts to a test interest rate resulted, after some arithmetic, in a second interest rate which would be closer to the desired true yield rate. Continued reentry of successive interest rates into this formula gave a series of rates which converged on the desired answer. Very considerable thought was devoted to the technique of selecting a starting approximation and to the improvement of the convergency power of the formula. Today in our Company, this theory has been scrapped. We choose a convergence formula on the basis of its ease of programming and we choose a starting point almost at random. The fact that the computer has to make eight or ten or more passes through the formula to get the desired result, where the more sophisticated *algebra* of yesterday might require only three or four passes, is of no moment, since the difference can't be more than a few seconds of computer time. The change in the availability of arithmetic facilities has dictated a change in the emphasis of the algebra.

In the life actuarial field, we used to devote a lot of time to the study of techniques for predicting the financial effects of changing the slope of the mortality curve or of changing the interest assumption. We did so because the physical labor of developing a new mortality table and the necessary auxiliary commutation function was fearsome. Today, if we want the result of changing interest and mortality assumptions we find out by actually changing them, throwing the stuff into a computer, and examining the actual results quickly enough and cheaply enough for it to be practical to make numerous tests.

In some recent studies of the Society of Actuaries, 17 successive variations of a mortality table were tested before a satisfactory result was reached. If 34, or 50 variations had had to be tested, it would not have been too onerous to do so. The elegant theories for predicting algebraically the results of mortality variations are withering on the vine.

Although this example has been drawn from the life actuarial fields with which I am more familiar, I have no hesitation in assuming that the widespread use of computers will spell analogous changes in technique in those fields which have been thought of as "casualty." With advanced facilities for gathering data, for sorting and classifying the information, and for computing very rapidly and cheaply the financial effects of using the data, the Actuary of Tomorrow in any field will have sharply different premises upon which to base his decisions as to how to combine theory and practicality. The very existence of the new tools for computation will determine new directions for pure actuarial research and different emphasis for actuarial theory.

An always interesting subject for speculation is the probable position of the actuary in the insurance company of tomorrow. Will he be a mathematical specialist living out his lonely life in a transistorized ivory tower? Will he be a technician, called in for consultation on the matters within his limited purview to assist the actuarially uninformed in making the important decisions? If he is, it will not be good for the insurance business, nor for any human undertaking in which good decisions depend upon scientific compounding of the kinds of probabilities dealt with in actuarial science. Neither the Actuary of Tomorrow nor the Actuary of Today will make his maximum contribution to the business in which he is engaged unless he adds breadth of vision and sound business judgment to his purely actuarial attainments. I have referred to the desirability of an understanding of marketing problems. If an actuary is to have breadth of vision he will add an understanding of underwriting problems, administrative problems, in fact whatever problems are important facets of the total problem of achieving progress in a competitive world. Of course, some of our number will get greatest satisfaction from concentrating on the actuary's professional mathematical techniques. In many cases I hope that the Actuary of Tomorrow will feel that he realizes his full potential only if he is called upon to graduate from actuarial work to executive responsibilities. As an executive he will be called upon to prove his breadth of vision, his imagination, his responsibility, his judgment, his versatility, and all the other characteristics of the modern business executive.

I used the expression "graduate from actuarial work" to describe the process by which men graduate from specialized backgrounds such as sales, underwriting, law, claims, finance, etc., into jobs which cut across all those fields. The executive of tomorrow will, I hope, be found more frequently to have graduated from an actuarial background than is currently the case. The training ground of the actuary ought to become more and more recognized as a good recruiting ground for executives as actuaries demonstrate more and more both their thorough understanding of the fundamentals of the insurance business and their breadth of vision. This has been happening to a greater extent in the life field. I expect it to happen in the casualty and property field.

To make this prediction of mine come true you must do a number of things. You must recruit far more young men, and bright young men, into the ranks of your students. You must maintain or even raise your standards of qualification for Fellowship without making the student's life so hard as to discourage recruiting. You must continually review and modernize your courses of study. You must maintain high ethical standards. These things I am confident you will do, and on the premise of that confidence I believe the casualty Actuary of Tomorrow will be a man of greater influence and prestige in the company of tomorrow.

By the time I get this far toward visualizing the Actuary of Tomorrow, trying to cope with the insurance problems of tomorrow, I find that I may not really be talking about the *casualty* Actuary of Tomorrow; but about *the* Actuary of Tomorrow, a man whose training and technical tools cut across the boundaries which now serve—very vaguely in some areas—to distinguish the so-called life actuary from the so-called casualty actuary. The possible realignment of insurance categories into personal and corporate, the development of new theory in the presence of new powers of data handling, and the logical conclusion of the existing trend toward what may be called "multiple-linearity" in insurance organizations, all will spell increasing pressure toward closer association between the two present major professional actuarial bodies.

I see nothing to fear and perhaps much to be gained in such a trend. Many of the charter members of your Society were competent in both the traditionally life and traditionally casualty aspects of actuarial work. May a similar versatility be an important feature of the "Actuary of Tomorrow"!

REPORTS OF THE SEMINARS HELD AT GROTON, CONNECTICUT AT THE 1962 SPRING MEETING OF THE SOCIETY

ANALYZING ANNUAL STATEMENTS AND EXPENSE EXHIBITS OF OTHER COMPANIES

SUMMATION BY ROBERT G. ESPIE

Seminars were held with R. G. Espie acting as Chairman, assisted by Messrs. Harmon T. Barber, Joseph Linder and Norton E. Masterson. The Seminars were opened by the distribution of a set of inter-company premium, loss and expense statistics drawn from the insurance expense exhibits and distributed to management. This exhibit compares the results of the company preparing it with those of five or six other companies which appear to be reasonably comparable by reason of size and type of operation. A supplementary exhibit shows the comparable figures for three very large companies organized and operating on a somewhat definite basis. It was pointed out that these statistics and comparisons are subject to considerable shortcomings. They can be distorted by any one of a large number of non-recurring transactions or by sharp changes in type of operation. It was suggested that they could presumably be used only as clues to areas in which further investigation must be carried out. If the ratio for any one company differs noticeably from those of others, or if the trend in a series of such ratios over a period of years shows lack of conformity, it becomes necessary to spend the additional effort to try to find the cause for difference. There is a danger that explained consistency of the figures may conceal conditions which warrant investigation—mere conformity does not indicate that everything is all right any more than lack of conformity indicates that things are unsatisfactory.

Two of the other Companies represented discussed somewhat similar presentations which they make for their managements' review. There was some comment as to whether some or all of the expense figures shown should be related to written premiums or to earned premiums or to both, one suggestion being that it does not really matter a great deal since relating expenses to either basis would probably indicate whether or not further study is required. Attention was also drawn to the very difficult problem faced in the comparison of the results of mutual companies since it appears to be essential to add dividends back to the premiums for comparative purposes, and yet dividends are not always readily available by line of business.

There was some discussion as to whether the annual statement should provide more detail for review of comparative statistics, one stand being that statistics are so necessary for comparative purposes as to require their publication in the N.A.I.C. statement. An opposing point of view contended that the annual statement's goal of testing solvency on a very strict basis made it a very poor vehicle for statistical comparisons and that it should not be further distorted for that purpose. Attention was drawn to the fact that there still remains a considerable area of discretion to management in the classification of some expenses and that, although the statistics are rather less valuable because of such variances, it is not possible to eliminate such variances without straitjacketing management.

It appeared that very few companies make comparisons of financial experience and that if comparisons are made of investment portfolios, they are not made by the actuarial staff.

From the discussion of comparative statistics and their significance there were numerous—and interesting—digressions into more detailed discussions of specific problems, such as the so-called equity in unearned premium reserves and the liability for potential capital gains tax on unrealized appreciation of securities. Each of these topics produced some lively comment.

It was generally concluded that although these exhibits have great shortcomings, and must be analyzed very carefully before conclusions are drawn from them, their possible value as clues to areas which require study is so great as to make it virtually essential that companies make an effort to produce such camparisons and study them for their own benefit. Companies cannot afford to fail to look at such comparisons.

RATING OF EXCESS COVERAGES

SUMMATION BY MATTHEW RODERMUND

There was not as much general discussion in this seminar as the chairman had hoped for, probably because the subject represented an area of insurance unfamiliar to most actuaries. However, a few actuaries who are familiar with excess insurance had been invited specifically to attend this seminar, and the Society was particularly fortunate to have as a guest at both sessions Mr. Brice Frey, Jr., Vice President of the General Reinsurance Corporation and the manager of that company's facultative facilities. The chairman is greatly appreciative of the contributions of both Mr. Frey and the knowledgeable actuaries.

Definition of terms seemed to be the first requirement in a discussion of excess coverages. For example:

Excess insurance—insurance which is remote from, but on top of, normal losses; usually it refers to coverage excess of self-insurance, or excess of underlying insurance; it is purchased by individual risks; it differs somewhat from excess of loss reinsurance, which is purchased by carriers for losses per accident or occurrence in excess of limits above which the carrier has issued coverage but above which it is unwilling to bear the loss.

Deductible—in the field of excess insurance deductible has the same meaning as retention, the amount of loss assumed by the risk or the carrier before his insurance or reinsurance is called upon; the word deductible appears to be favored in fire excesses, the word retention in casualty.

Umbrella insurance—an excess broad form casualty contract which can provide, in addition to the normal comprehensive liability coverage, advertisers' liability, false arrest, personal injury, libel and slander and patent infringement; it is written in excess of existing primary insurance and also in excess of an uninsured retention or deductible (minimum usually $25,000) on those liability exposures not covered by primary insurance.

Stop loss or aggregate excess—called excess of loss ratio reinsurance if applied to insurance companies, covers all losses in excess of a cumulative total of losses incurred over a given period of time, usually one year; losses included in the cumulative total, or those covered by the stop loss agreement, may themselves be limited on a per accident basis by a concurrent excess agreement.

Pro rata excess, or participating excess—excess insurance wherein a given limit is shared on a percentage basis by a number of carriers; this is the usual situation with large excess covers.

Surplus lines—any classes of insurance or limits of coverage which a producer, unable to place in the admitted market, offers to the non-admitted market.

Following agreement on definitions, the seminar discussed the relative merits of direct excess insurance and regular insurance, that is, insurance from the ground up. Some of the participants thought excess insurance might be more flexible, more capable of being tailored to the needs of the individual risk. Others claimed that the needs of most risks, even the biggest, can be handled by existing insurance forms and that there is a distinct advantage to getting all needed protection in one piece of paper. It was agreed the particular problems, and the capacity, of the individual risk would determine the direction of its insurance buying.

So far as rating tools are concerned, the seminar learned that the published excess limits tables, deductible tables (Chubb or Factory Mutuals), and guide (a) rates are useful to excess underwriters, but only as guides, to be modified by underwriting judgment, or seat-of-pants wisdom. One of the best and most powerful guides is the competitor's quote. However, the excess market has become so competitive that some underwriters feel, on occasion, that if they get the account their rate was too low.

Past experience of a risk, if available, is one of the best rating guides, but the indications of such experience are also to be evaluated critically, with an eye to credibility. Even at this stage of the discussion there was no suggestion in the seminar that actuaries might have a useful function in the process of underwriting or rating an excess contract. The principal rating problem seemed to be that in most cases the experience is nil. The game becomes one of guessing probabilities of events that have never happened before, and there appeared to be no consensus that this is a job for the actuary rather than the underwriter.

One of the complaints was that losses reported under excess covers seldom seem to be of a type that might have been predicted. Mr. Frey told of checking into a loss where the reserve was over $100,000 and the only discernible injury was the loss of a couple of toes on the right foot. He learned that, unfortunately, the claimant was the only man in the country who made his living by playing the guitar with his toes.

There apparently are few compilations of insurance data, or any other kind of data, that are useful on a regular basis to excess underwriters. It was mentioned that actuaries will be probing the large loss area in the next several years hoping to discover relationships that will be meaningful both for the reinsurance and the excess insurance business. Mr. H. S. Beers, President of the Aetna Casualty and Surety Company, in his address to the Society at this meeting, predicted that it is the actuary who will be expected to solve problems in the insurance business that now appear to be impossible. Mr. Beers did not pinpoint any such problems but very likely the problem of rating excess coverages is one of them.

How can the actuary be useful today in the realm of excess insurance?

The participants in the two sessions of this seminar agreed that actuarial work could probably be done in the aggregate excess field, where losses in the aggregate are the subject of the contract; and also in the field of loss development, where the solvency, or at least the profit, of the excess underwriter may be affected. The actuary probably is most useful today as a consultant, or technical advisor, or sounding board for underwriters in his own company on special excess insurance cases. But it is not likely that actuaries in the near future will be supplying with any degree of certainty the probability of a loss under an excess contract.

PACKAGE POLICY RATEMAKING

SUMMATION BY EDWARD S. ALLEN

A discussion of principles for package policy ratemaking at the present stage of package policy development will obviously produce more questions than answers.

The paramount question raised in this seminar was the proper definition of a package policy. Rather than attempting a definition, it was assumed that the title of the seminar was inclusive of all types of combinations of basic coverages in a single policy but that the approach to the establishment of ratemaking principles should be different for a package such as the special automobile policy than for packages such as the new commercial multiple peril policies.

In the former, the traditional procedures can probably be adapted to the problem whereas, in the latter, the variables in risk requirements and rating procedures for the coverages involved are such as to present a considerable challenge.

For commercial packages, we discussed whether the rating approach should involve (a) ratemaking for basic classifications as it exists today with all package experience assigned back to basic classes, (b) package experience to be reviewed on a loss ratio basis for the determination of appropriate package discounts or (c) the treatment of packaged coverages as a separate line of insurance to be rated without reference to basic classification indications.

The overwhelming expression of opinion was in favor of (c). One member expressed himself in favor of (a) but none in favor of (b). Also, among those in favor of (c) there was some minor sentiment for also maintaining all experience in basic classifications until we compile a body of credible package experience.

One member reported that his company has attempted the determination of a basic indivisible commercial package rate for stated coverages with modifications applicable for optional perils or exceptional coverages such as elevator liability. It is his opinion that this basic rate can be revised based on a review of the package experience.

Since discussions in the two sessions of the seminar developed in quite different directions, it might be of interest to the participants, as well as others, to list some of the comments and opinions expressed incidental to the general conclusions as summarized above. An abbreviated list is as follows:

1. The problem is complicated by coverage differences.
2. Experience to date has vindicated early judgment as to proper package discounts.
3. Separate rates should be made for various coverage combinations.
4. We are handicapped by current requirements such as Schedule P reportings and Insurance Expense Exhibit classifications.
5. Extended Coverage is a package and presents no insurmountable problem.
6. The problem is complicated as respects the determination of an appropriate exposure base.
7. Packages contain a lack of homogeneity.
8. Catastrophe coverage and small loss coverage should be treated differently.
9. The indivisible premium approach is important for maximum expense savings.
10. Necessary detail may be provided through sampling procedures.
11. We should rate property coverages in one rate with variations for different liability coverages.

HOW CAN ACTUARIAL ANALYSES HELP COMPANY CLAIM DEPARTMENTS CONTROL AVERAGE CLAIM COSTS?

SUMMATION BY MARTIN BONDY

Rather than restrict themselves to the literal boundaries of the title, the participants expanded the topic to HOW CAN ACTUARIAL DEPARTMENTS HELP CLAIM DEPARTMENTS FUNCTION MORE EFFECTIVELY. In exploring this subject, we traded experiences on jobs we had done and ideas on some we had considered doing but had not yet done. One of the topics discussed was the shortcomings of average claim costs as a yardstick of performance because of

1) differing methods of counting claims, and
2) differences in distribution by class, territory, etc.

The effect of growth on calendar year average claim costs was noted.

An interesting topic on which not much light was shed was the question of the correlation of speed of settlement with size of settlement. Is it more economical to settle claims more quickly or to resist a larger proportion of the claims? On account of the strong correlation between speed of settlement and size of claim, the possibly mistaken conclusion has been arrived at that quick settlement automatically brings about a savings in loss costs. It seems that correlation may have been mistaken for causation. In order to determine the effect of speed of settlement, controlled experiments were suggested, although no one had ever heard of any, or had devised such an experiment.

The solution of general business problems by mathematical techniques was suggested as a possible activity of an actuarial department. Examples of such problems are

1) most effective deployment of claims offices, (This sounds like an operations research transportation problem.) and
2) correlation or other statistical studies to show what type of person (attributes, education, age, etc.) makes the best type of claims adjuster.

Some actuarial departments had helped their claims departments in staffing the various offices by projecting expected claim volumes for future periods.

Mr. Masterson brought up an interesting illustration of motivating claims men by translating figures into meaningful terms. In a bulletin or some other communication to the claims department he noted that reduction of $1.30 per notice on Auto PD would produce a one point reduction in loss ratio. Similar small dollar reductions produce the same type of effect in other lines. Unfortunately he did not say whether this had improved the average claim cost. In any case, however, the message is clear. His figures are certainly meaningful in terms of our everyday experiences rather than dealing with thousands or millions of dollars.

The question of getting average claim statistics for fire insurance was raised. It was brought out that since policies are often split among many insurers, average claim costs for a single insurer may not be meaningful.

All in all, this type of discussion can prove of assistance to the practicing company actuary. It pointed up the value of exchanging ideas in a workshop type of seminar as opposed to an instructional or orientation type seminar.

As the reader will note, many interesting problems and studies were suggested but not many solutions were offered. The discussion served more to excite people than to calm them by providing them with satisfactory solutions to pressing problems.

The tenor of the discussion indicated the preponderant philosophy of our membership towards their role in the company. They were predominantly preoccupied with reserve levels even though the topic had little if anything to do with this subject.

The idea seemed to be that the actuarial department, as one conferee so clearly put it, should serve to wave red flags before operating departments in order that they might realize the existence of problems and solve them in their own way. The idea of suggesting courses of action to a claims department appeared, in the minds of most of those present, to transcend the authority and scope of the actuary.

For all the knowledge and training we bring to bear on problems, we may still be limiting our functions too much to historical or past-performance aspects, and too little to the managerial or executive.

DISCUSSIONS OF PAPERS PUBLISHED IN VOLUME XLVIII

RECENT TRENDS AND INNOVATIONS IN INDIVIDUAL HOSPITAL INSURANCE

BY

M. EUGENE BLUMENFELD

Volume XLVIII, Page 83

DISCUSSION BY ALFRED V. FAIRBANKS

Mr. Blumenfeld's paper has presented an insight into the problems faced by a rapidly expanding health insurance industry and outlined methods for overcoming these problems. The substantial increase in medical costs coupled with the extremely rapid growth of health insurance coverage during the past few years, makes this paper very timely.

He has recommended a return to sounder insurance principles plus an extension of coverage to every person in our society. Methods for providing true insurance protection against the hazard of financial catastrophe caused by severe disability, a satisfactory program for pre-paid medical care for those who must exist on a restricted budget, and adequate protection for those persons who, because of age or health conditions, are, or will become, substandard health risks are outlined in a discussion of seven plans of insurance.

Probably the only exceptions to Mr. Blumenfeld's recommendation of an extension of coverage to every person in our society are members of our armed forces and the small segment of our society economically unable to avail themselves of the protection and provided with medical and hospital services through various government agencies. In addition, there are those who must be precluded because of health conditions.

As Mr. Blumenfeld has pointed out, the industry must be alert to the needs of the public for adequate protection, yet provide policies designed to restrain excessive use of facilities and help check abuses.

For example, the average daily hospital cost today is about \$30. It is estimated that by 1970 this cost will have risen to \$50. A policy providing a fixed daily hospital benefit may eventually leave the insured with inadequate coverage, therefore, a flexible program should be developed that will maintain adequate coverage for the insured on an equitable rate basis. In order to increase the limits under a guaranteed renewable type policy providing a level premium to a stipulated age such as 65, without impairing the policyholders' equity, it is necessary that the premium for benefits continued from the original policy remain unchanged. The premium for the increased portion of the benefits should be based on current attained age rates.

For those persons in the higher income tax brackets, a more flexible coinsurance ratio could be included in our major medical policies to take into consideration the tax deductions for medical expenses.

Providing reimbursement for diagnostic services in the hospital only, when such services could frequently be performed in a doctor's office or in the outpatient department of the hospital, will invite excessive hospital use. Providing only hospital benefits when adequate nursing homes are available at considerably lower cost is not medical economy.

The more frequent use of a deductible in hospital policies recommended by Mr. Blumenfeld will certainly help reduce unnecessary cost. The size of the deductible should depend on the type and amount of coverage provided under the policy and the economic status of the policyholder. Too small a deductible especially with a blanket type coverage may not produce the desired savings. For family policies, the use of a deductible of $200 or $300 will permit a single rate for all children covered under the policy, whereas a smaller deductible will necessitate a rate for each child.

The actual number of days of hospitalization eliminated under a hospital policy with a fixed deductible depends upon the amount of the daily room and board benefit as well as other benefits provided under the policy and the type and amount of expenses actually incurred. An elimination period for the hospital room and board benefit could be used to eliminate the first stipulated number of days of each hospital confinement. A deductible could be used for other benefits.

One of the seven plans of insurance discussed by Mr. Blumenfeld is the paid-up hospital policy. Definite scheduled benefits are recommended to overcome the uncertainty of future medical costs. However, the possibility of increasing frequency due to such factors as new medical techniques remains. Equities should be available to the policyholder who, after paying premiums for a number of years, decides to make no further payments. In the event of a rate increase for existing policyholders, the Company would receive little relief from those policyholders who have only a few more years to pay premiums and no relief from those no longer paying premiums. In addition, there would be the problem of adjusting policyholders' equities.

Many of the problems pointed out in this paper are of an economic and social nature, the solutions for which will be to a large measure the responsibility of the insurance industry. The increasing availability of health insurance for senior citizens, substandard insurance for those persons with health conditions, guaranteed renewable protection, and the substantial increase in the proportion of our population with protection testify to the fact that the industry is assuming this responsibility.

Close cooperation with medical and hospital associations will help to reduce excessive charges and over-utilization through a better understanding of mutual problems.

Fortunately, the hospitals and doctors are taking steps to control the rising costs of medical care. The development of relative value schedules as a guide to doctors fees, utilization committees of hospital staff members to help control over-utilization of hospital facilities, improved accounting procedures for hospitals, and progressive patient care are all steps toward more effective utilization of facilities. Although it is claimed that progressive patient care will not reduce hospital costs, it would appear that the need for private nurses for patients requiring intensive care might be reduced.

The need for adequate statistics has been stressed by Mr. Blumenfeld. Without such statistics it will not be possible to maintain premiums that are adequate and equitable. They may very well indicate areas where policy provisions should be modified to provide better coverage at a lower cost and eliminate possible areas of abuse.

MATHEMATICAL LIMITS TO THE JUDGMENT FACTOR IN FIRE SCHEDULE RATING

BY

KENNETH L. McINTOSH

Volume XLVIII, Page 131

DISCUSSION BY LESTER B. DROPKIN

The present paper by Mr. McIntosh joins a growing list of recent contributions to the Society which are united in the belief that real value results from approaching a given subject of actuarial interest by theoretical means. With such a viewpoint, this reviewer is heartily in accord.

The actuary dealing with the charges of a fire rating schedule is faced with a mass of unknowns. To find order and useful relationships within this mass, the author sets up a mathematical model involving a system of linear equations, in which the number of unknowns exceeds the number of equations.

Consideration of the validity of the author's model, I leave to others who have a much greater knowledge of, and intimacy with the fire field—my remarks will concentrate on the more mathematical aspects of the paper.

With the author, we speak of m equations in n unknowns, $n > m$. There is essentially only one way to proceed and that is to consider n-m of the charges as being "independent variables" or parameters. Upon selecting the charges which are to serve as parameters, the original system of equations may be transformed and reduced to a system of m equations in which each of the "dependent variables," or non-parametric charges, is expressed as a linear combination of the n-m parameters.

It is this step, this transformation and reduction, this display in a concrete and specific way of the dependence relationship, that constitutes a key contribution by Mr. McIntosh. For, while we may know in a general and conceptual sense that it is possible to so transform and reduce the original equations, no progress is in fact possible until the deed is actually done and the specific relationships exhibited.

The author casually refers us to "conventional techniques" to accomplish the desired transformations. Such conventional techniques, however, often involve a good deal of laborious work. Set forth in an appendix to this review is an extremely convenient method for handling systems of linear equations. The method may have its advantages, since in checking out the numerical values of the paper there was at least one instance where the author's values checked out only by rounding while the values produced by the appended method checked out exactly.

It is, of course, clear that any n-m of the charges may be chosen as parameters. Different solutions emerge by choosing different sets of charges as the parameters, and by choosing different ways in which the parameters are to be fixed or limited.

A second contribution of the paper is the recognition by the author that if the several dependence relationships are made subject to certain restrictions, such as that each charge must be non-negative, and if they are considered conjointly, then delimiting the possible range of one charge results in a concommitant limitation of other charges.

It is somewhat unfortunate that because the author's presentation has been interlarded with verbal encrustations of unnecessary mathematical jargon, the paper has been made much more difficult to approach than, perhaps, need have been the case. The basic ideas of the paper are essentially simple and this reviewer would have preferred a more simple exposition of them.

Mr. McIntosh has, perhaps unwittingly, imposed a heavy burden upon himself for I am sure that this Society will be looking forward to future papers in which he will carry forward the ideas and conceptions of the present notable contribution.

APPENDIX

The following procedure is based upon Crout's modification of the standard method of elimination in solving systems of linear equations.[1] It is an extremely simple and convenient procedure to use when calculations are performed on a desk-type calculator since such calculators enable one to find the sum of a series of products and, if desired, to make a final division in one continuous machine operation.

It will be recalled that we start with a system of m equations in n unknowns (with $n > m$) each of which may be expressed as:

$$(1) \qquad R_i = \sum_{j=1}^{n} A_{ij} P_j ;$$

the m equations being developed as i runs from 1 to m. After selecting any n-m of the P's to serve as parameters, we wish to express each of the m remaining P's as a linear combination of the n-m parameters. If, conforming to the notation of the paper, we let $r = n\text{-}m$ and identify the parameters by the subscripts 1 to r, and the remaining m variables by the subscripts $r + 1$ to n, the resulting equations will be of the form:

$$(2) \qquad P_j = \left(\sum_{i=1}^{r} w_{ji} P_i \right) + w_{j0} ,$$

with $j = r + 1, \ldots, n$.

(While in the paper each of the n-m parameters is also expressed as a linear combination, this is a detail and unnecessary for the purposes of this appendix.)

We deal with the system of equations in a condensed shorthand form, writing down only coefficients and constants. The form is a rectangular array—otherwise known as a matrix. While it is convenient to describe an array by the term "matrix," knowledge of matrix algebra is neither necessary nor used here.

The method consists of writing down the given equations (1) in con-

[1] For the mathematical basis of Crout's method see, for example, "Numerical Analysis" by K. S. Kunz, Chapter 10, McGraw-Hill Book Company, Inc., New York, 1957.

densed form—the given matrix; forming one matrix—the auxiliary matrix; and a set of final results—the final matrix.

To explain and illustrate the method, we use the hypothetical example given in the paper. In particular, we illustrate the case when charges P_1, P_2, and P_4 are taken as parameters. We proceed as follows:

Step 1: Mentally transpose the terms in the given equations so that the constants (R_i) and the parameters are on the right side; arrange the order of the variables on the left side so that a non-zero coefficient appears as the first coefficient of the first equation. Write down the coefficients and constants to get the given matrix.

In our example, we have:

P_5	P_6	P_3	R	P_1	P_2	P_4
.20	1.0	0	.40	−1.0	− .25	0
0	1.0	.50	.55	0	−1.0	−.6
0	1.0	1.0	.42	− .40	0	−.3

Step 2: Form the auxiliary matrix from the given matrix according to the following rules.

(a) The various numbers, or elements, are determined in the following order: elements of the first column, then elements of the first row to the right of the first column; elements of second column below first row, then elements of the second row to right of second column; elements of third column below second row, then elements of third row to right of third column; etc.

(b) The first column is identical with the first column of the given matrix. Each element of the first row, except the first, is obtained by dividing the corresponding element of the given matrix by that first element.

In our example, we have, to this point:

P_5	P_6	P_3	R	P_1	P_2	P_4
.20	5.0	0	2.0	−5.0	−1.25	0
0						
0						

(c) Each element on or below the principal diagonal is equal to the corresponding element of the given matrix minus the sum of those products of elements in its row and the corresponding elements in its column (in the auxiliary matrix) which involve only previously computed elements.

(d) Each element to the right of the principal diagonal is given by a calculation which differs from (c) only in that there is a final division by its diagonal element (in the auxiliary matrix).

Applying (c) and (d) step by step, we have:

P_5	P_6	P_3	R	P_1	P_2	P_4
.20	5.0	0	2.0	—5.0	—1.25	0
0	1.0*					
0	1.0†					

$$* \; 1.0 = \underset{\substack{\text{from Row 2, Col. 2}\\ \text{of gv. matrix}}}{1.0} - \Big(\underset{\substack{\text{from Row 2, Col. 1}\\ \text{of aux. matrix}}}{0} \times \underset{\substack{\text{from Row 1, Col. 2}\\ \text{of aux. matrix}}}{5.0} \Big)$$

$$\dagger \; 1.0 = \underset{\substack{\text{from Row 3, Col. 2}\\ \text{of gv. matrix}}}{1.0} - \Big(\underset{\substack{\text{from Row 3, Col. 1}\\ \text{of aux. matrix}}}{0} \times \underset{\substack{\text{from Row 1, Col. 2}\\ \text{of aux. matrix}}}{5.0} \Big)$$

Then:

P_5	P_6	P_3	R	P_1	P_2	P_4
.20	5.0	0	2.0	—5.0	—1.25	0
0	1.0	.50*	.55†	0‡	—1.0‡	—.60‡
0	1.0					

$$* \; .50 = \Big(\underset{\substack{\text{Row 2, Col. 3}\\ \text{gv. matrix}}}{.50} - \underset{\substack{\text{Row 2, Col. 1}\\ \text{aux. matrix}}}{0} \times \underset{\substack{\text{Row 1, Col. 3}\\ \text{aux. matrix}}}{0} \Big) \div \underset{\substack{\text{Row 2, Col. 2}\\ \text{aux. matrix}}}{1.0}$$

$$\dagger \; .55 = \Big(\underset{\substack{\text{Row 2, Col. 4}\\ \text{gv. matrix}}}{.55} - \underset{\substack{\text{Row 2, Col. 1}\\ \text{aux. matrix}}}{0} \times \underset{\substack{\text{Row 1, Col. 4}\\ \text{aux. matrix}}}{2.0} \Big) \div \underset{\substack{\text{Row 2, Col. 2}\\ \text{aux. matrix}}}{1.0}$$

‡ Determined in the same manner as the .50 and .55.

Then:

P_5	P_6	P_3	R	P_1	P_2	P_4
.20	5.0	0	2.0	—5.0	— 1.25	0
0	1.0	.50	.55	0	— 1.0	— .60
0	1.0	.50*	—.26†	— .80	2.0	.60

$$* \; .50 = \underset{\substack{\text{R3 C3}\\ \text{gv.}}}{1.0} - \Big(\underset{\substack{\text{R3 C1}\\ \text{aux.}}}{0} \times \underset{\substack{\text{R1 C3}\\ \text{aux.}}}{0} + \underset{\substack{\text{R3 C2}\\ \text{aux.}}}{1.0} \times \underset{\substack{\text{R2 C3}\\ \text{aux.}}}{.50} \Big)$$

$$\dagger \; —.26 = \Big[\underset{\substack{\text{R3 C4}\\ \text{gv.}}}{.42} - \Big(\underset{\substack{\text{R3 C1}\\ \text{aux.}}}{0} \times \underset{\substack{\text{R1 C4}\\ \text{aux.}}}{2.0} + \underset{\substack{\text{R3 C2}\\ \text{aux.}}}{1.0} \times \underset{\substack{\text{R2 C4}\\ \text{aux.}}}{.55} \Big) \Big] \div \underset{\substack{\text{R3 C3}\\ \text{aux.}}}{.50}$$

Step 3: Form the final matrix from the auxiliary matrix according to the following rules:

(a) The elements of each column to the right of the vertical line are determined in the following order: last, next to last, second from last, etc.

(b) The last element in each column is identical to the corresponding element in the corresponding column of the auxiliary matrix.

(c) Each element is equal to the corresponding element of the corresponding column of the auxiliary matrix minus the sum of those products of elements in its row in the auxiliary matrix to the right of the principal diagonal and corresponding elements in its column in the final matrix which involve only previously computed elements.

In our example, the final matrix is first:

	W	P_1	P_2	P_4
P_5				
P_6	.68*	.40†	−2.0	−.90
P_3	−.26	−.80	2.0	.60

$$* .68 = \underset{\substack{\text{R2 C4}\\ \text{aux.}}}{.55} - \left(\underset{\substack{\text{R2 C3}\\ \text{aux.}}}{.50} \times \underset{\substack{\text{R3 C4}\\ \text{final}}}{-.26} \right)$$

$$\dagger\ .40 = \underset{\substack{\text{R2 C5}\\ \text{aux.}}}{0} - \left(\underset{\substack{\text{R2 C3}\\ \text{aux.}}}{.50} \times \underset{\substack{\text{R3 C5}\\ \text{final}}}{-.80} \right)$$

Then:

	W	P_1	P_2	P_4
P_5	−1.4*	−7.0†	8.75	4.5
P_6	.68	.40	−2.0	−.90
P_3	−.26	−.80	2.0	.60

$$* -1.4 = \underset{\substack{\text{R1 C4}\\ \text{aux.}}}{2.0} - \left(\underset{\substack{\text{R1 C2}\\ \text{aux.}}}{5.0} \times \underset{\substack{\text{R2 C4}\\ \text{final}}}{.68} + \underset{\substack{\text{R1 C3}\\ \text{aux.}}}{0} \times \underset{\substack{\text{R3 C4}\\ \text{final}}}{-.26} \right)$$

$$\dagger -7.0 = \underset{\text{R1 C5}}{-5.0} - \left(\underset{\text{R1 C2}}{5.0} \times \underset{\text{R2 C5}}{.40} + \underset{\text{R1 C3}}{0} \times \underset{\text{R3 C5}}{-.80} \right)$$

For the purposes of this illustration, we have done quite a bit of writing; in actual use, it is simple and fast. The interested reader may wish to check the following derivation of eq. (3a) of the paper.

P_5	P_6	P_4	R	P_1	P_2	P_3
Given						
.20	1.0	0	.40	−1.0	−.25	0
0	1.0	.60	.55	0	−1.0	−.50
0	1.0	.30	.42	−.40	0	−1.0
Aux.						
.20	5.0	0	2.0	−5.0	−1.25	0
0	1.0	.60	.55	0	−1	−.50
0	1.0	−.30	.433	1.333	−3.333	1.667
Final						
		P_5	.550	−1.0	−6.25	7.5
		P_6	.290	−.80	1.0	−1.5
		P_4	.433	1.333	−3.333	1.667

DISCUSSION BY ROBERT L. HURLEY

This paper involves certain aspects of higher algebra which have received an impetus in the last decade from the developments in the field of Linear Programming. As yet these techniques have had limited application to actuarial problems—but this may soon be rectified since the author of this paper, Kenneth L. McIntosh, is an active participant in the CAS recently appointed Special Committee on the Mathematical Theory of Risk.

The nub of the McIntosh paper is the application of linear algebra to the underlying philosophy of fire schedule rating. Undoubtedly the transition to matrices and vectors can be disconcerting for actuaries whose previous interests may have gravitated towards statistical distributions and probability theory. There are certain tangible aspects of probability theory which can be most pleasing.

For example, theoretical developments on the Negative Binomial by members of our Society within the last few years can be, and have been, put to the test of actual loss occurrences. The same situation held in the case of the earlier work by our Society on the Poisson distribution and even in the prior actuarial generation of Arne Fisher, Mowbray, Whitney and H. C. Carver in their investigations into the Pearson curves, the Chi Square test, etc.

It is certainly reassuring to take a highly theoretical mathematical development, apply it to raw insurance statistics, and see that it helps to solve actual rating problems. Unfortunately, Mr. McIntosh could not avail himself of the luxury of insurance data to fit his mathematical schema. This is thought to be the fault neither of Mr. McIntosh, nor of the Fire Insurance Industry.

Now, every author constrained to work with abstruse symbols runs the risk of having his work misinterpreted and what is at first strange often becomes suspect. There is, of course, the classic story, probably apocryphal, of the agnostic Diderot's confusion in being confronted by the mathematician Euler with the challenge "$(a + b^n) / n = x$. Therefore, a God must exist. Refute, Sir, if you can."

This quotation is cited not to imply that the author is thus attempting to convert an unbelieving reviewer afflicted with an invincible ignorance. But seriously, the reviewer considers the McIntosh paper as a sincere effort to explain fire schedule rating in terms of some advanced mathematical techniques.

The schedule rating method, in itself, suggests the linear equation philosophy. The schedule sets up a systematic arrangement of debits and credits for the physical characteristics of the risk. The net result of adding up the various debits and credits is the risk rate.

As Mr. McIntosh points out, a schedule cannot be operated in a laboratory but must be applied to specific risks to develop the policyholders' insurance costs. Therefore, there are practical constraints to the maximum and minimum charges that can be made. Many bureaus have long had minimum or "stop" rates below which any net rate produced by the schedule would be disregarded. While I do not know of any formal maximums there are practical limits beyond which the schedule rate cannot go.

Consequently, in arranging his schedule charges and credits the fire insurance engineer must set his relative values to stay within the plan minimum and the practical maximum charges. At the same time the factors should be arranged in such a fashion that the preponderance of risks do not cluster at either the top or the bottom limits. Moreover, there must be a relative consistency in the charge for similar hazards from risk to risk.

The Fire Insurance Industry has been operating this type of risk rating plan for many years with obvious success. Probably few of the schedule raters would recognize the association of their work with the McIntosh equations but it is believed that both are reducible to a common philosophy. Mr. McIntosh states in his paper that the fire insurance underwriters do not explicitly rate risks according to his mathematical model. Moreover, he observes that it would be impossible for them to do so at the present time. Basically Mr. McIntosh is saying that the limits which the rater must observe in scheduling his debits and credits are akin to a problem in linear algebra.

The reviewer does not believe that Mr. McIntosh offers his paper as an irrefutable proof of the mathematical basis for fire rates. Actually the value of fire schedule rating has been substantiated in many ways. Of prime importance, each assured is guaranteed that his rate takes into consideration the hazard presented by his own property as measured according to the impartial evaluation of the bureau engineer. The merit of the schedule rating approach is also proved by the fact that the insurance companies have been able to render vital protection to the public and at the same time have been able to segregate sufficient funds as a guarantee that future losses will be paid despite the magnitude of the conflagration hazard.

Lest there may be some misunderstanding of the role played by the fire insurance schedule, the reviewer would probably like to have the record straight. The schedule rate in itself is not susceptible of mathematical demonstration by insurance loss statistics. There are many students of the business who sincerely believe that no such attempt should be made.

This is not to say that fire insurance rates are not responsive to actual loss experience. The overall fire rate level is determined by comparing the actual experience with the balance point loss ratio. Once the rate level has been set for fire insurance within the State, the local rating bureau reviews the National Board tabulations of classified experience to see which types of business should be subject to rate modifications. In a way the schedule might be viewed as the means of distributing the State rate level as modified for the classification experience to the individual risk.

The Society is indebted to Mr. McIntosh for writing a paper on advanced mathematical techniques which have had wide application in many fields other than insurance. It may well be that the Society's "Special Committee on the Mathematical Theory of Risk" will indicate areas of possible application which will encourage other members to undertake writing valuable papers in this potentially important field.

AUTHOR'S REVIEW OF DISCUSSION

KENNETH L. McINTOSH

Mr. Dropkin's emphasis on the particular method of transforming the initial equations is a little bewildering, granted that in the immediate instance the method he suggests would have been a better choice than that which was used.[1] Not only does slide rule accuracy seem sufficient for present purposes since final results here are rounded to two figures, for a number of reasons the retention of more than two significant figures in any final rate is mathematically meaningless though sometimes necessary for practical reasons.[2] In any event, transformation of the initial equations is merely an unavoidable chore, preliminary to the main development. The term "conventional methods" was intended to embrace any and all of the several techniques to be found in standard texts, leaving open the specific choice in any specific case.

The critical problem here is to develop certain significant properties, not of the initial system of linear equations, but of the system of inequalities to which these equations are converted following transformation once the condition of non-negative charges has been imposed. The easiest (if not the only) way to develop these properties is by means of certain concepts and techniques associated with certain areas of set theory, which are relatively simple of application (at least as simple of application as is the negative binomial) but which are almost impossible to explain in ordinary algebraic terms. Actually, the fire schedule problem is non-linear, though here it has been reduced arbitrarily to linear form for illustrative purposes. In the general case it can always be reduced to linear form in practice, but only at the cost of introducing an unwieldy number of additional parameters not required for the non-linear solution.

Mr. Hurley's practical maximum and minimum stop rates, as well as the practical distribution of rates within the rate range of the class, carry beyond the intended scope of the presentation. Since these points have been raised, however, the stop rates merely furnish additional equations with mathematical properties identical to those of the rate level equations and with identical parameters. These can be and should be grouped with the rate level equations to form a combined system initially, and the development then proceeds exactly as with the rate level equations alone. The practically determined rate distribution will also give additional equations, though in any given case it may be expedient to treat these separately rather than to incorporate them into the initial rate level—stop rate system.

The development as presented assumes a pre-determined set of target class rate levels obtained by unspecified methods from unspecified data. From these rate levels, limits to schedule charges are derived mathematically. If the "assumption" of class rate levels is discarded and these are derived mathematically from loss experience, the charge limits then would seem to become functions of that same loss experience. That limits to the schedule rate are functions of any existing limits to schedule charges is obvious, and the mathematical chain from loss experience through rate level through schedule charge to schedule rate seems complete. Practical considerations preventing rigorous application hardly seem to impair the theoretical rigor of the mathematical development.

To keep the record straight, however, let it be emphasized that the theory

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[1] The method of Gauss was used. See M. G. Salvadori and M. L. Baron, *Numerical Methods in Engineering*. Prentice-Hall, Inc. (1952). P. 17; or V. N. Fadeeva, *Computational Methods of Linear Algebra*. Dover Paperback #S424. (1959). P. 65.

[2] The author knows of one insurance manager who must retain nine decimal places in all rate calculations solely in order to reconcile certain premium accounting balances which he must prepare.

here presented, even if extended to include derivation of the class rate levels from loss experience, is *not* proposed as a substitute for judgment in the fire rating process. It is hardly an original observation to state that so long as insurance loss remains a random variable and certain practical requirements must be met, judgment cannot be eliminated from any rating process. If the theory proposed has any practical value it will be first as a guide to judgment, second as a possible method of eliminating a certain amount of false starts and lost motion in the preparation or major revision of a rating schedule once it has been decided exactly what specific requirements that particular schedule must meet. Which, in final essence, is all that this or any other rating "theory" ever can accomplish.

OBSERVATIONS ON THE LATEST REPORTED STOCK INSURANCE COMPANY EXPENSES FOR 1960

BY

FRANK HARWAYNE

Volume XLVIII, Page 109

DISCUSSION BY SEYMOUR E. SMITH

I found Mr. Harwayne's paper quite interesting in that, while aware of the fact that there are wide variations in actual expenses by individual company, this is the first time that I have seen, in exhibit form, average expenses by premium volume and also the range of lowest and highest. To a certain extent I suspect that the difference in expense ratios between the large and small volume writers may be affected by the percentage of large risks to volume. However, this distortion should not affect the basic differences shown in Mr. Harwayne's exhibits.

Without in any way detracting from the importance of expense requirements as such, my own feeling is that expense ratios are merely one facet in the overall picture of profitability. Individual company management decisions as to policy can have quite an effect on expense ratios. For example, in certain lines of insurance a company may decide that improved profitability could result from higher levels of expenditure for such individual functions as underwriting, claim, engineering and inspection, etc. Out of curiosity, from the same source used by Mr. Harwayne, an exhibit has been prepared showing underwriting profits for a number of lines by size of company. The company size is based upon the premium volume for the individual line. There is apparently a definite relationship between the higher expense ratios noted by Mr. Harwayne for the smaller sized companies and the profitability for these same companies, as will be noted in the exhibit. The average underwriting gain for the smaller sized companies is considerably below the average for all stock companies combined. However, when considering companies, averages can be very misleading. As will be noted from the figures for the high and low profit company in each group, some small companies manage to conduct a very profitable operation and some large companies have sustained substantial underwriting losses.

In today's highly competitive and rapidly changing insurance market the wide range of profitability figures seems to emphasize the importance of management in individual insurance company operations. While the problem of making a profit may be a bit more difficult for the *average* small company as compared with the *average* large company, the wide range of results seems to indicate that quality of management rather than corporate size is the major controlling factor.

Mr. Harwayne, in his paper, has raised the question as to whether part of the expense savings of efficient carriers ought not be passed on to the policyholder. It appears to me that this question is becoming rather academic as the rapid growth in the recent past of independent filings, deviations, special package policies and the writing of participating insurance by stock companies is in large measure doing exactly this.

I found Mr. Harwayne's paper interesting—particularly since it has whetted curiosity for developing additional data on the various facets affecting profitability of operation.

1960 STOCK COMPANY UNDERWRITING NET GAIN (Adjusted)*

Premium Range (in millions)		Fire	Comp.	Other B.I.	Automobile B.I.	Automobile P.D.	Automobile Coll.	Automobile Compr.
1 - 2	Average	-5.9%	-4.6%	2.8%	-11.3%	-6.3%	-3.6%	5.3%
	High	12.4	14.7	44.3	19.7	20.6	12.5	46.3
	Low	-26.0	-36.8	-24.9	-34.3	-27.3	-17.1	-11.5
2 - 4	Average	-2.3	-8.1	-1.5	-5.3	-0.9	3.3	3.7
	High	19.9	10.5	13.3	29.8	33.3	43.5	11.5
	Low	-32.4	-27.0	-56.6	-32.4	-15.4	-15.3	-35.7
4 - 8	Average	-0.5	-3.8	5.3	-12.0	9.7	5.9	5.8
	High	23.7	7.7	23.8	12.3	10.3	23.7	15.6
	Low	-18.6	-15.1	-6.4	-36.9	-6.1	-5.5	-4.3
8 - 16	Average	0.0	1.5	3.7	-4.6	1.6	9.9	6.3
	High	5.3	21.5	15.6	4.4	7.6	26.2	11.7
	Low	-3.5	-17.5	-7.0	-15.0	-2.9	-2.3	-0.8
16 - 32	Average	1.3	4.2	5.5	-4.4	4.7	9.7	7.1
	High	15.0	14.6	10.0	5.1	6.2	x	11.9
	Low	-4.8	-0.5	-0.1	-15.4	2.9	x	3.8
32 - 64	Average	1.8	-2.7	3.9	1.0	4.6	5.1	15.1
	High	6.8	3.5	9.3	21.8	8.6	10.1	x
	Low	-4.4	-17.9	-1.0	-10.1	-4.0	0.5	x
64 - 128	Average	-0.1	-0.3	x	-4.2	5.3	19.7	x
	High	3.1	x	x	0.4	x	x	x
	Low	-4.8	x	x	-14.7	x	x	x
All Stock Companies		0.5	0.0	3.7	-2.7	2.7	7.8	6.4

*From Loss and Expense Ratios booklet published by the New York Insurance Department

AN ACTUARIAL ANALYSIS OF A PROSPECTIVE EXPERIENCE RATING APPROACH FOR GROUP HOSPITAL-SURGICAL-MEDICAL COVERAGE

BY

GEORGE E. McLEAN

Volume XLVIII, Page 155

DISCUSSION BY ROGER A. JOHNSON

Mr. McLean's comprehensive paper entitled "An Actuarial Analysis of a Prospective Experience Rating Approach for Group Hospital-Surgical-Medical Coverage" outlines briefly the history of experience rating of these coverages, and follows with a rather complete description of the experience rating plan now in effect in his Blue Cross Plan.

As a fairly recent convert to Blue Cross, I am not in a position to criticize either his history or his rating plan. The Plan which I represent adopted, effective August 1, 1960, a merit rating program which is substantially different from Mr. McLean's plan. Such differences, however, reflect variations in philosophy and local conditions, and one cannot say that either program is right and the other wrong.

Without going into a complete description of our program, which I may do at some later date, let me point out some major differences:

1. Some traditional elements of "community" rating have been maintained, such as the group conversion subsidy, and groups are encouraged to cover their retirees in affiliated retiree groups by spreading the additional cost of such groups over all.
2. A one-year experience period is used, credibility limiting fluctuations in either direction.
3. Credibility is determined by premium volume. In spite of Mr. McLean's objections, this has the great advantage of simplicity.
4. In addition to individual ratings for groups having 5% or higher credibility, the program provides for merit rating of smaller groups (less than 30) in the aggregate, and for the rating of non-group business in the aggregate, both using the merit rating formula with full credibility.

It is to be hoped that Mr. McLean's paper will encourage others in this field, both from Blue Cross and "commercial" organizations, to make further contributions to the rather meagre coverage of this area in our Proceedings.

AUTHOR'S REVIEW OF DISCUSSION and ADDITIONAL NOTES

GEORGE E. McLEAN

In his discussion Mr. Johnson made the statement that the Experience Rating Program described is that which is now in effect in the Massachusetts

Blue Cross-Blue Shield. While this is substantially true, the fact is some of the ideas at the time the paper was conceived had not been put into effective operation and have been modified upon implementation.

There has been a change in the basic permissible loss ratio and there has been a slight alteration in the approach to converting losses to current level. These amendments and changes I shall discuss briefly after I address myself to the four points raised by Mr. Johnson dealing with differences between the Philadelphia and Massachusetts approaches.

1. In setting the permissible loss ratio for experience rating of group business, 1% of premium is earmarked for group conversion subsidy. In this respect our approach is philosophically and actually not different from Philadelphia's. We do not, however, at the moment provide any sort of credit for groups to encourage them to include their retirees. In my opinion this is a very intelligent approach on the part of the Philadelphia Plan and one which the whole industry might consider seriously. If more companies could be encouraged to provide for their retirees through the mechanism of group coverage it would certainly mitigate the problem of covering the aged to a degree.

2. The question of allowing additional credibility based upon accumulation of experience over an extended period of time is one which may be legitimately argued on various lines. We are about to test our own experience over a period of two or three years to determine which method would have yielded more accurate results in the light of subsequent development. Merely from observation, the system of using two years' experience versus one tends to damp the natural sinusoidal pattern of renewal rates of relatively large groups.

3. I would agree with Mr. Johnson entirely that premium volume as a measure of credibility does have the advantage of greater simplicity. In some Blue Cross-Blue Shield Plans, and possibly in some commercial carriers which make limited offerings in this field, the variety of coverages available is sharply restricted. In these plans or companies premium volume may well be an accurate gauge of credibility since it will reflect, primarily, size of risk and utilization rates. In a Plan such as Massachusetts, however, which has seven standard offerings ranging from $12 room and board indemnity contracts to full semi-private coverage, plus more than one hundred special types of contracts in force including some with room allowances as low as $7 a day, there is a considerable variation in basic rate resulting from coverage provided. For this reason premium volume tends to break down as a true measure of credibility.

4. We rate our non-group business as a category of risk in much the same way as Philadelphia. Every year the experience of this entire category is studied in depth and new manual rates promulgated. If there is an indicated change of 5% or more from present manual rates a change is instituted.

   We experimented, at one time, with the business of rating non-credible groups as a class but we experienced a great difficulty in administration. At that time this category was assessed a blanket 10% surcharge; the remainder of the group business was experience rated from the manual rate without blanket adjustment. The situation which produced the difficulty involved the borderline groups; that is, those which were nearly credible for rating purposes. For example, in a given locale we had two groups different in size by only about five contracts, one of which fell just below the dividing line and received a 10% surcharge; the other was rated on its own experience which, though poor, did not produce any surcharge over the manual rate because of the application of a low credibility. The particular group which suffered the 10% increase happened to have very good experience and we were hard pressed to explain to them why there was such a sharp deviation in our treatment of groups so similar in size.

We have now reached the conclusion that the best method of operation for our area is to examine the experience of all groups holding similar coverages, determine proper manual rate levels, and allow deviations from this standard based upon experience and credibility. Since our experience rating program is nearly in balance we realize approximately the income contemplated in the new manual rates; moreover, our treatment of groups is equitable and readily salable to our accounts because there is no point in the range of risk size at which we introduce a totally new concept of rating.

ADDITIONAL NOTES

In the original presentation of this paper the minimum retention, as a percentage of premium, was 8% and produced a 92% permissible loss ratio. Because we have been permitted to reduce our rate of accrual to statutory reserve, the new minimum retention has been reduced to 6% yielding a 94% permissible loss ratio.

With regard to the development of statewide group trend factors, for use in converting losses to anticipated levels, those currently in use are 1.08 for Blue Cross and 1.04 for Blue Shield. These factors were determined in essentially the same way as those shown in Exhibits VII and VIII of the paper but reflect more recent experience. The annual increase in cost for Blue Cross and Blue Shield combined will vary between 6.0% and 6.5% depending upon the coverages held. The use of a composite factor is more nearly in line with the commercial practice, I believe, and it would appear from this that a 6% per year increase factor might be an accurate reflection of the situation, at least as it exists in Massachusetts today.

The application of these statewide trend factors to all groups, regardless of size, produced what in our opinion were some legitimate complaints. It was argued that some consideration, at least, should be given to the trend in loss cost exhibited by the particular group where there were a large number of contracts involved. As a consequence we have modified our approach to experience rating by introducing the "group's own trend factor" which is melded with the "statewide trend factor." The sample application of group trend factor will illustrate the effect of the group's own experience in determining trend factors.

An individual group's own trend factor is developed by:

1—Determining the ratio of actual losses to premiums at present standard rates for each of the two experience years.

2—Dividing the second year ratio by the first to determine the group's own trend.

Weight of Group Trend Factor—Because the statewide trend is based on four years' experience, while the group's trend is based on only two years' experience, only half weight is given to the group trend. Also, recognizing that a group's credibility is a measure of the reliability of its loss experience, we further modify the group's trend by its credibility.

Composite Trend—the mathematics of modifying a group's trend by half its credibility and then combining with the statewide trend to produce a composite trend is illustrated in the Blue Cross sample—footnote to item 3A.

Maximum and Minimum Annual Trend—Because we feel that we cannot recognize a downward group trend, the minimum group trend factor is 1.00. To compensate, we limit upward group trend to the statewide factor so that the maximum upward group trend factor is 1.08 for Blue Cross and 1.04 for Blue Shield.

As a result of these maximum and minimum limitations:

The range of annual composite Blue Cross trend factors is from 1.04 to 1.08.
The range of annual composite Blue Shield trend factors is from 1.02 to 1.04.

Composite Compounded Trend—The composite annual trend factor (in this case 1.07) is then cubed and squared as shown in the footnote to item 3A.

When first experience year losses (in this case 1959 losses) are multiplied by the cubed factor (1.23) we arrive at what these losses would cost if they occurred three years later (in 1962). When second experience year losses (in this case, 1960 losses) are multiplied by the squared factor (1.14) we arrive at what they would cost if they occurred two years later (in 1962):

	Actual Losses	Composite Compounded Trend Factor	Losses At Anticipated Level
1st Exper. Yr. 1959	\$31,200	1.23	\$38,376
2nd Exper. Yr. 1960	\$34,000	1.14	\$38,760
			\$77,136

Loss Ratio For Rating—Now actual premium has been adjusted to premium at present standard rates for the memberships and benefits in effect during each of the experience years. Also, losses have been adjusted to the level anticipated in the forthcoming year. Using these figures we determine what the group's loss ratio presumably will be if standard rates are paid:

	Losses At Anticipated Level	Premium At Present Standard Rates	Loss Ratio for Rating
2 Yrs. Combined	\$77,136	\$69,000	1.12

Surcharge or Discount—

$$\frac{\text{Loss Ratio-Permissible Loss Ratio}}{\text{Permissible Loss Ratio}} \times \text{Credibility} = \text{Rating (rounded to nearest 5\%)}$$

In this example, the formula is:

$$\frac{1.12-.94}{.94} \times .90 = +.1724, \text{ rounded to nearest } 5\% = 15\% \text{ surcharge}$$

Statewide Trend Method—Item 3B illustrates the effect of using the statewide trend factor without consideration of the group's own trend. Since we are taking ratings to the nearest 5% the difference in method produces a difference of 5% in the indicated renewal rating.

In conclusion I would say that the changes described have put us in an even more competitive position by sharpening our experience rating technique. Our present methods, however, even now are undergoing examination with a view to possible further refinements.

MASSACHUSETTS HOSPITAL SERVICE, INC.

Sample Application of Group Trend Factor

1. *Actual Experience:*

Year	**Premium**	**Loss**	**Loss Ratio**
1	$38,000	$31,200	.82
2	$45,000	$34,000	.76

2. *Computation of Group Trend Factor:*

Year	**Standard Premium**	**Actual Loss**	**Loss Ratio**
1	$34,000	$31,200	.92
2	$35,000	$34,000	.97

Group Trend Factor = .97 ÷ .92 = 1.05

3. *Standard Experience:*

A. Group Trend Method

Year	**Standard Premium**	**Standard Loss**	**Loss Ratio**	**Loss Trend Factor**[1]	**Credibility**
1	$34,000	$38,376	1.13	1.23	
2	$35,000	$38,760	1.11	1.14	
	$69,000	$77,136	1.12		90%

Rating + 15%

B. Statewide Trend Method

Year	**Standard Premium**	**Standard Loss**	**Loss Ratio**	**Loss Trend Factor**	**Credibility**
1	$34,000	$39,312	1.16	1.26	
2	$35,000	$39,780	1.14	1.17	
	$69,000	$79,092	1.15		90%

Rating + 20%

[1] Loss Trend Factors used in the Group Trend Method are

Year 1: 1.07 × 1.07 × 1.07 = 1.23
Year 2: 1.07 × 1.07 = 1.14

where 1.07 is the composite Trend determined from the formula
(½ Group Cred) (Group Trend Factor)+(1 − ½ Group Cred) (Statewide Trend Factor)
which in this example is (.45) (1.05) + (.55) (1.08) = 1.07.

Note: If Group Trend Factor is greater than 1.08 use 1.08 for Group Trend Factor.
If Group Trend Factor is less than 1.00 use 1.00 for Group Trend Factor.

PATTERNS OF SERIOUS ILLNESS INSURANCE

BY

MARK KORMES

Volume XLVIII, Page 121

DISCUSSION BY JOHN R. BEVAN

Over the years, the contributions to the Society Proceedings on Accident and Health matters have not been in proportion to the emerging rate-making problems and to the developments of actuarial interest in this field. Mr. Kormes, however, does not share this responsibility since the paper under discussion is the second one he has authored on the general subject of coverage for catastrophic disabilities.

Although his paper and the statistical tables therein cannot be used directly for rate-making purposes, there is included valuable data which provides a general background for expected loss patterns. By the word "patterns" is meant such significant studies as the nature of chronological loss development, the distribution of losses by size of claim and the incidence of losses by type of medical expense. The availability of such data can be of assistance to the actuary in the pricing of and the reserving for the many complex forms of coverage in use today by the industry.

Let me preface my further remarks with an observation to the effect that actuaries are not readily satisfied with data presented them. Statistical material may be in large enough blocks for full credibility but may not be homogeneous; it may be homogeneous but not credible. It can be recent but too thin, or broad and stable but unresponsive to current trends. Dissatisfaction on any of these counts often leads a Bureau actuarial committee to ask the staff to obtain more data while keeping the matter on the agenda. In keeping with such tendencies of the actuary, I found myself dissatisfied with some of the statistical data in this paper in the following respects:

Generally, ample evidence is available to demonstrate that medical costs for this type of coverage vary by age, sex, geographical area, income and by type of protected person, i.e., employee, spouse and child. Those of us engaged in rate forecasting for other than Blue Cross companies have typically introduced rate differentials for all these factors. In this study, however, no such stratification is attempted although it is readily conceded that the income and area factors are not as important in a Blue Cross study confined to one state and to specified income groups. Thus, the data are applicable primarily to the Blue Cross flat rating approach.

In all probability the statistical system in use by the Massachusetts Blue Cross would not permit further statistical refinement. Possibly, it was the author's view that any further fragmentation of data by sex or age would lack credibility. In any event, it can be said that future experience studies of such data would be improved by segregation along the lines indicated above. For example, in the paper under discussion, individual and family contracts are segregated for experience purposes. However, if the head-of-the-family's experience covered under the family contract could be separated and joined with the individual's experience, such combined results would provide a reasonably homogeneous class and a broader statistical base. The residual family experience comprised of only dependent wives and children would similarly be a purer classification and of value in assessing dependent loss expectations. In such further studies, it might be of interest to note the format used by Messrs. Gingery and Mellman in their recent article in the 1961 Proceedings of the Society of Actuaries entitled "An Investigation of Group Major Medical Expense Insurance Experience."

More specifically, it is also felt that the arrangement of the data would be of more value for interpretive purposes if

1. Maternity claims were separately shown, thus distinguishing fortuitous from non-fortuitous claims, and
2. Total medical expense charges were tabulated as well as the actual claim payments.

As to suggestion No. 1, it has usually come as a surprise to most actuaries that maternity claims are a proper subject of insurance in the first instance. Since such claims are usually foreseeable, non-catastrophic and budgetable, they can be considered to be outside the realm of insurability. However, the coverage has nevertheless become a fixed segment of the Accident and Health product and will probably remain there. Under these circumstances, the best course for the actuary is to recognize the difference between the chance and non-chance claims in his statistics. To do otherwise is to produce a blend of data which leads to a "bunching" of claims in a severity study at the maternity benefit amount and to obscure the frequency level due to chance claims alone. Again, the Massachusetts Blue Cross statistical plan may not provide for such refinement. Further, if the objective of the author's study is merely to measure past rate adequacy overall and to predict future pure premiums, the maternity segregation is not crucial on the assumption that the relativity of maternity losses to total will not change significantly. The stress in this discussion is only to suggest that interested readers from outside the Blue Cross field would benefit by such a split in the possible application of these studies to their own rate-making activities.

As to suggestion No. 2 above, it is helpful in the field of Major Medical insurance to have available total charges in addition to losses paid under a specific plan of coverage. With the availability of the former data, it becomes possible to relate any type of major medical plan with varying deductibles and coinsurance to the raw data and thus to measure the effect of varying such factors. Again, this was the approach used in the aforementioned paper by Messrs. Gingery and Mellman.

In analyzing the actual statistical tables the following comments seem appropriate:

1. Tables I and II demonstrate remarkably consistent results in portraying the loss development pattern of paid to ultimate losses as of specified points of time.
2. In the diagnosis study as shown in Table VI, there may be some justification for expanding the coded disabilities for Master Medical since the "all other" category is averaging around 45%.
3. In Table VII, an exhibit of claims by size is shown in which, as Mr. Kormes has stated, the distributions do not follow any regular

pattern. The significant bunching in the size group $250.01 to $300.00, for example, demonstrates this irregularity when shown with adjoining groups:

Master Medical
1959
Family

Size of Claim	Number	Amount
$200.01-250.00	28	$ 6,289
250.01-300.00	536	159,226
300.01-400.00	29	10,131

Mr. Kormes explains this aberration (and it occurs to a lesser extent in distributions for other years and for the individual contracts) by the statement: "This is most probably due to certain types of more frequent serious illnesses for which the costs fall into the above ranges." While this explanation may be valid, it would appear to the writer that this particularly freakish phenomenon should be verified by first segregating the tabulating cards by diagnosis and then preparing a tabulation by size and by diagnosis.

Because of the irregularity of these distributions, the author would probably be the first to agree that their use in determining rate credits for higher deductibles, as was done on page 125, is subject to some margin of error. Possibly it could be minimized by combining the available years of experience into one table and smoothing the resulting data into a more acceptable device for such purposes.

As a further point on this item, which point was touched upon above, the tabulation of charges in lieu of claims paid by size would also improve accuracy in deriving rate differentials for varying deductibles. That is, alternate deductibles should be applied to total charges rather than to claims to which coinsurance percentages and the current $25 deductible have already been applied.

In conclusion, I feel that Mr. Kormes is to be commended for adding to our statistical storehouse of Accident and Health data. The theme of this discussion is only to suggest that the value of future studies would be increased if the data were arranged and refined along the lines indicated above.

AUTHOR'S REVIEW OF DISCUSSION

MARK KORMES

Statistics are Heaven or Hell for the actuary depending on whether or not they show what he expects and are available in such detail as he desires. It is for this reason that I have selected the title of my paper and have repeatedly indicated therein the need of further studies and more detailed analyses.

Mr. Bevan's discussion quite properly brings out the necessity for additional more detailed information. Some of the subdivisions such as age and sex may have merit if they are to be used as rating factors.

In some of the Blue Cross plans where I have been instrumental to implement this coverage an age factor was introduced to reduce the rate for groups with a large proportion of younger ages and vice versa.

Since the year of birth is punched on all claim cards an analysis of losses by age will be possible. There is, however, at the present time a lack of the corresponding information for the exposure so that the calculation of incidence and cost by ages could not be accomplished with the desired degree of accuracy.

Blue Cross Plans prefer not to differentiate by sex because of the community aspect of their philosophy. The income factor has been recognized in the rate determination as follows:

Income Range	Factor
Under $ 5,000	.95
$ 5,000 to 6,999	1.00
7,000 to 9,999	1.05
10,000 to 14,999	1.25
15,000 to 24,999	1.75
25,000 & over	3.00

The number of employees in each range is multiplied by the factor and the sum of the products is divided by the total number of employees to determine the average income adjustment factor. Since in practically all instances the average income factor was close to unity the expense of special statistical analyses did not seem warranted.

I cannot agree with Mr. Bevan that employees as a group and dependents are more homogeneous classes than the individual and family classifications. On the contrary, every study which was made of the employees under the family contracts showed consistently a better experience than that for single employees. This is quite understandable because a single employee is apt to stay longer in a hospital having no one to take care of him and he is also apt to be more frequently admitted as a medical case for the same reason. Just because insurance companies decided to make rates for employees and for dependents as separate categories this does not necessarily result in more homogeneous classifications.

The next criticism of Mr. Bevan is directed against the inclusion of maternity claims. I am advised by the statistical division of the Massachusetts Blue Cross that the number and amount of maternity claims is negligible and, if excluded, would in no way affect the results. This is primarily due to the fact that normal delivery is covered by the basic contract and that only under severe complications would there accrue benefits under the Master Medical coverage primarily for nursing service. Mr. Bevan is, however, entirely correct in stressing the separation of maternity cases in the experience of an insurance company major medical contract which is not in excess over basic coverage.

The desirability of having information on total medical expense is undeniable but because of the built-in deductibles per calendar quarter and special benefit provisions for diagnostic X-ray services in physician's office the information would not be complete. Furthermore, since the cost of many services following the discharge from a hospital in cases of the specific prolonged illnesses is covered in *full,* the determination of the total cost would involve additional labor. The surgical benefit for pelvic delivery cases while in accord with a fee schedule is *not a service benefit* and the collection of reliable data on the additional charges made by physicians would be well nigh impossible. It is for these reasons that the existing statistical and claim processing set-up does not provide for the collection of this information.

I concur with Mr. Bevan that a further analysis by diagnosis of the Master Medical category "All Other" is desirable. This will be possible because the statistical card contains a three digit international classification of disease code. It is hoped that such information will be made available in the near future.

There is no doubt that a further study is needed to explain the "freakish" phenomenon of the distribution by size particularly for Master Medical. The short time at my disposal did not permit the desired analysis but the following facts may throw some additional light on the situation:

(a) For all years (1956 to 1959) the average cost of a coronary attack was $284. While this is an arithmetical average, subsequent studies may confirm that a large number of such cases are close to this average. From Table VI it is seen that this diagnosis accounts for approximately 9% of all Master Medical cases.

(b) The size of loss analysis for the year 1959 is based on incurred experience as of March 31, 1960. From Table II we find that the payments are only 42% of the ultimate incurred cost. A very large number of out-standing claims carry a flat reserve of $300. (The over-all average cost indicated by the 1959 experience as shown in Table VII for family contracts is $354.94.)

I am grateful to Mr. Bevan for taking the time to prepare the discussion of my paper and to call attention to the various elements where detailed information is of essence in rate making.

EXPERIENCE RATING REASSESSED

BY

ROBERT A. BAILEY

Volume XLVIII, Page 60

DISCUSSION BY JOHN W. CARLETON

Mr. Bailey has made a timely contribution to the technical literature. His examination of the structure of experience rating is well organized, and the conscientiousness with which he sorts out and labels the areas of judgment is to be commended.

The paper should be reviewed by someone qualified to deal with the mathematical developments. Absent such a qualification, I find it necessary to comment on the criteria which Mr. Bailey uses to define a good experience rating plan.

He starts with four fundamental criteria, the first relating to the measurement of something called information and the other related to practical aspects of the insurance transaction. If I understand him, he says the actuary should first find the formula that uses risk loss experience so as to maximize predictive accuracy. Then he should see if the formula so obtained will be acceptable to underwriters and buyers. If so, proceed; if not, compromise prudently.

There is something troublesome about the concept of a correct design that may have to be compromised in order to make it work. Such a concept of correctness is suspect. Perhaps it would be worthwhile to examine the statistical model that seems to underlie Mr. Bailey's symbols.

Statistical, mathematical or economic models can be used either to advance the frontiers of abstract thought or to strip a complex practical problem to its manageable essentials. It is only in the latter use that it is proper to be concerned about the degree of correspondence between the simplified model and the more complex reality. The correspondence can never be perfect, but if it is too thin a different approach to model design may be suggested.

In his paper Mr. Bailey does not refer to a model. The model I'm going to talk about is one I infer from what he says. This is dangerous—dangerous for me. He may have a way of looking at the problem that requires no model, or he may have a much more sophisticated one than I would be capable of sensing.

His model seems to be the one frequently used to maximize accuracy in predicting "inherent hazards." The expression "inherent hazard" is used to label a quantitative attribute of individual risks. Within the model, risks are assumed to be heterogeneous in this attribute, but they lend themselves to classification in such a way that the dispersion of inherent hazards within classes is less than for the total risk population. Certainly, common sense and all known data fully support this obvious assumption, and perhaps that support is sufficient to give the concept of "inherent hazard" working reality.

Most actuaries know what is meant when one of their brethren talks about "inherent hazard," but many of them have difficulty defining the concept tightly and without circuity, particularly if they are to stay inside their statistical model and assume that the risk population, both within and among classes, is heterogeneous. For definition purposes, many have been forced to set up a second model of homogeneous risks, describe the behavior of such a model, and then define the inherent hazard of an individual risk in terms of its membership in such a group.

"Inherent hazard," as we use the expression in our models, is not part of the working vocabulary of many underwriters. It is safe to assume that it is in the working vocabularies of even fewer insurance buyers. This should not concern us if we were confident that we have a precise, if esoteric, way of expressing what the buyers and sellers actually want to accomplish, but it should concern us if there is any possibility we are letting the model dictate the pricing problem rather than the other way around. We can examine the model further with this in mind.

In the simpler statistical models used in experience rating analysis, the inherent hazards are assumed not to change with the passage of time. Perhaps it would be fairer to say that they are assumed to have a degree of continuity such that changes can be ignored within time spans that encompass the sum of the experience period, the rating lag and the period to which the revised rates are to be applied. I know of no objective support for this assumption of continuity. It seems reasonable—perhaps more reasonable than an underwriter's annual renewal review or a safety engineer's optimism—but reasonable or not the assumption is inconsistent with some operating practices in the business.

The model is operated in such a way that the accuracy of the inherent hazard prediction is enhanced by adding information from the risk's own loss experience to information already used in setting up the class rate. Mr. Bailey uses the word "information" in a sense similar to that in which it is used by information theorists. Many of the papers on Credibility in the Proceedings were published after the mathematical foundations of information theory were laid down but before they were translated into lay English that nonprofessionals could hope to understand. There now appears to be a striking parallelism. Information is measured by the extent to which it reduces the uncertainty of the receiver. Thus, the same message will carry more information to one receiver who has a lot of uncertainty than it will to a second receiver whose uncertainty has been cut down by other sources.

Similarly, individual loss experience may add very little to what the underwriter already knows about the hazard of a risk if a great deal of good information has been poured into a refined classification system. On the other hand, the same risk's losses may be entitled to quite high credibility if the ratemaker's only prior information is represented by some classification rates set up with guesswork.

When this relationship is worked out mathematically in the statistical model, the uncertainty implicit in (or the lack of information conveyed by) the class rates is usually expressed as the dispersion of inherent hazards within classes. Mr. Bailey has done this, and followed through consistently. There is a troublesome consequence:

As the valid information upon which class rates were established approaches negligibility, the theoretical recognition that should be given risk losses, regardless of risk size, approaches one hundred per cent. When Mr. Bailey collides with this result he modifies the criteria to emphasize fluctuation control at the expense of predictive efficiency.

For this weighing of the information carried in the class rate against the information carried by the risk's losses, the model itself seems deficient because of a conspicuous noncorrespondence with reality. In the model we have no information about the validity of the class rate other than the dispersion of inherent hazards within classes and we have no information about peculiarities of the individual risk other than incurred losses, claim by claim, during the experience period. In practice we seldom have any knowledge of the dispersion of inherent hazards within classes but usually do have considerable background information about the source of the class rates which should contribute to informed judgment on their application to an individual risk. Moreover, we quite commonly have a good deal of information about the individual risk that should enable us to match it against the source of the class rate. Of course, this is only to say this statistical model uses only the kinds of information that it was designed to use.

To some, predictive accuracy is an end in itself; to others it is only a contribution to a larger problem of finding the points where buyers and sellers can meet and agree. To examine this difference we can look for the economic or market model in which the best predictive accuracy would be mandatory for survival.

If all competing carriers were to use the same experience rating plan year after year, if the plan's predictive accuracy were lower than it need be, and if all underwriters were equally ignorant of how low that accuracy was; then nothing adverse would happen that an off-balance factor couldn't cope with. The three requisites might be difficult to maintain indefinitely, but while they were maintained the plan could be looked upon as one in which the policyholder pays some portion of last year's losses next year and thus is rewarded for being a good risk and punished for being a poor one. Only enough predictive accuracy is required to keep the third requisite in effect.

At the other extreme, there is a market model in which each carrier uses a plan different from that of every other carrier. More importantly, each policyholder is a perfect price buyer who considers each year's insurance as a separate transaction and annually shops the entire market for the lowest renewal quotation which he buys. Under such conditions, I believe all carriers having experience rating plans with less than the best predictive accuracy would be in financial difficulty. I'm not certain what would happen to the carrier whose plan had the best predictive accuracy. It might do satisfactorily or it might only be in less financial difficulty than the companies with less gifted actuaries. But in either event the overpowering demand for predictive accuracy would call for statistical models capable of using more and different kinds of information than the model we have been talking about.

Of course, such a concept of the market doesn't correspond with reality either. Other things being not too unequal, most buyers prefer to maintain a continuing relationship with the same carrier or producer. Service effectiveness and service satisfaction typically improve with time. Even price buyers tend to have more confidence in longer period comparisons than shorter period ones. A company that rates its business in such a way as to make its better customers feel at home should expect them to respond by staying there.

Is it possible to imagine a statistical model that has a closer correspondence to the pricing problem? In such a model predictive accuracy probably would not be controlling, but certainly conspicuous deficiencies of it would limit the inertia of the business. That inertia-like characteristic would be recognized quantitatively, together with the factors that contribute to it. The model should permit the buyer to dissociate himself from insurance pooling to the extent that he is willing to absorb his own losses, either directly or in rating. If a simpler definition of rateable losses brings about an easier meeting of the minds, the model should balance that gain against the loss of predictive efficiency. If the buyer wishes both to minimize pooling and to contain fluctuations, the model should permit him to extend himself in time.

It is easier to point to the elements that an existing statistical model does not contain than it is to design a better one. I am not at all certain that a better one can be designed or that one containing the elements I have mentioned would be a foundation for constructive mathematical inquiry. I do feel that Mr. Bailey could do it if anyone could.

DISCUSSION BY LEWIS H. ROBERTS

This paper is distinguished by two virtues which are unfortunately not often found in combination: on the one hand, incisive theoretical analysis, and on the other, thorough practicality. The first deserves mention because the author has developed the mathematical basis for a crucial problem which is not only one of our most difficult, but one which for many years has provided a broad field of uncertainty upon which the exponents of executive intuition have jousted in darkness with the upholders of underwriting judgment. The second virtue was demonstrated to this reviewer by the important applications in which the formulas presented in this paper have proved to be exceedingly valuable in competitive rate making.

The author gives as the first criterion for experience rating:

"Each dollar of loss, or absence thereof, should contribute to the risk's adjusted rate an amount equivalent to the amount of information it provides regarding the future losses of the same risk for the same amount of exposure."

The "amount of information" provided by a statistic is defined in statistical theory by the equation

$$(1) \qquad I = 1/\sigma^2$$

where σ is the standard deviation of the statistic.

This leads immediately to Gauss' theorem on observation weights, according to which observations with varying degrees of reliability, or precision, are averaged with weights equal to I to yield minimum variance, hence maximum information, for the average. Reliance upon this theorem is implicit in the author's basic approach, and provides the essential element of mathematical soundness which has unfortunately been the missing ingredient of more than one other treatment of this subject.

The author's second criterion, that the risk's premium should not fluctuate widely from year to year, appears to be self-evident. Generally, however, only if the experience of a risk is allowed to contribute *more* to the adjusted rate than the amount of information it contains—that is, if too much credibility is given to the experience—would wide fluctuations occur. We might regard this second criterion, therefore, as providing a symptom that the first has been violated.

His third criterion is that a dollar of actual loss should not add more than a dollar to the adjusted losses because otherwise the insured might find it to his advantage to pay his own losses. The author's reason might not be clear to everyone. There is no objection to the insured's paying his own losses under deductible and excess insurance. Why should there be any objection here? The answer seems to be that it is not so much the insured's *paying* his own losses that bothers us—it is his *not reporting* them. This third criterion, like the second, is essentially symptomatic of violation of the first. The problem here arises particularly when amounts of loss are ignored and only the number of claims is considered. It is not surprising that anomalies should result from such oversimplification. Rigorous adherence to the first criterion should preclude premium debits that exceed the amount of actual loss and expense, as the author's formulas demonstrate.

The fourth criterion, that an experience rating should not be too expensive to administer, is incontestable. It may be, however, that we actuaries allow ourselves to be too defensive about administrative costs, and tend to underestimate the profit value of an efficient pricing system for insurance.

One of the author's particularly trenchant remarks is that ". . . the Actuarial Theory of Indeterminacy . . . would state that when we get sufficiently refined statistics in sufficient volume to be able to determine the correct values for an experience rating plan, we won't use the information that way because we can then determine a far better class plan instead. It is when the data is limited and hence the rates less accurate that the need for experience rating is greater." Very true. Some time has been known to elapse, however, before the results of actuarial research found their way into a class plan, and then only after the defects of the plan had been profitably exploited by independent underwriters.

Without, of course, attempting to repeat the author's derivations in detail here, let us examine the salient features of his thesis. By way of introduction to the author's formulas, a few comments on their theoretical background may be appropriate.

We shall use the symbol $\underline{E}$ to denote expected values. The word "expected" will be used here only in the statistical sense of theoretical average.

In the sense of conserving the most information, the most efficient formula upon which to base the credibility of a risk's experience is given by:

$$(2) \qquad Z = \sigma_E^2 / (\sigma_A^2 + \sigma_E^2)$$

where A and E are the only available estimators of the inherent hazard, H, of a risk, and $\underline{E}(A - H) = \underline{E}(E - H) = 0$. If A is the risk's actual losses, and the inherent hazard remains unchanged since the experience period, we define H as equal to $\underline{E}A$, hence $\underline{E}(A - H) = 0$. Where a risk with inherent hazard H is chosen at random from a class of risks with average inherent hazard E, it follows for any such choice that $\underline{E}H = E$, hence $\underline{E}(E - H) = 0$. (It is important to note that where experience rating is optional it is incorrect to regard H as a random choice, hence we are not justified in assuming $\underline{E}(E - H) = 0$ in discussing optional plans.)

The variance of actual losses, σ_A^2, is by definition $\underline{E}(A - H)^2$. We define σ_E^2 as $\underline{E}(E - H)^2$, which is necessarily equal to $\underline{E}(H - E)^2$ or σ_H^2, the latter being the variance of the class and a measure of its heterogeneity. Note that σ_E^2 is not used here to denote the variance of E, which has no variance, but σ_E^2 is the mean square error associated with the use of E to estimate each H. It is therefore identically equal to the variance of H.

A theoretical weakness of most, if not all, experience rating plans in use today is that credibility cannot be measured in accordance with Eq. (2) above because σ_A^2 is reflected only roughly and σ_E^2 is ignored altogether. The importance of taking σ_E^2 into account is pointed up by the efficiency of so-called "merit" rating plans in which substantial discounts and surcharges are soundly developed for risks whose experience would have no credibility whatever under traditional experience rating formulas.

The author implicitly applies Eq. (2) with important results when he considers each dollar of loss separately. This approach by-passes a major stumbling block to utilization of small-risk experience. It also provides a much-needed theoretical explanation of the multi-split experience rating plans, in which this principle was first developed on a basis which, although intuitive, was nonetheless essentially sound.

The stumbling block to which reference has just been made is the variation between risks in the probability distribution of claims by size. If such variation is recognized, how can it possibly be measured when only a very small number of claims has been incurred by any but the largest risks? The measurement of credibility for each dollar of loss separately neatly substitutes for this apparently insoluble problem another that can be solved. By calculating the means and variances of the frequencies of successive increments to loss we arrive at a formula which gives high credibility to the first dollar of loss, lesser credibility to the fiftieth dollar, still less to the hundredth, and finally gives zero credibility to increments of loss in excess of some maximum value. By suitable gradation of credibility, an appropriate discounted value is provided for every possible size of loss.

The credibility of the t'th dollar of loss is given in the author's Eq. (4) as

$$(3) \qquad Z_t = \frac{Nm_t}{Nm_t + m_t^2/\sigma_t^2} = \frac{\underline{E}(f_t)}{\underline{E}(f_t) + m_t^2/\sigma_t^2}$$

in which $\underline{E}(f_t)$ is the expected number of claims for a risk with exposure equal to $\bar{N}$ units, while m_t and σ_t^2 are the mean and variance of the inherent hazard (as measured by the expected number of claims) per unit of exposure. The subscript t means that we are referring to the t'th dollar of loss, hence frequencies are counted only for claims of t dollars or more.

Although the author mentions a reference in which derivation for this equation is given, it is interesting to notice how immediately it follows from his first criterion for experience rating.

It should therefore be derivable from Eq. (2) of this review, in which the first criterion is mathematically reflected. The author's Eq. (4) can be written:

$$(4) \qquad Z_t = \frac{\sigma_t^2}{\sigma_t^2 + m_t/N}$$

The value σ_t^2 is the variance, within a class, of the expected number of claims per exposure unit, hence corresponds for unit exposure to the term σ_E^2 in Eq. (2) of this review. Under the Poisson assumption with respect to the probability distribution of the number of claims incurred by a given risk under constant hazard in a given period of time, the variance of the number of claims would be equal to the expected number, or m_t per unit of exposure. For N exposures the variance of the indicated pure premium per unit of exposure for the t'th dollar of coverage would be only m_t/N, however, which corresponds to the terms σ_A^2 in Eq. (2).

It is noteworthy that the author's Eq. (4) yields the same modification for the increment of rates provided for the t'th dollar of loss as does Hewitt's formula based on the negative binomial.[1] This is seen from the following:

If we count exposure in units of time, the variance between risks becomes $N^2\sigma_t^2$, and the variance of the number of claims sustained by one risk becomes Nm_t. We then have for N time units:

$$(5) \qquad Z_t = \frac{N^2\sigma_t^2}{N^2\sigma_t^2 + Nm_t} = \frac{\sigma_t^2}{\sigma_t^2 + m_t/N}$$

Where C claims have been incurred, as compared with Nm_t expected, the

[1] Charles C. Hewitt, Jr., "Negative Binomial Applied to the Canadian Merit Rating Plan for Individual Automobile Risks", P.C.A.S. XLVII, 1960.

modification applicable to that portion of the rate provided for the t'th dollar of loss becomes

$$(6)\qquad M_t = \frac{\sigma_t^2}{\sigma_t^2 + m_t/N} \cdot \frac{C}{Nm_t} + \frac{m_t/N}{\sigma_t^2 + m_t/N}$$

$$(6a)\qquad M_t = \frac{1}{m_t} \cdot \frac{C\sigma_t^2 + m_t^2}{N\sigma_t^2 + m_t}$$

Hewitt's formula (substituting N for his s) is:

$$(7)\qquad M = \frac{a}{r}\,\frac{r + C}{a + N}$$

where $a = m_t/\sigma_t^2$ and $r = m_t^2/\sigma_t^2$ in the notation used here. Equations (6a) and (7) are the same when these substitutions are made.

An example of a practical use of the formulas presented in this paper is provided by their application to a sample of 862 Homeowners risks studied by the writer. It was found that the calculated value of σ_t^2 turned "negative" for values of t in excess of premium. Negative values of σ^2 are, of course, impossible. The value of σ_t^2 was calculated by subtracting the expected number of claims, which equals the Poisson variance and corresponds to a homogeneous population, from the actual variance of the number of claims per risk. There will always be some value of t, however, for which a finite number of risks will generate not more than one claim apiece in a finite period of time, regardless of the variance between their means. The variance of such an observed distribution will of course be only binomial (npq with n equal to 1) hence less than Poisson (p). Until a more powerful method of analysis is recognized, it appears necessary to regard the value of t for which the observed value of σ_t^2 equals m_t as the limit beyond which further increments of loss have zero credibility.

As an interesting sidelight upon this study, it was found that when losses were discounted by means of a geometric progression similar to that underlying the multi-split plan used in Workmen's Compensation, the result was not significantly different from that obtained by applying the credibility formula derived in terms of the t'th dollar of loss. Such a simplification, of course, is most welcome in practical applications.

An important point is raised by the author to the effect that the parameters of an experience rating plan should be derived from experience. The need for doing so in connection with small risk experience rating, or merit rating, has long been recognized. This may have been because under merit rating plans a small number of classes can be set up to correspond to the several debit and credit groups established under such plans. For other experience rating, however, it would be no less appropriate to tabulate experience by the amount of the modification, and there is no real obstacle to arranging for this to be done. Such a study would provide a valuable check on the actuarial soundness of plans in current use, although it would not guarantee that they are the most efficient of possible plans.

In the latter part of his paper the author develops a method of experience rating which makes the least possible use of existing rates, consistent with a selected maximum degree of instability in collectible rates. The degree of instability is expressed in terms of the effect of a single loss. The conclusion reached—that up to the maximum single loss the credibility should be unity and that over this amount the credibility should be zero—is by no means intuitively obvious. The usefulness of this form of experience rating lies in those areas, such as new coverages or where a class is known to be very heterogeneous, where there is little confidence in the accuracy of established rates for individual risks or even, perhaps, overall.

An intermediate approach, not mentioned by the author, is provided where credibility is taken to be inversely proportional to the coefficient of variation of losses, thereby limiting but not minimizing the variance of formula rates. Under this procedure we say, in effect, that we don't know just how accurate the established rates are, but we do have a fair amount of confidence in them. We will therefore give as much credibility to the experience as we can, subject to a maximum variance in formula rates (as Z approaches zero) equal to the sum of the variance of established rates plus the variance which corresponds to full credibility. For intermediate credibilities we will accept a variance in formula rates equal to the sum of the variance corresponding to full credibility plus the product of the square of the complement of the credibility times the variance of established rates.

An incidental point, mentioned by the author in connection with the approximation of claim distributions, deserves comment. He suggests that some available data indicate that the log-normal curve is appropriate for fitting claim distributions in fire insurance as well as in the casualty lines. The writer has found this to be the case except as the policy limit is approached. In that region a graph on log-normal probability paper curves upward. Available data are insufficient to show precisely how the function behaves in the immediate vicinity of the policy limit, but it seems reasonable to believe that a discontinuity exists at that value because of the probability of total losses.

In conclusion, I should like to commend the author for having contributed one of the most scholarly and valuable papers to be found in our Proceedings.

MINUTES OF THE MEETING

May 21, 22 and 23, 1962

HOTEL GRISWOLD, GROTON, CONNECTICUT

At the meeting the following 90 Fellows, 36 Associates and 25 invited guests, including 9 guests as subscribers to the "Invitational Program" registered as being in attendance:

FELLOWS

Allen, E. S.
Bailey, R. A.
Barber, H. T.
Berkeley, E. T.
Berquist, J. R.
Bevan, J. R.
Blodget, H. R.
Bondy, M.
Bornhuetter, R. L.
Boyajian, J. H.
Boyle, J. I.
Budd, E. H.
Byrne, H. T.
Carleton, J. W.
Carlson, T. O.
Crane, H. G.
Crowley, J. H., Jr.
Curry, H. E.
Day, E. W.
Dickerson, O. D.
Dropkin, L. B.
Elliott, G. B.
Espie, R. G.
Fairbanks, A. V.
Foster, R. B.
Fowler, T. W.
Gillam, W. S.
Goddard, R. P.
Graham, C. M.
Hart, W. V. B., Jr.
Harwayne, F.
Hazam, W. J.
Hewitt, C. C.
Hope, F. J.
Hunt, F. J., Jr.
Hurley, R. L.
Johe, R. L.
Johnson, R. A.
Kallop, R. H.
Klaassen, E. J.
Kormes, M.
LaCroix, H. F.
Leslie, W., Jr.
Linden, J. R.
Linder, J.
Lino, R.
Liscord, P. S.
Livingston, G. R.
Longley-Cook, L. H.
MacKeen, H. E.
Makgill, S. S.
Masterson, N. E.
Matthews, A. N.
Mayerson, A. L.
Maycrink, E. C.
Menzel, H. W.
Mills, R. J.
McConnell, M. H.
McGuinness, J. S.
Muetterties, J. H.
Murrin, T. E.
Niles, C. L., Jr.
Oberhaus, T. M.
Otteson, P. M.
Phillips, H. J., Jr.
Pinney, A. D.
Pollack, R.
Resony, J. A.
Roberts, L. H.
Rodermund, M.
Rosenberg, N.
Rowell, J. H.
Ruchlis, E.
Salzmann, R. E.
Schloss, H. W.
Simon, L. J.
Skelding, A. Z.
Smith, E. M.
Tapley, D. A.
Tarbell, L. L.
Trist, J. A. W.
Uhthoff, D. R.
Valerius, N. M.
Wieder, J. W., Jr.
Wilcken, C. L.
Williams, P. A.
Williams, H. V.
Willsey, L. W.
Wittick, H. E.
Wolfrum, R. J.

ASSOCIATES

Allebach, W. F.
Andrews, E. C.
Balcarek, R. J.
Berkman, J.
Butler, R. H.
Craig, R. A.
DeMelio, J. J.
Feldman, M. F.
Gillespie, J. E.
Gould, D. E.
Greene, T. A.
Harack, J.
Jones, N. F.
MacGinnitie, W. J.
Margolis, D. R.
McClure, R. D.
McDonald, M. G.
McIntosh, K. L.
McLean, G. E.
McNamara, D. J.
Meenaghan, J.

Mohnblatt, A. S.	Sarnoff, P. E.	Strug, E. J.
Nelson, S. T.	Scammon, L. W.	Trudeau, D. E.
Richards, H. R.	Schneiker, H. C.	Walsh, A. J.
Riddlesworth, W. A.	Stern, P. K.	Woodworth, J. H.
Roth, R. J.	Stoke, K.	Young, R. G.

INVITED GUESTS

Beers, H. S.	Frey, B. A., Jr.	Rothbare, H.
*Blane, R.	Hoyt, F. A.	Sabbagh, M. J.
Bleiberg, S.	*Jackson, J. J.	Smith, R. A.
Buffinton, P. G.	Kelly, A. B.	Sohmer, H.
*Crain, J.	Martorana, J. F.	*Strong, H. L.
Crandall, A. E.	Marshall, R. E.	*Peterzon, R. M.
*Donovan, H. G.	*Miller, H. A.	Waterson, A., Jr.
*Foody, W. M., Jr.	Miller, R. G.	
Forest, J. H.	*Nagel, J. R.	

*Participants in Invitational Program.

First, it is noted for the record that the buffet supper which had been tentatively scheduled for Sunday evening, May 20, for early arrivals, was not held.

Prior to the formal convening of the meeting there were held a number of informal round-table discussions, beginning at 9:30 A.M. on May 21st, participants being free to go and come as they pleased:

(a) Retrospective Rating—Its Uses and Misuses—Francis J. Hope, Moderator.

(b) New Approaches To Solution Of Actuarial Problems In Electronic Era—Robert B. Foster, Moderator.

(c) Is Psychological Testing Useful For Classification Purposes?—Paul M. Otteson, Moderator.

(d) Possibilities Of Operations Research Techniques For Actuarial Problems—Paul S. Liscord, Moderator.

(e) How Can Administrative Procedures For Merit Rating Plans Be Improved? Are Centralized Records Now Feasible?—Ernest T. Berkeley, Moderator.

(f) Training Program For Actuarial Trainees—Casualty and Fire Insurance—John W. Wieder, Jr., Moderator.

(g) A Current Evaluation Of Table M By Line Of Insurance—Richard L. Johe, Moderator.

(h) Analysis Of Increased Limits Experience.

(1) Effect of increased limits coverage on basic limits average claim costs.

(2) Methods of analyzing increased limits losses by range of loss or limits carried.

Robert A. Bailey, Moderator.

At 12:30 P.M. recess was taken for luncheon.

The first formal session of the meeting convened at 2:00 P.M. with a brief address of welcome by the President. The President also noted the following:

(1) *Research Committee and Research Advisory Committee.*

By action of the Council at the meeting of February 28, 1962, the existing Research Committee was discontinued and the President had appointed a new Committee—"Research Advisory Committee"—to co-ordinate activities on various research projects and to advise the Council on new research projects. Seymour E. Smith had agreed to act as Chairman of the new Research Advisory Committee. Active research was now under way or contemplated as follows:

Committee On Automobile Research—Harold E. Curry, Chairman

Committee On Large Loss Experience—Matthew Rodermund, Chairman

Committee On Mathematical Theory Of Risk—Charles C. Hewitt, Jr., Chairman

Committee On Annual Statement—Joseph Linder, Chairman

(2) *Astin*

The ASTIN session would be held May 23-25, 1962 at Juan Les Pins, France. Joe Linder and Doc Masterson were leaving for this gathering and were bringing greetings and best wishes from the CAS. The President also announced that consideration was being given to suggesting to ASTIN that it hold its 1964 meeting in New York to tie in with the 50th anniversary meeting of the CAS in November of that year.

(3) *17th International Congress Of Actuaries.*

The Congress would meet in London and Edinburgh in 1964. Each National Association had been invited to submit a report relating to the development, status and activities of the actuarial profession in their respective countries. It was expected the CAS would co-operate with other organizations in the United States in the preparation of the requested report. Among the subjects for individual papers to be presented at the 1964 gathering of Astin is "Practical Application Of Modern Statistical Techniques In Motor And Other Non-Life Insurance Branches And In Life Insurance". The President announced that several members of the CAS had expressed an interest in preparing an appropriate paper to be presented at the Astin meeting.

Beginning at 2:30 P.M. on May 21, the following seminar discussions were held concurrently:

Seminar A

Analyzing Annual Statements And Expense Exhibits Of Other Companies. How Can Such Analyses Aid Your Company's Future?

Chairman: Robert G. Espie, Vice President and Assistant Comptroller, Aetna Life Affiliated Companies.

Seminar B

Rating Of Excess Coverages—Umbrella Policies, Deductible Coverages, Excess Of Loss Or Loss Ratio, Stop Loss, etc. What Statistics Are Available And Needed For Proper Rate Making?

Chairman: Matthew Rodermund, Vice President-Actuary Munich Reinsurance Company.

Seminar C

Package Policy Ratemaking—Automobile And Multiple Peril. What Basic Principles Should Govern Future Rate Revisions On Package Policies?

Chairman: Edward S. Allen, Actuary, The Phoenix of Hartford Insurance Companies.

Seminar D

How Can Actuarial Analyses Help Company Claim Departments Control Average Claim Costs?

Chairman: Martin Bondy, Actuary and Assistant Treasurer, Consolidated Mutual Insurance Company.

Seminar E

Profit And Loss Reports For Management. What Types Of Reports Are Most Significant?

Chairman: Charles L. Niles, Jr., Actuary, General Accident Group.

Conclusion of the seminar discussions at 4:30 P.M. brought to an end the formal activities for the first day of the meeting. At 6:00 P.M. the group reconvened for a brief Social Hour which had generously been arranged for the entertainment of the CAS by the management of the Griswold Hotel.

The meeting reconvened at 9:30 A.M. on May 22, with President Laurence H. Longley-Cook presiding. The President announced that the firm of Woodward and Fondiller had established an annual award of $200 in memory of Joseph H. Woodward, a charter member and Past President of the CAS, and Richard Fondiller, Secretary-Treasurer of the CAS from 1918 to 1953. The award, to be known as the "Woodward-Fondiller Prize", is to be made to the author of the best eligible paper submitted each year by an Associate or Fellow who has attained his designation within the last five years. To be eligible the paper must show evidence of ability for original research and the solution of advanced insurance problems. If no paper is considered eligible in a given year, the award shall not be made.

At this point Vice President Wolfrum took over the conduct of the proceedings.

The following new papers were then presented:

(1) "An Introduction To The Negative Binomial Distribution And Its Applications" by LeRoy J. Simon, Associate Actuary, Insurance Company Of North America.

(2) "Homeowners—The First Decade" by Frederic J. Hunt, Jr., Asso-

ciate Actuary, Insurance Company Of North America. Ernest T. Berkeley, Actuary, Employers Group, then presented a written review of Mr. Hunt's paper and Mr. Hunt then made some additional comments.

(3) "Size, Strength & Profit" by LEROY J. Simon, Associate Actuary, Insurance Company Of North America.

The session then recessed at 10:20 A.M. for a repeat of the five seminars which had been conducted on Monday afternoon. At 4:30 P.M. recess was taken to be followed by a Social Hour beginning at 5:30 P.M. with an informal banquet at 7:00 P.M.

Following the Banquet, there was presented a musical skit, prepared and presented by the Entertainment Committee consisting of Bill Hazam, Matt Rodermund (Chairman) and Ruth Salzmann, dealing with the vagaries, weaknesses and strong points, if any, of the actuary, the underwriter, the insurance editor and management, in general. The musical numbers were sung by the CAS Quartet: Bob Foster, Paul Liscord, Lu Tarbell and Ager William. The festivities were concluded by the reading of an original poem "Elegy In An Auto Junk Yard" by Win Greene.

The meeting reconvened at 9:15 A.M. on Wednesday morning with Vice President Murrin in charge of the meeting. Thereupon, reviews of previous papers were presented:

Author	*Reviewer*	*Title of Paper*
(1) M. Eugene Blumenfeld	Alfred V. Fairbanks	"Recent Trends And Innovations In Individual Hospital Insurance".
(2) Kenneth L. McIntosh	(a) Lester B. Dropkin (b) Robert L. Hurley	"Mathematical Limits To The Judgement Factor In Fire Schedule Rating".
(3) Frank Harwayne	Seymour E. Smith (Review read by Paul S. Liscord)	"Observations On The Latest Reported Stock Company Insurance Expenses For 1960".
(4) George E. McLean	Roger A. Johnson	"An Actuarial Analysis Of A Prospective Experience Rating Plan For Group Hospital-Surgical-Medical Coverage".
(5) Mark Kormes	John R. Bevan	"Patterns Of Serious Illness Insurance."
(6) Robert A. Bailey	(a) John W. Carleton (Review read by Richard J. Wolfrum) (b) Lewis H. Roberts	"Experience Rating Reassessed".

The following authors presented additional remarks in comment upon the reviews: Messrs. Kormes, McIntosh and McLean.

The gathering then heard a stimulating address "Tomorrow's Actuary" by Henry S. Beers, President, Aetna Affiliated Life Companies. Mr. Beers' talk will be printed in Volume XLIX of the Proceedings.

The chairmen of the seminars then presented a report on the activities and discussions during their respective seminars.

At 12:15 P.M. the May 1962 meeting of the CAS was adjourned.

VOL. XLIX, Part II No. 92

PROCEEDINGS

NOVEMBER 14, 15 and 16, 1962

ACTUARIAL ASPECTS OF INDUSTRY PROBLEMS

PRESIDENTIAL ADDRESS BY LAURENCE H. LONGLEY-COOK

The work of the actuary in property and casualty insurance is so very diverse that he should have something to contribute to the solution of nearly every industry problem. Unfortunately for many an actuary the pressures of his day to day tasks give him little time to turn to broad industry problems unless their solution becomes his particular charge. The President of a sister organization, in an address a few years ago said, "Any profession or occupation gives to its practitioners some special emphasis on life; we play one instrument in the orchestra. To play our part worthily we need more than dexterity upon our own instrument, for we are part of the whole." If we are to play our part worthily in the insurance field, we must contribute to the solution of industry problems so that insurance can provide broader coverages, better service and more economical charges to the public it serves.

Henry Beers in his speech at our Spring Meeting discussed the present and future work of the actuary and stressed the actuary's ability to solve the "impossible" problem. The actuary's special ability in this field stems at least in part from his logical training and often lies in his skill in reducing intangibles to numerical form so that the most probable result of any action can be measured and the range of variation from the most probable result determined. Many of the "impossible" problems in our industry are "impossible" because the real problem has not been sufficiently clearly defined and one of the most important services the actuary can perform is to define and to redefine a difficult problem until it comes so clearly into focus that the solution is comparatively straightforward. The work of crystalizing the nature of a problem in this way requires the logical thinking which is so strongly stressed in actuarial training. The logical analysis of a problem is an actuarial solution just as much as a study full of mathematical symbols and tables of figures.

In addressing you as President of the Casualty Actuarial Society, I want to draw your attention to five industry problems which, I believe, offer important opportunities for actuarial research. The first problem which I want to mention is the determination of what hazards are insurable. This is certainly not a new problem to actuaries as it was one of the main topics of discussion at the Fourteenth International Congress of Actuaries which was held in Madrid in 1954. Twenty separate papers on the problem were contributed at that time from actuaries all over the world. It is tempting to dismiss the problem with the statement that we already insure every hazard which is insurable, but we should then remind ourselves that there was a time when wind damage was considered uninsurable. There is particular interest in this problem at the present time because of a strong public demand for flood and wave damage insurance.

Some people have suggested that flood and wave damage coverage should be provided by means of an assigned risk plan or other compulsory machinery. However, such a plan would encourage the construction of dwellings and other buildings in areas where their frequent destruction by the elements would be a waste of the National wealth and would not be in the over-all public interest. The task for the actuary is to devise a plan which would avoid this pitfall and still make insurance available to the vast majority of the public. My own thought is that a solution might lie in broadening extended coverage to include a large number of perils at present difficult to insure. Thus we might be able to pool earthquakes in California, hurricanes in Florida, sewer back-up in Illinois, high tides in New Jersey and floods in Pennsylvania. Nationwide pooling arrangements to protect the small local company would be an essential part of the plan and cooperation between the States in rating and form approval might be needed. I believe such a development of our business should not be dismissed lightly but should be a subject of careful actuarial analysis. No plan should attempt to protect the foolhardy construction of buildings in inappropriate locations, but, just because all risks cannot be insured, there is no reason to dismiss the hazard as uninsurable. With flood insurance part of the standard extended coverage, its exclusion in certain locations would provide a useful "beware" warning to builders, purchasers and mortgagees.

The next problem on which I want to touch is that generally referred to as the Surplus Line or Non-Admitted business. Estimates as high as $500,000,000 in direct premiums have been given for the size of this market and concern must be expressed as to the reasons this business seeks protection outside the United States. Many problems are involved: regulation, taxation, ethics, equality of opportunity, etc. All of these problems are of concern to the actuary, but his special talents should be used to study the financial effect of the situation on both insurance companies and the insuring public and to suggest how equality of opportunity can best be established.

It would be very wrong to attempt to shut out the non-admitted market, thus making insurance more expensive or less convenient to the needs of the public. Rather, we must find means of making it possible for admitted companies to compete for this business by providing coverage on terms and rates which will be at least as attractive as those which can be offered by the non-admitted market.

A careful analysis of the business written by the non-admitted market is the first requirement. While full details are not available, the actuary can make reasonable estimates of the various covers being placed, their approximate volume, how written and how rated. He will be interested to determine how much of the business is written by the non-admitted market because of lack of capacity in the home market; because of underwriters' dislike of the risks; because of the regulatory yoke on admitted companies; because of lack of flexibility in rating; etc. From this study he will go on to inquire to what extent we should revise some of our old customs. Should experience rating be used freely in property insurance? Should it be made easier for underwriters to take the unusual risk or the poor risk at a price? Further, he may ask would it pay an admitted company to set up a non-admitted subsidiary? What volume could be expected? What would be the cost of such a venture and what the likely profit? Here is a fascinating field for actuarial research.

The third problem to which I wish to turn your attention is in the private passenger automobile field. Here the greatest problem is not merit rating, not assigned risks, not young drivers, not direct writers, but rather the large proportion of the claim dollar which is wasted in legal fees. While actuaries and other members of the industry have given full attention to the former problems, little study has been given to this major problem—the wastage of the loss dollar through legal costs. For some mysterious reason little has been written on this subject by members of the industry and what studies of the problem have appeared have been mainly from legal or educational sources. Estimates which have been made show that hundreds of millions of dollars are wasted in trying to determine who was to blame in any particular accident when, at least in the case of a collision between two insured automobiles involving only physical damage, this determination is of little real importance to the public. The laws of probability show that if every insurance company paid for the damage to every automobile it insured instead of for the damage to every automobile for which its insured driver was liable, it would make no practical difference to the underwriting results of companies. However, it would lead to applicable savings in expense both to insurance companies and to insureds.

In other parts of the world the "knock for knock" agreement had contributed greatly to the reduction in the cost of settling automobile claims. Under such an agreement each carrier pays the costs of the repairs to its own vehicle in the event of a collision. The idea has been extended, at least in Great Britain, to an agreement to share the expense of Bodily Injury and Property Damage claims up to a substantial limit, thus preventing the courts being filled with automobile litigation. Since there are, I believe, difficulties to such agreements under our laws, we might explore a simple addition to the insurance code in each state barring direct or indirect subrogation between insurance companies. This idea is not too revolutionary because at least one Unsatisfied Judgment Fund excludes subrogation claims. Many rating and other changes would result from such a plan but it does not appear to present insurmountable difficulties, and the over-all savings to both insurers and insureds would be enormous.

The fourth industry problem to which I want to refer is the Annual Statement and the related exhibits. The Annual Statement has received little attention from non-life actuaries with a few notable exceptions. We have tended to accept it as certain, like death and taxes, and have left it and its problems to others. On the life side, the company actuary has always been directly concerned with the Statement since he has to sign it and this may explain its comparative freedom from difficulty.

Concern must be expressed for the fact that General Expenses, which consist mainly of Underwriting and Processing costs are higher today for many lines of business than they were 10 years ago, despite the introduction of electronic data processing. These costs could be reduced if the Annual

Statement were designed to suit modern data processing equipment. For example, the Statement still calls for the tabulation of fire premiums-in-force by term of insurance and year written in order that the unearned premium may be calculated by simple multiplication. This requirement is identical today to what it was in 1904 and, for all I know, for many years before that.

While the tabulation mentioned has shown no change, other portions of the exhibit have become excessively complex. Instead of the simple subdivision of property insurance into (a) Fire and (b) Marine and Inland, we now have 26 subdivisions of business of which approximately one-half are property "lines" and the remainder casualty. The subdivision of every item of premium, loss and expense into these 26 "lines" is costly and is actually impossible for a company writing foreign business or excess of loss reinsurance. However, companies are required to force such business into the 26 line breakdown. No other country in the world requires such tremendous detail from its insurers and, in fact, the overhead expenses involved in complying with the Annual Statement makes it almost impossible for a domestic company to transact overseas business profitably except through a non-admitted subsidiary. Another cause of difficulty is the famous, or should I say infamous, Schedule P which except for its fifth part has, I believe, long outlived its usefulness. The Schedule is most expensive to prepare and little understood even by those who have been associated with casualty insurance for years.

You will be interested to learn that last Spring the Council of the Casualty Actuarial Society set up a Committee, under the Chairmanship of Joseph Linder, to study and report on the current problems of complying with the Annual Statement, in the hope that this will stimulate necessary revisions. You will have noted that recently one of our best read insurance columnists has joined in the cry for revision. A study to estimate the millions of dollars in processing costs which the Industry could save if the Annual Statement and Expense Exhibit were simplified could provide a valuable impetus to revisions.

As my fifth industry problem, I will draw your attention to the rate making statistics. It was not very long ago that these statistics presented no particular problem. Nearly all rates were made in concert and statistical agents collected statistics on a single uniform plan. The position is now different. Independence is common and all but the smallest independents are interested in their own statistics. Existing statistical plans were never designed to meet the needs of independents and are more concerned with proving past classification rates were right than in the study and development of new and better classification systems. Hence, many companies find the need for two classification systems; one to meet their internal needs and one for the use of the statistical agents. The position has been further muddled by a few insurance departments who have decided to be more independent than the Independents and call for statistics on bases which do not fit either the needs of the independent companies or the traditional requirements of the statistical agents.

As the actuary of an independent company, I have received considerable cooperative assistance from statistical agents in the last few years and my opinions have been solicited on more than one occasion. However, I believe that a logical and necessary step is that such agents have actuarial committees which include representatives of all who use their services. Statistical plans are not an end in themselves but a means to rate making. The independent rate maker is as much concerned with the form of statistical plans as are rating bureaus.

Most of the larger independent insurance companies have carried out considerable study programs into the problems of statistical plans and I would hope to see the results of some of this research in our Proceedings. I have on another occasion drawn attention to the use of the census method as a means of simplifying the collecting of data for business such as Automobile and Homeowners, which have numerous classification breakdowns. I would like to see studies of this and other revolutionary proposals which may do a better job at a lower cost.

As another move to simplify the development of statistics and to reduce costs I believe we would do well to limit the collection of data to companies over a certain size. The idea that the maximum volume of data possible is essential to insurance rate-making appears to have no actuarial support. Life actuaries have for years based their mortality tables, including their substandard lives studies, on the experience of the larger companies only.

Despite the efforts of many actuaries the orderly development of property and casualty statistics is frequently disturbed by those who are in a position to influence the development of statistical plans to achieve their own partisan ends. It is unfortunate that the collection of rate making statistics in property and casualty insurance is not controlled or administered on a non-partisan basis by the Casualty Actuarial Society just as the collection of life insurance rate making statistics is controlled by the Society of Actuaries.

I have tried in these brief remarks to draw your attention to five problems of the insurance industry calling for actuarial study to aid in their solution. These are Insurable Hazards, Business with Non-admitted Companies, Legal and Other Expenses of Automobile Claims, the Annual Statement, and Rate Making Statistics. In the solution of all these problems the actuary has something to offer and he should find time to make his contribution either in the counsels of the company, bureau or department he serves or, if possible, in a more direct way. The five problems I have selected for review have been chosen almost at random from many which call for actuarial study. Others of both major and minor importance include improved rate making classifications for extended coverage; subrogation in fire insurance; net cost rate making; stop loss reinsurance; the small premium problems; and even a single short rate cancellation rule suitable for electronic data processing to replace the present multiplicity of tables.

The Casualty Actuarial Society through its meetings and "Proceedings", provides a valuable forum for discussion and for the publication of research studies. Occasionally, but only very occasionally, it can also help by setting up a special committee. The rapid changes which have taken place in our industry in the last decade have created or magnified numerous problems and we as actuaries are shirking our responsibilities if we do not contribute to their solution.

REFORMULATION OF SOME PROBLEMS IN THE THEORY OF RISK

BY

KARL BORCH

1. INTRODUCTION

1.1 In classical actuarial theory we are concerned exclusively with *expected values*.

The *net premium* of an insurance contract is by definition equal to the expected value of the claim payments which will be made under the contract. Similarly the *technical reserves* of an insurance company are defined as the expected value of the payments to be made under all contracts in the company's portfolio.

If the insurance contracts are of long duration, interest is usually taken into account by discounting the value of all payments to some particular point of time. In the following we shall ignore interest, since it is fairly clear that this element can be brought into all formulae without any serious difficulty.

1.2 It is, however, evident that an insurance company must consider the possibility of deviations from the expected values. In practice this is done by adding a "safety loading" to the net premium, and by keeping "special reserves" in addition to the technical reserves.

There is a considerable literature about the measures which insurance companies can take to allow for such deviations from the expected values. It is convenient to refer to this heterogeneous body of literature as the "theory of risk," although "non-classical actuarial mathematics" would have been a more appropriate and more correct term.

1.3 In this paper we shall re-examine some of the basic ideas and objectives behind the studies which one—more or less appropriately—refers to as theory of risk. We shall try to show that recent developments outside the field of actuarial mathematics make it possible to formulate these objectives in a precise manner, and in some cases to find clear-cut solutions to problems which have been discussed by actuaries in a rather inconclusive manner for more than a generation.

2. THE BASIC MODEL

2.1 An insurance contract defines a probability distribution $F_i(x)$, where $F_i(x)$ is the probability that claim payments under the contract shall not exceed x. If we ignore interest, the *net premium* of the contract is:

$$P_i = \int_0^\infty x dF_i(x) \ .$$

The *technical reserves* of an insurance company holding n contracts are:

$$V = \sum_{i=1}^{n} P_i = \int_0^\infty x dF(x)$$

where $F(x)$ is the convolution of the distributions $F_1(x) \ldots F_n(x)$.

2.2 We shall now consider an insurance company which holds a portfolio of insurance contracts. We shall write $F(x)$ for the probability that the total amount of claim payments under these contracts shall not exceed x. We shall assume that the premiums for all contracts have been paid to the company in advance. We shall further assume that the pre-paid premiums together with the company's initial capital amount to S.

Claims may become payable at any time within the contract period. If we assume that all contracts are of short duration, it will not matter at which particular time the claims occur. The *risk situation* of the company will then be completely determined by the two elements S and $F(x)$.

2.3 When all contracts in the portfolio have expired, the amount of money left with the company will be

$$y = S - x \, .$$

y is obviously a stochastic variable, and its distribution is easily found to be

$$G(y) = 1 - F(S - y). \qquad (-\infty \leq y \leq S)$$

We shall refer to this probability distribution as the *profit distribution* associated with the risk situation $\{S, F(x)\}$.

2.4 If an insurance company has a well-defined policy, it must have some consistent rule which makes it possible to decide when one profit distribution $G_1(y)$ is preferable to another $G_2(y)$.

A perfectly consistent rule would be to go exclusively by expected profits, and prefer $G_1(y)$ to $G_2(y)$ if and only if

$$\int_{-\infty}^{+\infty} y dG_1(y) > \int_{-\infty}^{+\infty} y dG_2(y) \, .$$

There is nothing wrong with this rule, except that it does not seem to be followed by any insurance company. The fact that reinsurance exists is a sufficient proof that the possibility of deviations from expected profits is taken into account when insurance companies make their decisions.

2.5 It may be useful to illustrate the point above with a simple example.

We consider an insurance company which has underwritten a contract which can lead to a claim of \$1 million with probability 0.001. We assume that no other claims can occur, and we assume further that the company's funds, including the premium collected for the contract mentioned, amount to just \$1 million. It is easy to see that the profit distribution in this case is:

\$1 million with probability 0.999
\$0 with probability 0.001

If the company pays \$50,000 in order to reinsure one-half of this risk, the profit distribution will change to

\$950,000 with probability 0.999
\$450,000 with probability 0.001

If the actuary of the company is used to reason along classical lines, he may point out that the net premium for this reinsurance is \$500, and that it is sheer madness to pay 100 times this amount for reinsurance cover. His directors may, however, still prefer to take the reinsurance, rather than carrying the whole risk alone. This means that they consider the second profit distribution as better than the first.

2.6 We shall now assume that the company's preferences over various profit distributions constitute a *complete ordering* over the set of all probability distributions $G(y)$. This is just the precise mathematical way of saying that the company has a well-defined policy, a term which we used rather loosely in paragraph 2.4.

A complete ordering can under very general conditions be represented by an index number or a functional $U(G)$ such that

$$U(G_1) > U(G_2)$$

if and only if $G_1(y)$ is preferred to $G_2(y)$, and

$$U(G_1) = U(G_2)$$

if the two distributions are considered as equivalent.

We shall refer to $U(G)$ as the *utility* attached to the profit distribution $G(y)$.

The ordering is assumed to include *all* probability distributions. Hence it must also include degenerate distributions of the type $\epsilon(y\text{-}a)$. For this distribution profits will be exactly *a* with probability 1.

We shall write $U(G) = u(a)$ if $G(y) = \epsilon(y\text{-}a)$.

2.7 If the preference ordering is consistent, one can prove that

$$U(G) = \int_{-\infty}^{+\infty} u(y)dG(y).$$

This formula was first presented by Daniel Bernoulli[3] in 1738 as a reasonable hypothesis concerning rational decision-making under uncertainty. The principle was first applied to insurance problems by Barrois[1] in 1834. In 1947 von Neumann and Morgenstern[12] proved that Bernoulli's hypothesis could be derived as a theorem from a few simple, and intuitively very acceptable axioms. These axioms must be fulfilled if the preference ordering over the set of profit distributions shall be consistent in any acceptable sense, and it is almost self-evident that the axioms hold for a rationally managed insurance company.

2.8 The proof given by von Neumann and Morgenstern is elementary. However, the authors present their proof with apologies because it has become "lengthy and tiring" in order to be complete, and they express the hope that a shorter exposition may be found later.

Shorter ways to the theorem have indeed been found, but usually by sacrificing the elementary character of the proof. It has been demonstrated by Chipman[6], Debreu[8] and others that the theorem is an almost trivial consequence of the axioms when the problem is formulated in topological terms.

The more elementary discussion around the theorem has not tended to shorten the proof. Efforts seem to have concentrated on deriving the theorem from the simplest and most basic of axioms, and this obviously tends to lengthen the proof. Savage[13] may be less tiring than von Neumann and Morgenstern, but he is certainly not shorter. Some textbooks[9] give elementary proofs, which although not mathematically complete, give a good intuitive idea of the contents of the theorem.

2.9 From the formula in pargarph 2.6 we see that the function u(y) determines the preference ordering over the set of profit distributions. In the following we shall refer to u(y) as the company's *policy function,* since it determines the "attitude to risk," and hence the policy which the company will follow.

The function u(y) can evidently be interpreted as the utility attached to a profit y which will be received with certainty. For this reason the function is usually referred to as "the utility of money" in economic literature. We shall, however, avoid using this term, since it carries a number of undesirable connotations.

2.10 The policy function determines a unique preference ordering. However, the contrary is not true. It is easy to see that if a given preference ordering can be represented by a function u(y), it can also be represented by any function $Au(y) + B$, where A and B are constants, and $A > O$. Hence a preference ordering determines the policy function only up to a positive linear transformation.

It is evident that any "reasonable" preference ordering is represented by functions u(y) which increases with y.

2.11 If an insurance company acts rationally, it will seek to manage its affairs so that it reaches the profit distribution which according to its particular policy is the "best" among the distributions which are attainable. This means that the objective of the company will be to maximize the utility index U(G) over the set of attainable profit distributions G(y).

This formulation of the problems which lie behind the theory of risk will in a number of cases make it possible to find definite solutions to familiar unsolved problems. We shall illustrate this with two simple examples.

3. TWO SIMPLE EXAMPLES

3.1 We shall consider a company which as a result of its direct underwriting has arrived at a risk situation determined by S and F (x).

The utility attached to this situation is according to the formula in paragraph 2.6:

$$U(O) = \int_0^\infty u \left\{S\text{-}x\right\} \, dF(x).$$

We now assume that the company can reinsure a quota k of its portfolio by paying a reinsurance premium of P(k). This arrangement will lead to a risk situation with utility

$$U(k) = \int_0^\infty u \left\{S\text{-}P(k)\text{-}(l\text{-}k)x\right\} \, dF(x).$$

Since the company's objective is to maximize utility, its task will be to determine the value of k which maximizes U(k). This is a straightforward, although not always simple, mathematical problem.

There are obviously no difficulties involved in generalizing this model and considering other forms of reinsurance than quota share treaties.

3.2 The weakness of the model in the preceding paragraph is the assumption that a function $P(k)$ exists. We have no right to assume that reinsurance cover has so to speak a market price, and that a company can buy exactly the quantity it wants.

This problem has been investigated in some other papers[4,5]. It appears that in a reinsurance market there will not in general be a unique market price determined by supply and demand for reinsurance cover. It seems that a complete analysis of reinsurance markets will have to be carried out in terms of the general theory of n-person games by von Neumann and Morgenstern[12].

3.3 As another example let us consider an insurance company which is about to market a new insurance contract. Let $F(x)$ be the claim distribution defined by this contract, let the premium be P, and the initial capital of the company S.

Assume now that the number n of contracts which the company can sell depends on the amount s spent on sales promotion, i.e. we assume that $n = n(s)$.

Hence an expenditure of s for sales promotion will give the company a utility

$$U(s) = \int_0^\infty u \ \{S + nP - s - x\} \ dF^{(n)}(x)$$

where $F^{(n)}(x)$ is the n-fold convolution of $F(x)$ with itself.

The problem of the company is then to determine the value of s which maximizes $U(s)$, given that $n = n(s)$.

3.4 The weakness of the model above is the assumption that there exists a function $n(s)$ which gives the market reaction to a certain expenditure on sales promotion. It is natural to assume that the reaction of the market will depend also on the sales efforts of all competing companies. If we want to analyze the problem in this more realistic manner, we will again have to resort to the general theory of n-person games.

This analysis will be more complicated than the analysis of a reinsurance market which we discussed in paragraph 3.2. In a reinsurance market we have to consider the policy functions of all participating companies. In the marketing problem discussed above we will also have to consider the market reaction to the sales effort made by the different companies.

4. SOME GENERALIZATIONS OF THE MODEL

4.1 In the preceding sections we have assumed that all insurance contracts were of short duration, and that premiums were paid in advance for the whole contract period. These simplifying assumptions made it possible to solve our problem by considering only the probability distribution of profits at the end of the contract period.

If we drop these assumptions, it may be of some importance whether claims occur early or late in the contract period. This may mean that we have to consider a stochastic process instead of a simple probability distribution, and this will clearly lead to considerable complications.

Under the more general assumptions it may be necessary to take interests into account. This will lead to some complications, which, however, seem to be of a fairly trivial nature, and which we will ignore in the following.

4.2 Let us now consider a portfolio of long-term insurance contracts, all of which will have expired by the time T. We can of course define a profit distribution $G(y,T)$ as the probability distribution of the amount of money y which is left with the company when all contracts have expired. However, $G(y,T)$ will be of little interest if there is a possibility that the company may have to go into liquidation before the time T.

We shall illustrate this point by a simple example.

4.3 We shall consider a company with initial capital 1, and we shall assume that the company receives a premium of 2 by underwriting a portfolio which can lead to a claim of 4 with probability p.

The profit distribution $G(y,1)$ will then be

$$\begin{array}{ll} 1 + 2 = 3 & \text{with probability } q = 1 - p \\ 1 + 2 - 4 = -1 & \text{with probability } p \end{array}$$

If the company underwrites a portfolio of this kind in two successive periods, it will get a profit distribution $G(y,2)$ given by the following table:

$$\begin{array}{rll} 3 + 2 = 5 & \text{with probability} & q^2 \\ 3 + 2 - 4 = 1 & \text{" \quad "} & pq \\ -1 + 2 = 1 & \text{" \quad "} & pq \\ -1 + 2 - 4 = -3 & \text{" \quad "} & p^2 \end{array}$$

The last two lines in this table concern the case where the company was insolvent after the first period, but still underwrote a portfolio for the second period. If this is illegal, so that the company had to liquidate after the first period, we obviously have to consider the modified profit distribution $G'(y,2)$ given by

$$\begin{array}{rll} 5 & \text{with probability} & q^2 \\ 1 & \text{" \quad "} & pq \\ -1 & \text{" \quad "} & pq + p^2 = p \end{array}$$

4.4 In order to generalize these considerations, we shall formulate the problem in terms of the so-called *collective theory of risk* due to Lundberg.[11] We shall use the notation of Cramér.[7]

We consider as earlier a portfolio of insurance contracts which all will have expired at the time T, and we introduce the following symbols

$F(x,t)$ = the probability that claims occurred up to the time t shall not exceed x.
Pt = the amount of premiums received up to the time t.
S = the initial capital of the company.

The funds held by the company at time t, $Y_t = S + Pt - x$ is clearly a stochastic variable which can take both positive and negative values. If

$Y_t < O$ the company is insolvent or "ruined" at the time t, and may have to go into liquidation.

Let now

$$1 - \psi(T) = \Pr \{Y_t \geq O \text{ for all } t \leq T\} .$$

The complementary probability $\psi(T)$ is usually referred to as the *ruin probability*.

4.5 The profit distribution considered in paragraph 4.2 is obviously given by

$$G(y,T) = 1 - F(S + PT - y,T).$$

However, as indicated by the example in paragraph 4.3 this distribution has to be modified if there are some rules which require the company to cease its operations if it becomes insolvent at some specified time. The nature of the modification will obviously depend on these rules.

The strongest possible rule is that the company shall go into liquidation immediately upon becoming insolvent. The probability that this shall happen is obviously $\psi(T)$. Hence we get a modified profit distribution $G'(y,T)$ of the form

$$\begin{array}{ll} \psi(T)G_1(y,T) & (\text{for } y < O) \\ \{1-\psi(T)\}\ G_2(y,T) & (\text{for } y \geq O.) \end{array}$$

The two probability distributions $G_1(y,T)$ and $G_2(y,T)$ can be derived from the stochastic process $F(x,t)$. However, the computations involved are very heavy, and will not be carried through here.

4.6 The reinsurance problem of paragraph 3.1 will now consist of determining the attainable profit distribution which maximizes the expression

$$\int_{-\infty}^{+\infty} u(y)\ dG'(y,T).$$

This formulation of the problem is unsatisfactory on at least the following two points:

(i) The value of T is fixed, and this seems unnecessarily rigid. We shall deal with this problem in Section 5.

(ii) It is assumed that the reinsurance arrangements made at the time O remain fixed for the whole contract period.

The latter assumption can probably be relaxed by formulating the problem in terms of the *dynamic programming* of Bellman[2]. Although his approach to this kind of problems appears very promising, we shall not explore its possibilities in the present paper.

4.7 An interesting aspect of the result in paragraph 4.5 is that it combines Lundberg's ruin probability with the von Neumann-Morgenstern theory based on the Bernoulli principle discussed in paragraph 2.7. We can see this result either as a generalization of Lundberg's theory, or as a special case obtained from the general decision theory by introducing restraints of particular relevance to insurance. The latter point of view is probably the more fertile.

4.8 Lundberg's theory has found virtually no application to practical insurance problems. The reason is clearly that it ignores the profit distribution, and hence deals only with one of the two elements which, according to paragraph 4.5, are essential to the problem. Most writers on collective risk theory focus their attention on the limiting case where T tends to infinity. In this case it may be logically justified to ignore the profit distribution. It seems, however, that by going to the limit these authors lose all contact with practical insurance problems, since they really assume that insurance companies are completely disinterested in profits.

5. A DIFFERENT APPROACH

5.1 In this section we shall very briefly outline another approach which may give more satisfactory solutions to some of the problems studied under the general heading "theory of risk." This new approach will be discussed in more detail in a forthcoming paper.

5.2 We consider first an insurance company with initial capital S_0, and we assume that this company receives a premium P for underwriting a portfolio with claim distribution $F(x)$. This transaction will give the company a utility

$$U(S_0) = \int_0^\infty u \{ S_0 + P - x \} dF(x).$$

We shall ignore that it may be possible for the company to increase this utility by suitable reinsurance arrangements. We next assume that things go well, so that when the contracts in this portfolio have expired, the company is left with a capital $S_1 > S_0$.

The company then decides to distribute an amount s_1 as dividend, so that it will enter the next underwriting period with capital $S_1 - s_1$. If in this second period the company underwrites a portfolio identical with the one in the first period, the utility will be

$$U(S_1 - s_1) = \int_0^\infty u \{ S_1 - s_1 + P - x \} dF(x).$$

5.3 It is clear that $U(S_1 - s_1)$ will decrease with increasing s_1, so that high dividend payment appears as a disadvantage to the company. If, however, a high dividend is considered desirable in itself, the company will have to balance the two elements.

If the company shall be able to make rational decisions in such cases, it must have a complete preference ordering over a set of pairs $\{s_1, U(S_1 - s_1)\}$ This ordering can be represented by a utility function

$$V \{ s_1, U(S_1 - s_1) \}.$$

The problem of the company is then reduced to determining the value of s_1 which maximizes this function.

It may be possible to extend these considerations to operations over several periods, so that our problem will be to determine values $s_1 \ldots s_T$ which maximize a function of the form

$$V \{ s_1, \ldots s_T, U(S_T - \Sigma s_t) \}.$$

5.4 With the considerations in the preceding paragraph we stepped on virgin soil, which appears very fertile. At present we can, however, only conjecture how this soil must be tilled if it shall yield solutions to the problems we have discussed.

It seems that a rational solution of our problem will require a preference ordering over dividend sequences of the type $\{s_1 \ldots s_t \ldots s_T\}$. This should present no mathematical difficulty, since such preference orderings over "commodity bundles" have been defined and used with considerable success in economic theory.

If T is finite, it is possible to make use of the Bernoulli principle to extend the definition to sequences where the elements are stochastic variables. It is, however, desirable to remove the "finite horizon" restriction on T, and this seems to involve considerable mathematical difficulties.

5.5 The first broad and systematic study of this problem seems to be one published by Koopmans[10] less than three years ago. The application Koopmans has in mind in choice of consumption levels at different points of time. For this application it is natural to postulate "impatience," i.e. that a sequence such as $\{3,2,2,1\}$ is always preferred to sequences of the type $\{2,2,2,2\}$ and $\{ \{1,2,2,3$. Koopmans shows that with this postulate an acceptable preference ordering can exist over a set of infinite non-stochastic sequences.

The impatience element does not seem to be particularly relevant in insurance. On the contrary most statements from insurance companies seem to indicate that preferences are just the reverse of that indicated in the example above, i.e. the aim is a steady, or a steadily increasing dividend rate.

It is an open question whether such perferences can be formalized, and if they are consistent with a complete ordering over a set of infinite dividend sequences.

6. CONCLUSIONS

6.1 In this paper we have indicated that fairly advanced, and partly new mathematical methods may be required to solve some of the problems which intrigue actuaries today. It may, however, be useful to pause for a moment and ask if we are not engaging in a wild goose chase by developing such methods and putting them to application in our work.

6.2 The simplest solution to the problem in paragraph 5.2 would be to distribute a dividend $s_1 = S_1 - S_0$ whenever $S_1 > S_0$, and to distribute nothing if $S_1 < S_0$.

The traditional objection to this apparently sensible dividend policy is that it will lead to violent fluctuations in the dividend rate. However, why can we not accept snch fluctuations as a fact of life?

Experts on collective risk theory may be horrified at this dividend policy, and point out that it will give a ruin probability equal to one. However, is it really a catastrophe that an insurance company is virtually certain to become insolvent at some time in the infinite future?

6.3 The main purpose of this paper has been to point out that the mathematical tools which are necessary to solve some of our problems seem to be available in non-actuarial literature.

There can be no excuse for continuing to attack our problems with inadequate tools. The purpose of these concluding remarks is merely to call for some reflection before we pick up the proper tools and set to work. It may be that the problems we have discussed should be formulated in another way, and solved with entirely different methods.

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THE LOW VALUED RISK
A STUDY OF THE PREMIUM REQUIRED FOR HABITATIONAL RISKS OF VARIOUS POLICY AMOUNTS

BY

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INTRODUCTION

When the All-Industry Bills were adopted in 1946, Multi-Peril Package Policies, particularly the Homeowners Policy, had not been conceived. It is understandable, therefore, that certain phraseology of the All-Industry Bills was not readily adaptable to changing conditions and philosophies which were subsequently dictated by the introduction of package policies. Of particular significance is the possible variation in interpretation of the phrase ". . . kind of insurance, or class of risk within a kind of insurance, or combination thereof."

In a broad sense, this paper is concerned with the effect of the above two events on the operation of a multi-line fire and casualty company, that is, first, the effect that the Homeowners has had on the Fire and Allied Lines business of a particular company and, secondly, the ramifications of various interpretations of the meaning of ". . . kind of insurance, or class of risks within a kind of insurance, or combination thereof". Of particular significance is the question of variation in expense by "class of risk" and the extent to which such variation should be allowed in the administration of the various state rating laws.

Effect of Homeowners on Remaining Fire and Allied Lines Business: The possible effect of the Homeowners on the remaining Fire and Allied Lines business of a particular company includes:

1. Change in quality and type of dwelling business remaining in the Fire and Allied Lines category.
2. A shift in the ratio of dwelling to commercial or specifically rated risks in the Fire and Allied Lines category.
3. The effect of these changes (i.e., 1 and 2 above) on the expense and loss portion of the Fire and Allied Lines premium dollar.

The change in the quality or type of dwelling business remaining in the Fire and Allied Lines category should be obvious. In many states the cost of the Homeowners is less than comparable amounts of coverage for fire and extended coverage.[1] This means that very little "selling" is required for those dwellings eligible for a Homeowners Policy.

[1] In Minnesota, for example, the 3 year premium for a $10,000 Form 1 Homeowners in a Class 1-6 town is $77.00. The premium for Fire and Extended Coverage for the same amount of insurance ($10,000 on building and $4,000 on contents) is $93.40. The author made an extensive review of this premium differential situation in May of 1961. At that time the Homeowners premium for Form 1 was less than the equivalent Fire and EC premium in 10 states for all policy amounts and in 12 other states the Homeowners premium was less when the policy amount exceeded $14,000 ($10,000 building, $4,000 contents). Since this analysis was made, some 25 states have reduced Homeowners rates and this rate differential in favor of the Homeowners probably exists in even more states.

Also, the higher valued dwellings are generally owned by persons who are more in need of liability and theft coverages and thus the Homeowners is a very natural type of package policy for such individuals.

The result is that all dwellings having an insurable value of less than $8,000 (the minimum Homeowners eligibility requirement is $8,000) and some other dwellings in the low valued category which are less desirable from an underwriting viewpoint (i.e., substandard in construction, located in undesirable neighborhoods or owner having possible moral hazard) have remained in the Fire and Allied Lines category and the better, higher valued dwelling risks have been transferred to the Homeowners class.

Trend in Volume and Loss Experience: Experience reported by the stock fire insurance companies to the National Board of Fire Underwriters during the period 1956-1960 shows the total fire premium for Habitational lines written in 1960 was some 48 million dollars less than the premium written in 1956 (See Exhibit 1). During this same period, the written-paid loss ratio for fire coverage on Habitational risks has increased from 50.9% to 60.0%, indicating the effect the transition of the better dwelling business to the Homeowners class has had on the remaining fire insurance in the Habitational classes. During this same period, the written-paid loss ratio for fire coverage for other than Habitational risks has improved. This loss ratio was 49.7% in 1956 and 45.8% in 1960.

The transition to the Homeowners class of a large block of dwelling business has also resulted in a change in the distribution of the "book" of Fire and Allied Lines coverage for most companies.

Exhibit 2 shows the trend in Fire, Extended Coverage and Homeowners premiums for the ten years 1951-1960. In this period, total premium (other than Life) increased more than 5 billion dollars, yet Fire premiums have increased only 87 million dollars, Extended Coverage premiums increased 167 million dollars, whereas Homeowners premiums have gone from zero to in excess of 600 million dollars in 1960. The 1960 Homeowners premiums represented 5.86% of the total written premium compared to 13.18% for Fire and 4.56% for Extended Coverage.

Of even greater interest is the change in distribution of Fire premiums by class in the five year period 1956-1960. In 1956 the Habitational classes (see Exhibit 1 for a list of classes involved) represented 42% of the total Fire premium; whereas in 1960 this group represented only 36%. Furthermore, within the Habitational Group, several marked changes in distribution have occurred. Class 009—Household Contents in Dwelling, has decreased 15 million dollars and Class 029—Dwelling Building Only, has decreased 50 million dollars and Class 019—Dwelling Buildings and Contents, has increased only 3 million dollars in this five year period. The net change in dwelling building and/or contents classes is thus a decrease in premium of 62 million dollars.

Change in Fire and Allied Lines Experience: The effect of these changes on the expense and loss portion of the Fire and Allied Lines premium dollar have been of considerable concern to the author for a number of years. The significance of the various changes will vary by company, depending on their "book" of business. In our case, we have been engaged in the personal lines market to a very heavy extent—Habitational lines representing 81.6% of our total Fire and Allied Lines "book" in 1960. In this same year, those stock companies reporting their experience to the National Board of Fire Underwriters had only 39.9% of their total Fire and Allied Lines premiums in the Habitational Group.

Like many other companies who wrote a large proportion of Habitational lines, the period 1956-1960 saw our Fire and Allied Lines business levelling off as a result of the heavy influx of Homeowners writings. Although this was to be expected, our concern has been directed to the effect this transition has had on our Fire and Allied Lines expense ratio.

During the period 1956-1960 the average industry expense ratio, as reported by Best, decreased from 45.5% in 1956 to an estimated 44.3% in 1960 for Fire, and decreased from 46.3% in 1956 to an estimated 45.3% in 1960 for Extended Coverage. During this same period our underwriting ratio for all lines decreased, thus following the general trend in the industry. During this same period, however, our Fire and Allied Lines expense ratio increased several percentage points.

This unfavorable trend in our Fire and Allied Lines expense ratio appeared to be the result of two factors:

1. The transition of the better dwelling business to the Homeowners class was leaving the less desirable and lower premium dwelling business in the Fire and Allied Lines class.
2. The high ratio of Habitational business in the Fire and Allied Lines category (81.6% as compared to an industry average of 39.9%) indicated that our average premiums for Fire and Allied Lines were lower than the industry average.

Although our combined ratio for Fire and Allied Lines was favorable, the unfavorable expense trend was of particular concern because in certain states great weight is given to expense as the only means of justifying a deviation.[2]

STUDY OF PREMIUM REQUIRED FOR HABITATIONAL RISKS

As a result of all these factors, the author undertook to determine the required premium for Habitational risks (Fire and Allied Lines only, excluding Homeowners) by various policy amounts. The decision to concentrate our study on Habitational risks was made on the basis that we were writing very little commercial business and, further, that such commercial business developed premiums of sufficient size which, in themselves, should not be the cause of an unfavorable expense situation.

Basic Data Available: As a basis for this study, we had available four years experience (1957-1960) of Fire and Allied Lines by nine policy amount groups, as follows:

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[2] The New York Insurance Department, for example, uses the following formula: For Fire Insurance: Expense 47.1%, Loses 46.9%, Profit 6.0%. For Extended Coverage: Expense 56.3%, Losses 37.6%, Profit 6.0%. A company is generally required to justify a lower expense ratio for a deviation. For example, with a 10% deviation for Fire, the allowance for losses becomes 52.1% (46.9% ÷ 90%), profit 6.0%, leaving an allowable expense ratio of 41.9%.

Policy Amount Group	Policy Amount Range
1	\$ 0 - \$ 2,500
2	\$ 2,501 - \$ 5,000
3	\$ 5,001 - \$ 10,000
4	\$ 10,001 - \$ 25,000
5	\$ 25,001 - \$ 50,000
6	\$ 50,001 - \$100,000
7	\$100,001 - \$200,000
8	\$200,001 - \$300,000
9	\$300,001 and Over

Data consisted of premiums written, number of risks, losses paid and number of losses. This data, however, was lacking in several respects as follows:

1. The experience was not broken down by occupancy class.
2. Data was lacking for what we considered to be a crucial area in terms of policy amount of about \$7,500 - \$8,000. (\$8,000 is the Homeowners eligibility requirement amount.)
3. Definite figures were not available which would make it possible to determine the actual average policy amount in each group. (We could only assume the midpoint of the range and this would be very unsatisfactory for the range 0 - \$2,500).

Additional Data Obtained: As a result, we obtained more definite information for all Fire and Allied Lines business during a 10 day period on a countrywide basis. A total of 11,203 policies were recorded during this period which gave us a reasonable sampling to serve as a basis for further statistical analysis.

To check the validity of the 10 day survey results, we compared the average premium for the year 1960 by amount group, which was available from the original statistical data, with the average premium for the 10 day survey, with the following results:

Policy Amount Group	Policy Amount Range	Average Premium 1960 Experience	Survey Experience
1	\$ 0 - \$ 2,500	\$ 19.42	\$ 19.53
2	\$ 2,501 - \$ 5,000	25.38	25.45
3A	\$ 5,001 - \$ 7,500	42.17	37.56
3B	\$ 7,501 - \$ 10,000	42.17	51.69
4	\$10,001 - \$ 25,000	65.60	67.47
5	\$25,001 - \$ 50,000	177.89	177.53
6	\$50,001 - \$100,000	301.09	342.56

It will be noted that the survey enabled us to obtain the average premium for the range \$5,001 - \$7,500 and \$7,501 - \$10,000; whereas the original data gave us a single average premium for the range \$5,001 - \$10,000. We have already pointed out the significance of obtaining this further breakdown.

The average premiums checked very closely with the exception of the last group $50,001 - $100,000. Since most of the business in this range is in the mercantile class, we were not too concerned with the apparent discrepancy between the 1960 figure of $301.09 and the 10 day survey figure of $342.56. In this policy amount group our 10 day survey produced only 34 policies and thus data was of very limited credibility. The survey produced no risks in policy amount groups 7, 8 and 9 (policy amounts above $100,000), but this area was of no particular concern as regards our study of Habitational risks. Future discussion will, therefore, be concerned with the first six policy amount groups or risks having insurable values up to $100,000.

The survey also gave us data with respect to the average policy size within each policy amount group. These results were as follows:

Policy Amount Group	Policy Amount Range	Average Policy Amount
1	$ 0 - $ 2,500	$ 2,420
2	$ 2,501 - $ 5,000	4,016
3A	$ 5,001 - $ 7,500	6,574
3B	$ 7,501 - $ 10,000	9,068
4	$10,001 - $ 25,000	14,554
5	$25,001 - $ 50,000	33,793
6	$50,001 - $100,000	70,316

The survey also gave us a breakdown of the average premium and average policy amount for various occupancy groupings. Exhibit 3 shows these results in detail.

Determination of Premium Needed for Expenses: With the necessary basic data at hand, we approached our goal of determining the required premium for Habitational risks by various policy amounts by dividing the needed premium into three components:

1. Fixed Expenses.
2. Variable Expenses.
3. Losses.

The first step was to determine the current distribution of expenses and losses for Fire and Allied Lines. We elected to use our five year average for 1956-1960 as follows:

Losses	41.9%
Loss Adjustment Expense	2.9%
Commissions	24.3%
Taxes	3.3%
Other Expenses	21.5%
Profit & Catastrophe	6.1%
Total	100.0%

The five year average was used for several reasons. First, it gave us a desirable distribution of expenses and losses with an allowance of 6.1% for profit and catastrophe. Secondly, the actual five year loss ratio was used and this, of course, was preferable to using a single year's experience. As previously pointed out, the 1960 expense ratio was several percentage points higher than the five year average, but its use would have defeated our purpose of determining the required rates for various policy amounts and provide a reasonable margin for profit and catastrophe.

Commissions and Taxes are, of course, "variable expense" in that they vary with the premium. Other Expenses are both "variable" and "fixed". Part of this expense is fixed since the cost of issuing a policy, the premium collection expense and certain other expenses are the same regardless of the amount of premium involved.

The following process was used to arrive at the amount of "fixed" expense:

1. The "Other Expense" ratio of 21.5% (See above formula) was applied to the 1960 written premium for Fire and Allied Lines.
2. This dollar amount of "Other Expense" was divided by the total number of policies written in the same year (1960) which amounted to $8.51 per policy.
3. The distribution of our "fixed expenses" was established as follows:

Cost of issuing new & renewal policies	$3.32
Cost of issuing endorsements	$ .43
Collection Costs	$1.15
All other "fixed" costs[3]	$2.15
Total	$7.05

4. The $7.05 of "fixed" expense was converted to total dollars of expense by multiplying it by the number of policies issued during 1960 and the resulting total dollars were converted to a ratio of 17.8% by dividing by the total premium written during the same year.
5. The "fixed" other expense was thus 17.8% ($7.05 per policy) and the remaining "variable" other expense was 3.7% (21.5% minus 17.8% = 3.7%).
6. Our rating formula now becomes:

Losses	41.9%	
Loss Adjustment Expense	2.9%	
Commissions	24.3%	
Taxes	3.3%	
"Fixed" Other Expense	17.8%	($7.05 per policy)
"Variable" Other Expense	3.7%	
Profit & Catastrophe	6.1%	
Total	100.0%	

[3] In addition to Commissions and Taxes, other variable costs include advertising expense, boards and bureaus, surveys and allowances to managers. By subtracting all variable expenses from the total expenses for Fire and Allied Lines, we arrive at a total "fixed" expense of $7.05 per policy and a total "variable" expense of $1.46 per policy. The total average expense per policy for all "other expenses" is thus $7.05 plus $1.46 or $8.51 per policy.

It is thus apparent that by using a "fixed" expense of $7.05 per policy the actual "fixed" other expense ratio will vary from the average of 17.8% depending upon the actual size of the premium. For a low premium, the $7.05 will represent a much higher ratio than the average of 17.8%, and for a high premium the $7.05 will represent a lower ratio than the average of 17.8%.

Determination of Premium Need for Losses: The next step in our investigation was to determine the variation by policy size, if any, in the amount of premium required to pay losses. Using the four year statistical data for number of risks and amount of losses paid by average policy size and the average size of risk determined from the ten day survey, we computed the total liability and the "loss cost" on a written basis. Exhibit 4 shows these results.

The next step was to convert this written data to an "in-force basis" in order to determine how much premium is needed to pay losses for various policy amounts on an annual basis. We had available total average liability in-force for four years 1957-1960. Dividing the total amount of losses paid during this same four year period by the total liability in-force produces an average loss cost on an in-force basis for the period of 7.26 cents per one hundred dollars of insurance in-force.

The average loss cost on a written basis for the same four year period (losses paid divided by insurance written) was 11.84 cents per one hundred dollars of insurance written. To change the "written" loss cost for each policy amount group (See Exhibit 4) to an "in-force" basis, each "written" loss cost was multiplied by the ratio of the average loss cost on an "in-force" basis (7.26 cents) divided by the average loss cost of 11.84 cents on a "written" basis (ratio equals .613). These results are shown in Exhibit 5A.

The validity of this conversion is based on the assumption that the ratio of "written" liability to "in-force" liability is the same for each policy amount group. The basic statistical data on a written basis shows a fairly even distribution of business by year for each policy amount group, indicating that the error in making this assumption would be small.

The loss cost on an "in-force" basis multiplied by the average policy amount produces the annual premium required to pay losses for this size of policy. These results are shown in Exhibit 5B.

The original loss data used in determining the annual premium required to pay losses was for all Fire and Allied Lines. Even though the Habitational classes represented over 80% of our business, there existed the possibility that several large losses in the mercantile or other than Habitational classes might distort the loss data. We subsequently obtained similar basic data for the four years 1957-1960 for Habitational classes only. The results are shown in Exhibit 5C.

This data for Habitational classes (average policy size versus annual required premium to pay losses) was then plotted on a log-log scale. A number of trials had indicated that the relationship was in the form of a straight line on a log-log scale indicating an equation of the form $y = ax^b$. The resulting curve is shown in Exhibit 6. From this curve we determined the annual premium required to pay losses for various policy amounts from $1,000 to $100,000. (Graph paper 20″ x 24″ was actually used to insure reasonable accuracy.) The results are shown in Exhibit 7 and also shown are the loss costs. It will be noted that the loss cost varies from 11.7 cents per one hundred dollars of insurance for a $1,000 policy to 3.95 cents per one hundred dollars of insurance for a $100,000 policy. This indicates clearly that the pure premium for losses is proportionately higher for the lower policy amounts.

Normal rating methods indicate that the premium available to pay losses for a $50,000 risk is fifty times as great as the premium available to pay losses for a $1,000 risk if both risks have been written at the same rate under the same occupancy classification. In other words, if the loss ratio for a certain class is 50%, it is generally assumed that 50% of the premium for each risk is required to pay losses regardless of policy size. These findings indicate that the ratio would be about 19.8 instead of 50 ($23.20 loss premium for a $50,000 risk versus a $1.17 premium for a $1,000 risk). Similarly, a $50,000 risk requires pure loss premium of only 5.8 times the required pure loss premium for a $5,000 risk ($23.20 versus $4.01), whereas the normal formula would indicate ten times as much premium would be required.

Various forms of Casualty insurance have long recognized this variation in pure loss premium (for example, increased liability limits), but it has not been recognized in Fire insurance prior to the introduction of the Loss Constant Dwelling Schedules which will be discussed later in this paper.[4]

Determination of Required Premium by Policy Amount: Having determined the premium required to pay for "fixed" other expenses, "variable" other expenses and losses, it is then possible to determine the required premium for any size of risk as follows:

Required Premium = Premium for Fixed Expense + Premium for Variable Expense + Premium for Losses

Or: $X = F + V + L$

Where: X = Required Premium (Annual)

F = Fixed Expense = \$7.05 per policy

V = All Other Expenses, including allowance for Profit and Catastrophe = 40.3% of Final Required Premium[5]

L = Premium for Losses (from Exhibit 7)

Or: $X = \$7.05 + L + 40.3\%\ X$

Or: $$X = \frac{\$7.05 + L}{.597}$$

Using this formula we computed the required premium for various policy amounts from $1,000 to $100,000 and also the average rate for each policy amount and the results are shown in Exhibit 8.

Based on the average loss cost for all policy amounts of 7.26 cents per one hundred dollars of insurance in-force, the average rate required is 27.60 cents

[4] Some recognition to a variation in the premium needed to pay for losses by policy amount has been made in the area of large risks insured under highly protected Risk Rating Plans. The deductible schedule of the Factory Mutual Rating Bureau recognizes a constant expense and a variable amount of loss, depending upon the relationship of the size of the risk to the amount of the deductible. The deductible filings of Chubb & Sons also recognize this differential.

[5] Reference to the basic formula on page 11 will indicate that the sum of loss adjustment expense, commissions, taxes, "variable" other expense and profit and catastrophe equals 40.3%.

per one hundred dollars of insurance. However, in order to obtain sufficient income to pay for all anticipated losses and expenses, a rate of 137.7 cents is needed for a $1,000 policy; whereas a rate of only 7.80 cents is needed for a $100,000 policy.

A comparison of the required premium with the actual premium received for the various policy amount groups produces some interesting results:

Policy Amount Group	Average Policy Amount	Required Annual Premium	Actual Annual Premium	Difference (+) or (—)
1	$ 2,420	$15.66	$ 10.07	— $ 5.59
2	4,016	17.97	13.12	— 4.85
3A	6,574	20.22	19.36	— 0.86
3B	9,068	22.36	26.64	+ 4.28
4	14,554	24.87	34.78	+ 9.91
5	33,793	57.54	91.51	+ 33.97
6	70,316	61.74	176.57	+ 114.83

The above table indicates that inadequate premium is received for risks below about $7,000 or that the break even point is at about a $20 annual premium. For policy amounts above $7,000 excess premium is received but this is needed under current rating methods to compensate for losses incurred for low valued risks.

"LOSS CONSTANT" DWELLING SCHEDULES

This investigation was made independent of any actuarial study by any rating bureau or advisory organization. However, the results are comparable to the so-called "Loss Constant" Dwelling Schedules which have been filed in a number of states. There are, however, a number of major differences in philosophy and approach which will be discussed.

The so-called "Loss Constant" Dwelling Schedules have now been adopted in the states of Mississippi, Tennessee, Missouri, Kentucky, Oklahoma and Washington and there are more filings pending. The author has reviewed one such filing wherein it was reported that the "Loss Constant" Schedule was based on a review of dwelling losses for a limited time by a number of individual companies. These studies showed that the average amount of loss was about the same regardless of the amount of the policy. In our opinion, this data was lacking in credibility and failed to recognize possible variation in loss frequency and an equally important factor in the low valued risk problem, that of expense. However, the similarity of results make it desirable to compare one of these schedules with the data developed during the course of this investigation.

Exhibit 9 shows the former dwelling fire rates for Tennessee and the new "loss constant" dwelling schedule rates. No changes were made in the Extended Coverage rates and the Loss Constant Schedule applies only to Fire insurance. Under this schedule the loss constant is charged for each item, that is, a separate loss constant for the building item and a separate charge for the contents item. Thus, a policy covering both buildings and contents would incur a $14 loss constant instead of a $7 loss constant.[6]

Exhibit 10 shows a comparison of the premium required for various policy amounts, computed by means of the suggested rate formula developed by this study and the premium developed by the Tennessee Loss Constant Schedule for protection class 5. Protection class 5 was used because the original Tennessee rate of 28¢ compares closely to the average required rate developed by this study of 27.6¢. Our formula provides higher premiums for the small risk and somewhat lower premiums for the larger risk when compared to the "Loss Constant" Schedule.

VARIATION IN EXPENSE RATIO BY PREMIUM AMOUNT AND OCCUPANCY CLASS

This study indicates the desirability of considering the variation in both expenses and losses in the determination of proper rate levels by occupancy class. Historically, expense data has been maintained by "line" of insurance. This is a reasonable approach assuming that the various units within the "line" are reasonably homogeneous. In the case of Fire and Allied Lines, such an assumption is not truly valid.

As pointed out earlier in this paper, the Habitational classes comprise about 40% of the total premium written in the Fire and Allied Lines category on a countrywide basis. The remaining 60% is made up of mercantile, non-manufacturing and special hazard risks. Each of these classes has its own expense breakdown. Higher commissions are paid on dwelling business, for example, and this factor alone could account for a variation in expense of 10 to 15 percentage points. Thus, the use of an "average" expense formula for all Fire and Allied Lines distorts the true rating structure of any particular "class" within this category. Thus, the true expense of the Residential Class is buried in the average expense for all Fire and Allied Lines.

A second factor which distorts the expense picture is that of variation in average premium. The Residential Class develops lower average premiums per policy than the mercantile or non-manufacturing classes, for example. Since a large part of the expenses are related to a "work unit" or policy base rather than a premium base, this means that the Residential Class will incur a higher expense ratio because the average premiums are lower.

Using the data developed by this study, we can readily determine the effect that lower average premiums have on the actual expense ratio. Exhibit 11 shows the actual expense ratio for various policy premium amounts. With a $10 premium the actual expense ratio is 101.8%, but with a $100 premium the actual expense ratio is only 38.35%. If we consider that a 45% expense ratio is reasonable, it is apparent that an average premium of at least $50 must be developed by the company if their own Fire and Allied Lines expense ratios are going to be comparable to the average.

It is also obvious that a company specializing in low average premium business, such as dwellings, will develop higher than "average" expense ratios unless they reduce commissions or otherwise compensate for this unfavorable expense situation.

In connection with a rate hearing held in New York several years ago, cer-

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[6] The Loss Constant Schedule adopted in Mississippi uses a single "loss constant" charge per policy rather than per item. All other schedules have been filed on a per item basis.

tain average premium figures were presented by the New York Fire Insurance Rating Organization as follows:

Occupancy	Average Premium	Total Policies
Dwelling	$ 35.60	5377
Other than Private Dwellings	140.00	2693
Total	$ 70.40	8070

Reference to Exhibit 11 shows that a company with an average "book" of business and having an average Fire and Allied Lines premium of $70 should incur an expense ratio of about 41%.

However, a company specializing in dwelling business and developing an average premium of only about $35 will incur an expense ratio of 51.5%.

It is thus evident that a company should not rely too heavily on their "average" Fire and Allied Lines expense ratio in determining the underwriting gain or loss for a "class" of business within the Fire and Allied Lines category. In reality many companies are producing an underwriting loss on low average premium business which can only be offset by a profitable block of high average premium business.

In our opinion, the above analysis indicates the necessity and desirability of considering both the expense and loss ratios by class in support of any particular rate level. The requirement to "better" a standard expense formula based on all Fire and Allied Lines experience will inevitably penalize the company who writes a high proportion of low average premium business and favor the company who writes a high proportion of specifically rated risks or high average premium business.

In this respect, the provisions in the Casualty and Surety Rate Regulatory Bill with regard to expense is more realistic and, in fact, should be equally applicable to Fire and Allied Lines.[7] The tendency of regulatory authorities to use a "standard" expense ratio as a convenient yardstick and their reluctance to consider variation in loss experience indicates that any changes in this area will be slow in coming.

CONCLUSIONS

1. A realistic rate formula for Fire and Allied Lines should include the following major components:
    a) Fixed Expenses
    b) Variable Expenses
    c) Losses
    d) Profit and Catastrophe

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[7] Section 3(a), paragraph 3, of the Casualty and Surety Rate Regulatory Bill, as approved by the National Association of Insurance Commissioners June 12, 1946, provides as follows: "The systems of expense provisions included in the rates for use by any insurer or group of insurers may differ from those of other insurers or groups of insurers to reflect the requirements of the operating methods of any such insurer or group with respect to any kind of insurance, or with respect to any subdivision or combination thereof for which subdivision or combination separate expense provisions are applicable."

2. The results of this study indicate that the relationship of the premium required to pay losses and the policy size are in the form of the equation $y = ax^b$. Further studies would be desirable to determine if Fire and Extended Coverage losses varied in the same manner.

3. The variation in average size of premium will have a marked effect upon the expense ratio of a company. A company specializing in private dwelling business will inherently incur a higher expense ratio than a company with a better spread of business in the Fire and Allied Lines category.

4. Regulatory authorities should be encouraged to consider the possible variation in expense which results from the kind or class of business written rather than use a single average expense as a yardstick.

5. This study indicates that current rating practices in the Fire and Allied Lines field tend to develop inadequate rates for low premium risks such as dwellings, and produce excessive rates for high premium risks or occupancy classifications.

EXHIBIT 1

FIRE EXPERIENCE
NATIONAL BOARD OF FIRE UNDERWRITERS
COUNTRYWIDE 1956-1960

Habitational Risks*

Year	Written Premium	Paid Losses	Loss Ratio
1960	$453,514,173	$271,930,321	60.0%
1959	503,571,975	276,065,386	54.8
1958	510,835,640	270,160,046	52.9
1957	494,657,980	254,311,491	51.4
1956	501,193,296	255,060,802	50.9

All Other Risks

Year	Written Premium	Paid Losses	Loss Ratio
1960	$791,755,511	$362,767,247	45.8%
1959	760,961,542	355,977,083	46.8
1958	711,321,841	346,136,155	48.7
1957	718,710,625	363,922,191	50.6
1956	690,219,442	343,164,173	49.7

*The following classes comprise the Habitational Group: 002 Household Contents in Mercantile Buildings; 007 Boarding Houses; 009 Household Contents - Dwelling; 011 Seasonal Dwellings; 019 Dwelling Building & Contents; 021 Farm; 029 Dwelling Building Only; 030 Large Area Housing; 031 Apartment Buildings Without Mercantile; 032 Apartment Buildings With Mercantile; 033 Household Contents - Apartments.

EXHIBIT 2

TREND IN PREMIUMS WRITTEN BY LINE
(LAST 000 OMITTED)

Year	Total Premium	Fire	Extended Coverage	Homeowners
1960	$10,527,285	$1,387,420	$480,229	$617,230
1959	9,930,697	1,433,516	531,609	420,544
1958	9,076,828	1,362,713	525,648	280,550
1957	8,640,093	1,335,719	511,192	195,136
1956	7,991,071	1,332,478	502,222	149,165
1955	7,662,138	1,317,031	470,169	59,332
1954	7,143,593	1,307,738	407,171	- -
1953	7,000,347	1,306,224	370,468	- -
1952	6,410,590	1,288,997	343,532	- -
1951	5,137,529	1,300,695	313,097	- -

Data from "Best's Fire and Casualty Aggregates and Averages", Twenty-Second Annual Edition (1961), Alfred M. Best Company, Inc., New York

EXHIBIT 3

RESULTS OF 10 DAY SURVEY OF FIRE & ALLIED LINES BUSINESS
TOTAL OF 11,203 POLICIES

Average Premium

Occupancy	Amount Groups							
	1	2	3A	3B	4	5	6	Total
Dwelling Contents	18.01	23.46	35.22	54.56	92.27	-	-	24.58
Dwelling Building	22.97	28.11	33.55	49.46	58.15	117.55	169.67	49.23
Dwelling B. & C.	42.05	42.98	37.89	47.74	66.48	93.65	-	56.80
Apt. Buildings	15.75	25.31	26.00	128.00	80.00	107.00	245.50	63.23
Boarding Houses	19.00	11.00	-	-	-	220.33	-	169.00
Seasonal Dwellings	23.75	37.53	49.13	45.00	58.60	222.33	253.00	53.64
Total Habitational	19.07	24.57	35.14	49.41	61.53	120.39	156.45	38.94
Farms	21.00	42.08	53.14	61.40	123.76	-	-	91.19
Mercantile	28.16	50.03	76.53	99.24	137.09	295.48	431.56	87.09
Grand Total	19.53	25.45	37.56	51.69	67.47	177.53	342.56	41.65
1960 Experience	19.42	25.38	42.17	42.17	65.60	177.89	301.09	44.04

Average Risk Amount

Occupancy	Amount Groups							
	1	2	3A	3B	4	5	6	Total
Dwelling Contents	2,486	3,738	6,174	8,837	13,137	35,000	85,000	3,988
Dwelling Building	1,911	4,826	6,530	9,116	14,519	31,662	72,333	10,121
Dwelling B. & C.	2,068	4,169	7,071	8,980	14,048	30,765	66,667	10,640
Apt. Buildings	2,500	3,654	7,000	8,000	18,308	35,750	74,200	15,532
Boarding Houses	2,500	5,000	-	-	-	28,333	-	22,188
Seasonal Dwellings	2,000	4,183	6,763	8,667	12,600	29,533	77,000	8,503
Total Habitational	2,447	3,911	6,586	9,059	14,367	31,552	73,127	7,341
Farms	500	3,643	6,429	8,720	15,225	-	-	10,952
Mercantile	1,938	7,141	6,383	9,278	16,986	38,421	68,971	13,051
Grand Total	2,420	4,016	6,574	9,068	14,554	33,793	70,316	7,649

EXHIBIT 4

DETERMINATION OF LOSS COSTS BY AVERAGE
POLICY AMOUNT ON WRITTEN BASIS

Amount Group	Average Size Risk	No. Risks	Total Liability	Losses Paid	Loss Cost
1	$ 2,420	228,327	$ 552,551,340	$ 856,444	15.50¢
2	4,016	756,995	3,040,091,920	4,543,679	14.95
3	7,997	612,920	4,901,521,240	6,570,097	13.40
4	14,554	411,214	5,984,808,556	5,238,354	8.75
5	33,793	16,871	570,121,703	751,497	13.18
6	70,316	3,976	279,576,416	193,461	6.92
Total		2,030,303	$15,328,671,175	$18,153,532	11.84¢

Note: Average size of risk determined by 10 day survey. Number of risks and losses paid are from 1957-1960 experience by amount group.

EXHIBIT 5A

CONVERSION OF "WRITTEN" LOSS COSTS TO "IN FORCE" LOSS COSTS

Amount Group	Policy Amount Range	Loss Cost "Written"	Loss Cost "In Force"
1	\$ 0 - \$ 2,500	15.50¢	9.50¢
2	\$ 2,501 - \$ 5,000	14.95	9.16
3	\$ 5,001 - \$ 10,000	13.40	8.21
4	\$10,001 - \$ 25,000	8.75	5.36
5	\$25,001 - \$ 50,000	13.18	8.08
6	\$50,001 - \$100,000	6.92	4.24
	Average	11.84¢	7.26¢

EXHIBIT 5B

ANNUAL PREMIUM REQUIRED TO PAY LOSSES FOR VARIOUS POLICY AMOUNTS ALL FIRE AND ALLIED LINES

Amount Group	"In Force" Loss Cost	Average Policy Size	Annual Premium Required to Pay Losses
1	9.50¢	\$ 2,420	\$ 2.30
2	9.16	4,016	3.68
3	8.21	7,997	6.57
4	5.36	14,554	7.80
5	8.08	33,793	27.30
6	4.24	70,316	29.81

EXHIBIT 5C

ANNUAL PREMIUM REQUIRED TO PAY LOSSES FOR VARIOUS POLICY AMOUNTS HABITATIONAL LINES

Amount Group	"In Force" Loss Cost	Average Policy Size	Annual Premium Required to Pay Losses
1	10.11¢	\$ 2,447	\$ 2.47
2	8.63	3,911	3.38
3	7.70	8,006	6.16
4	3.92	14,367	5.63
5	6.41	31,552	20.22
6	3.50	73,127	25.59

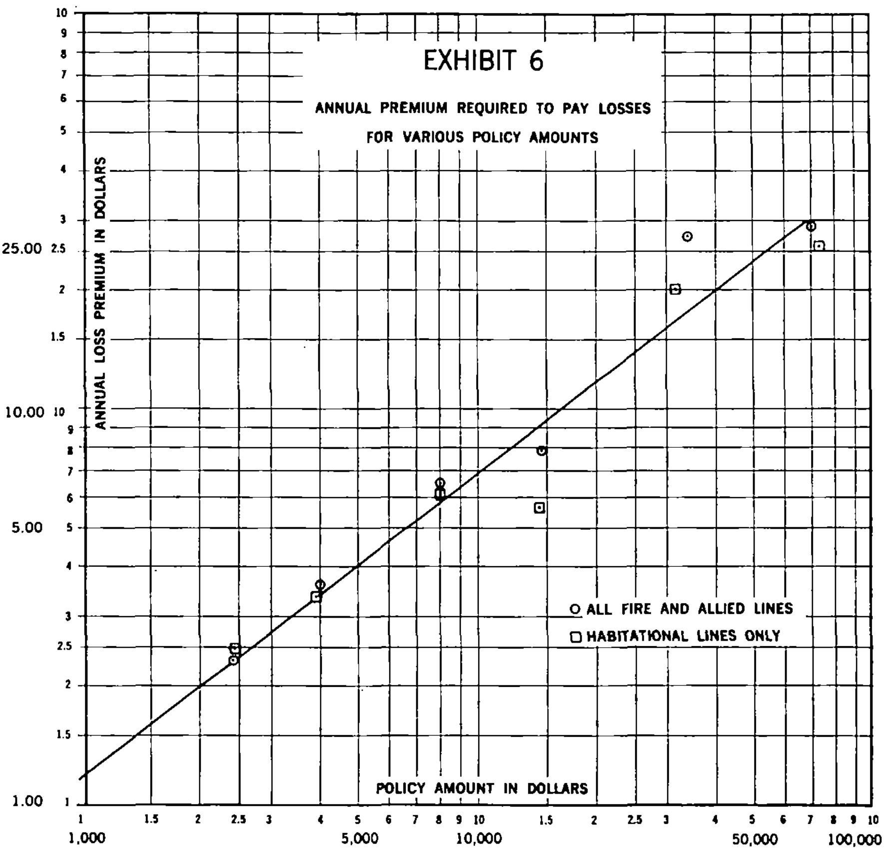
EXHIBIT 6
ANNUAL PREMIUM REQUIRED TO PAY LOSSES
FOR VARIOUS POLICY AMOUNTS
ANNUAL LOSS PREMIUM IN DOLLARS
POLICY AMOUNT IN DOLLARS
O ALL FIRE AND ALLIED LINES
□ HABITATIONAL LINES ONLY
25.00
10.00
5.00
1.00
1,000
5,000
10,000
50,000
100,000

EXHIBIT 7

ANNUAL PREMIUM REQUIRED TO PAY LOSSES FOR VARIOUS POLICY AMOUNTS

Policy Amount	Annual Premium Needed to Pay Losses	Loss Cost
$ 1,000	$ 1.17	11.70¢
2,000	1.99	9.95
3,000	2.72	9.07
4,000	3.38	8.45
5,000	4.01	8.02
6,000	4.58	7.63
7,000	5.15	7.36
8,000	5.74	7.18
9,000	6.25	6.94
10,000	6.80	6.80
11,000	7.32	6.65
12,000	7.82	6.52
13,000	8.36	6.43
14,000	8.80	6.28
15,000	9.30	6.20
16,000	9.73	6.08
17,000	10.15	5.97
18,000	10.57	5.87
19,000	11.02	5.80
20,000	11.48	5.74
25,000	13.53	5.41
30,000	15.50	5.17
35,000	17.60	5.03
40,000	19.50	4.88
45,000	21.30	4.73
50,000	23.20	4.64
60,000	26.60	4.45
70,000	29.95	4.28
80,000	33.40	4.18
90,000	36.70	4.08
100,000	39.50	3.95

EXHIBIT 8

REQUIRED PREMIUM FOR VARIOUS POLICY AMOUNTS

Policy Amount	Required Premium	Annual Rate Required
$ 1,000	$13.77	137.70¢
2,000	15.14	75.70
3,000	16.37	54.56
4,000	17.47	43.67
5,000	18.53	37.06
6,000	19.48	32.46
7,000	18.76	26.80
8,000	21.42	26.77
9,000	22.48	24.97
10,000	23.20	23.20
11,000	24.07	21.88
12,000	24.91	20.75
13,000	25.81	19.85
14,000	26.55	18.96
15,000	27.39	18.26
16,000	28.11	17.56
17,000	28.81	16.94
18,000	29.51	16.39
19,000	30.27	15.93
20,000	31.04	15.52
25,000	34.47	13.78
30,000	37.77	12.59
35,000	41.29	11.79
40,000	44.47	11.11
45,000	47.49	10.55
50,000	50.67	10.13
60,000	56.37	9.39
70,000	61.98	8.85
80,000	67.76	8.47
90,000	73.28	8.14
100,000	77.97	7.80

EXHIBIT 9

TENNESSEE DWELLING FIRE RATES

1. Old Rates:

Protection Class	Annual Rates	
	Building	Contents
2	20¢	20¢
3-4	22	24
5	28	28
6	32	32
7	36	36
8	38	38
9	52	52
10	56	56

2. New "Loss Constant" Schedule Rates:

Protection Class	Annual Rates		Loss Constant
	Building	Contents	
2	6¢	6¢	$7.00
3-4	10	10	7.00
5	14	14	7.00
6	18	18	7.00
7	22	22	7.00
8	26	26	7.00
9	30	30	9.50
10	34	34	9.50

EXHIBIT 10

COMPARISON OF PREMIUM REQUIRED BY FORMULA WITH TENNESSEE "LOSS CONSTANT" PREMIUMS

1. Premium Required by Formula:

Policy Amount	Required Premium @ Average Rate of 27.60¢	Required Premium Using Formula
$ 1,000	$ 2.76	$13.77
5,000	13.80	18.53
10,000	27.60	23.20
15,000	41.40	27.39
25,000	69.00	34.47
50,000	138.00	50.67

2. Tennessee "Loss Constant" Schedule - Protection Class 5:

Policy Amount	Old Rate	Old Premium	New Rate	Loss Constant	New Premium
$ 1,000	28¢	$ 2.80	14¢	$7.00	$ 8.40
5,000	"	14.00	"	"	14.00
10,000	"	28.00	"	"	21.00
15,000	"	42.00	"	"	28.00
25,000	"	70.00	"	"	42.00
50,000	"	140.00	"	"	77.00

EXHIBIT 11

VARIATION IN EXPENSE RATIO BY PREMIUM SIZE

Premium	Fixed Expense	Variable Expense	Total Expense	Expense Ratio
$ 10	$7.05	$ 3.13	$ 10.18	101.8 %
15	"	4.70	11.75	78.33
20	"	6.26	13.31	66.56
25	"	7.83	14.88	59.52
30	"	9.39	16.44	54.80
40	"	12.52	19.57	48.93
50	"	15.65	22.70	45.40
60	"	18.78	25.83	43.05
70	"	21.91	28.96	41.37
80	"	25.04	32.09	40.11
90	"	28.17	35.17	39.08
100	"	31.30	38.35	38.35
125	"	39.13	46.18	36.94
150	"	47.00	54.05	36.03
175	"	54.78	61.83	35.33
200	"	62.60	69.65	34.83
300	"	93.90	100.95	33.65
400	"	125.20	132.25	33.06
500	"	156.50	163.55	32.71

NOTE: From our formula on page 11 we determine that the variable expense equals the sum of commissions (24.3%), taxes (3.3%) and "variable" other expense (3.7%) or a total of 31.3%.

APPENDIX A

DETERMINATION OF REQUIRED TERM PREMIUMS FOR VARIOUS AVERAGE POLICY AMOUNTS

In order to compare the required premium with the actual average premiums received for various average policy amounts, consideration has to be given to the average term factor involved. Appendix B shows the computation of the average term factor of 1.94 for all Fire and Allied Lines. The actual average premium received divided by 1.94 produces the average annual premium. This premium can then be compared with the average annual premium required computed in accordance with the established formula. The results are as follows:

(1) Average Policy Amount	(2) Annual Premium Required To Pay Losses	(3) Total Annual Premium Required	(4) Actual Premium Received	(5) Actual Annual Premium	(6) Difference Col. 5 Minus Col. 3
$ 2,420	2.30	15.66	$ 19.53	$ 10.07	- $ 5.59
4,016	3.68	17.97	25.45	13.12	- 4.85
6,574	5.02	20.22	37.56	19.36	- 0.86
9,068	6.30	22.36	51.69	26.64	+ 4.28
14,554	7.80	24.87	67.47	34.78	+ 9.91
33,793	27.30	57.54	177.53	91.51	+ 33.97
70,316	29.81	61.74	342.56	176.57	+ 114.83

Note (1): Total Annual Premium required computed using formula $X = \frac{\$7.05 + L}{.597}$

Thus, for average policy of $2420:
$X = \frac{\$7.05 + 2.30}{.597} = \frac{\$9.35}{.597} = \$15.66$

Note (2): Actual Annual Premium = Actual Premium Received divided by average term factor of 1.94.

Thus, for average policy of $2420:
$\text{Annual Premium} = \frac{\$19.53}{1.94} = \$10.07$

APPENDIX B

DETERMINATION OF AVERAGE TERM FACTOR FOR FIRE AND ALLIED LINES

1. Distribution of Premium In Force as of December 31, 1961:

Term	% of Total Premium in Force
1 year or less	2.54%
2 years	.28
3 years	54.23
4 years	.08
5 years	19.96
Installment	22.91
	100.00

Note: Distribution of premium is for the author's Company.

2. Normal Term Rate Factors:

1 year	1.0
2 year	1.85 x annual premium
3 year	2.70 x annual premium
4 year	3.55 x annual premium
5 year	4.40 x annual premium
Installment	.945 x annual premium

Note: The above represents the term factors in effect in most states at the present time. Some variation does exist but the effect on the results would be very small. Wisconsin, for example, still uses a 3 year term factor of 2.5. So do Louisiana and Texas. Some variation in the term factor for installment premium payment plans also exist, although a factor of .945 times the annual premium is most prevalent.

3. Determination of average term factor:

Term	% of Total Premium In Force	Normal Term Factor	Col. 2 Divided By Col. 3
1 year	2.54	1.0	2.54
2 years	.28	1.85	.15
3 years	54.23	2.70	20.08
4 years	.08	3.55	.02
5 years	19.96	4.40	4.54
Installment	22.91	.945	24.24
	100.00		51.57

$$\text{Average Term Factor} = \frac{100}{51.57} = 1.94$$

DISCUSSION BY FREDERIC J. HUNT, JR.

The problem of dwelling policies written for small amounts is one with which many in the property insurance field have long been concerned. Originally attention was centered on insurance to value as shown by a 1952 statement that ". . . the loss value dwelling continues to present the most serious underinsurance problem."[1]

In 1955 and 1956 the subject received considerable publicity in the state of Texas, where deviations using rates graduated by size of policy were filed as a result of information developed by the Texas Checking Office and others. At that time the problem was described as "the failure of the present method of rating dwellings (for both fire and extended coverage) to take into account the very substantial differences in loss ratios for varying amounts of insurance."[2]

It was also stated that ". . . it appears conclusive that the vast differences in results . . . are not related to insurance to value. . . ."[2]

While the problem is one of long standing, the departure of most of the larger dwellings to the Homeowners Policy has in recent years served to highlight the poorer experience of the small policies. This presumably has served to spur on the various interested parties in their studies and has resulted in the recent introduction of the "loss constant" method of rating into the dwelling fire schedules, with the method already being in effect in a dozen or so states. Thus Mr. Buffinton's paper comes at a particularly appropriate time and is a most welcome and valuable addition to our proceedings.

With the "loss constant" method an accomplished fact, and one which will obviously be with us for some time to come, it is a source of no little comfort that Mr. Buffinton's independent investigations produced comparable results in important areas. The early "loss constant" filings had to make use of limited and unrefined data which supported the broad principles of the filings and clearly showed the disparity in experience between smaller and larger policies. However, the actual premium and rate schedules involved considerable judgment because of the lack of detailed information. Thus the importance of the similarity of results would seem to outweigh the question of whether the constant should be described as "loss" or "expense".

There are several points on which I wish to comment. The first, while not necessarily material to the conclusions in the paper, is the unfortunate use of written premiums and paid losses in the author's Exhibit I, since earned premiums and incurred losses are a much more accurate reflection of actual results. We are attaching Exhibit A which shows that the National Board earned-incurred experience on habitational risks has deteriorated from 1956 to 1960 but not as rapidly as written-paid figures would imply. Also the remainder of the fire account has improved. However, with a 48% expense ratio,[3] the earned-incurred results for both categories indicate underwriting profits or losses of only three points or so, rather than the dire habitational loss and handsome all other profit which would be assumed from the written-paid figures.

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[1] The National Underwriter (February 7, 1952), Vol. 56, No. 6, p. 2.

[2] Tom R. Chatfield, "Original 'Chatfield Report'—Refinement of Dwelling Fire and Extended Coverage Rates", dated September 7, 1955.

[3] Based on the total expenses of 20 of the largest stock companies as shown in Table 9—as New York Insurance Department Loss and Expense Ratios booklet.

A second point to which we must take exception is the author's assumption that there is a fixed cost per policy which is the same for all classes of fire business and that the expense ratio on dwelling policies will therefore be higher because the average premium size will be smaller than that of other fire policies. Other things being equal, we, of course, agree that, because of certain of the expenses included under the other acquisition and general expense categories, the ratios for these categories will be less for policies involving larger premiums. However, other things are not equal for all classes of fire insurance. The method of handling dwelling business is materially different than that for commercial business. Particularly for the smaller dwelling there is little if any underwriting. Dwelling policies are usually simpler and should cost less to prepare. They involve little, if any, of the special inspection, rating, mapping and similar detailed procedures necessary in the writing of many of the other fire classes. For policies of the same size, the cost per policy in the dwelling classes should accordingly be less than that for the other fire classes. Therefore, even though the average dwelling premium is smaller than the average of all fire policies, the total expense ratio will not necessarily be higher.

The subject of dwelling expenses as compared to the fire total received considerable attention during rate hearings held by the New York Insurance Department in 1955, 1956 and 1957. In the Allstate case we find statements such as the following:

"The writing of the fire risks in the commercial classes involves expense elements that do not occur in the dwelling classes, because commercial risks involve high units of coverage and all kinds of industrial premises, and are therefore rated on a building-by-building basis. . . ." "It is admitted . . . that the cost of loss adjustment expense, general expense and other acquisition expense is higher on mercantile than on dwelling insurance."[4]

In the North America case which followed, the Superintendent included the following paragraph in his decision:

"I am satisfied that the North America Companies properly used their expenses for all fire classes substantiating the independent filing, since their expenses for the dwelling classes are slightly lower than the average of all fire classes. Actuary Longley-Cook testified that while the loss adjustment expense ratio for dwellings is slightly higher than for all fire classes, his studies showed that lower other acquisition and general expense ratios for dwellings more than outweigh the higher loss adjustment expense. It is recognized that a number of items of expense are not applicable to dwelling class business."[5]

We do not have a list of the companies specializing in dwelling business which the author cites in support of his position that the expense ratio for such companies is higher than the standard expense formula so that we cannot attempt an analysis of the reasons for their higher expenses. However, we do suggest that at least some such companies have higher other acquisition and

[4] Brief on Behalf of Respondent-Petitioner Allstate Insurance Company, pp. 48-50 Matter of Cullen, as Treasurer of NYFIRO, etal. v. Holz, as Superintendent of Insurance of State of New York, and Allstate Insurance Co., 7 A.D. 2d 718, 181 N.Y.S. 2d 163 (1st Dept. 1958), aff'd. 6 N.Y. 2d 971, 161 N.E. 2d 392 (July 8, 1959).

[5] Opinion and Decision of Leffert Holz as the Superintendent of Insurance of State of New York In the Matter of The Independent Rate Filing for Dwelling Classes By The North America Companies, September 4, 1957, p. 3.

general expenses not because they write dwelling business, but because of their method of operation. Direct writers and other companies not operating through the independent agency system reduce or eliminate the commission element of their expenses but must absorb into the other elements of expense some of the functions which would otherwise be performed by the independent agent. One instance of this appears to be the Government Employees Insurance Company, which in 1960 had a negligible fire commission ratio of 0.2% but a ratio of other acquisition and general expenses to net earned premiums of 29.1%, comparing with the stock company aggregate other acquisition and general expense of 15.4%. (In fairness to Government Employees, it should be pointed out that their "other expense" drops from 29.1% to 18.5% when related to written premiums and adjusted to full manual.) That certain items of expense are transferred from commission to "other expense" in the direct writer's operations was admitted by the Allstate Insurance Company in the New York case previously mentioned, as follows:

"It is contended that under the old-line agency system, the agents perform certain services (policy writing, underwriting, coding, billing, collecting premiums, etc.) for which they are paid out of their commissions; that under the Allstate system these functions are performed by the company and must thus be added to the Bureau factor of 6.3 . . . in Allstate's expense tabulation. "So much is granted."[6]

Finally, while we are in agreement with the indicated results with respect to loss or expense constants and with the proposition that the policies for small amounts of insurance should be charged proportionately larger premiums than average sized policies, we are not convinced that this relationship continues all the way up the line. In other words, we feel that large policies may not be entitled to a proportionately lower premium than medium sized policies. The bureau "loss constant" method, while increasing the premium on small policies, usually reduces the premium for larger policies with the maximum reduction going to the largest policies. The extreme effect which this method can have is indicated by the first "loss constant" filing in Tennessee in which risks with the best protection and with insured amounts over $50,000 received reductions of over 50%. No attempt was made to justify such large reductions, the filing being primarily concerned with the justification of the increases on the small policies and the assumption apparently being made that virtually all risks of any appreciable size would be insured under a Homeowners policy. With the currently existing price comparisons between Homeowners policies and Fire and Extended Coverage policies of equal size, the assumption is no doubt valid but does not make the resulting premium correct. In fact, with the price differential, underwriters might do well to be particularly cautious concerning larger dwellings written on a traditional fire policy.

The loss data developed by the author does not appear to segregate buildings from contents and, in fact, the curve depicted in his Exhibit 6 appears to be based on his data for all fire and allied lines. This results in having amount groups one and two disproportionately affected by contents policies, while the non-habitational policies have an effect on all sizes. The experience for dwelling contents has long been quite different (in most cases much worse) than dwelling buildings and some of this difference can be presumed to be

[6] Op. cit.

attributable to the different exposure of contents with respect to frequency and small losses such as cigarette burns and also to the greater effect of underinsurance. Thus the buildings and contents pose at least slightly different problems, the solution to which may not be exactly the same.

Also, as would be expected, the loss data is much more limited for amount groups 5 and 6. The curve on Exhibit 6 passes through the premium point indicated for group 6, and yet this group can carry very little weight in terms of number of risks or of losses paid. In the fire field a total loss is always a very real possibility and represents a substantial part of the total hazard. A single total loss to the average size risk in group 6 would increase the loss cost of the group by more than a third.

If we were to recompute the curve in Exhibit 6 on the least squares method weighing the points on the basis of the liability figures in Exhibit 4, the slope would be decreased. The indicated premium to pay losses would remain about the same for policy amounts in the $10,000 to $15,000 area but would increase for the smaller policy amounts and decrease for the larger amounts. However, as discussed above, we suspect that the lower part of the curve may be distorted by the mixture of building and contents while the upper end does not have sufficiently credible data to prove or disprove its validity. Thus, the curve is most meaningful in its middle area where, coincidentally, the indicated results are closest to those produced by the loss constant method.

We do have one source of information by size of policy which can be considered in connection with this problem, namely, the statistical data compiled under the Homeowners Policy Statistical Plan. This data is compiled with respect to policy size on a written premium-paid loss basis by the National Board of Fire Underwriters. While number of risks and amount of liability are not a part of the compilation, we know that the premiums, except for the liability coverage and partially the theft coverage, were originally computed using discounted component rates applied to the amounts of insurance furnished and that the bulk of the premium was, therefore, proportional to the amounts of insurance. This, in effect, amounted to a premium computation similar to that contained in the "loss constant" method, that is, flat premiums or charges plus rates applied to the amount of insurance. If this method were completely accurate in allocating loss costs by size of policy, we would expect to find a uniform loss ratio by size. We are attaching Exhibit B showing the policy size results for 1958, 1959 and 1960 for Policies A and B. Since this exhibit is on a written-paid basis, it does not give any indication as to adequacy of premium levels. However, adjustment to the more accurate earned-incurred basis would presumably have a similar effect on the various groupings so that the figures are useful for comparisons between sizes. There appears a highly consistent pattern with the medium policies producing the best loss ratios and both the smaller and larger policies showing less favorable results.

The Homeowners results are consistent with the various low valued dwelling studies with respect to the smaller policies. However, these same Homeowners results directly contradict the extension of conclusions based on these studies to the high valued dwelling. Whatever the reasons, and this discussion is not the place to attempt an analysis, the larger dwellings do not appear to be entitled to as great a percentage "discount" as the average sized dwellings, at least insofar as the loss portion of the premium dollar is concerned. Thus, while very large policies may be entitled to a lower rate than very small policies, they may actually require a higher rate than the average policy. Such a situation would not be completely new in the property insurance field. Paul Johansen of Denmark presented a paper to the International Congress of Actuaries discussing fire insurance experience on rural buildings in which the indicated premium did not increase in proportion with the increase in the sum insured but rather increased in proportion with the square of the sum insured.[7]

The Homeowners policy size experience illustrates a final point which we believe deserves strong emphasis. Extreme care must be used in transferring rating procedures from components to established multiple line packages. As a package approaches a credible volume for establishing its own rate levels, it also approaches the point where its departure has a comparably credible effect on the characteristics of the residual business written under the components. Changes in component rates or rating procedures occurring subsequent to the establishment of a multiple line package must not automatically be considered applicable to that package. Because the packages are ordinarily designed to attract only preferred or specialized segments of classes written under the components, conclusions reached on the basis of the residual business and perfectly valid for that business may well be completely wrong for the package and completely inapplicable to the package.

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[7] Johansen, Paul, "On Fire Insurance of Rural Buildings," Transactions XVth International Congress of Actuaries, Vol. 2, pp. 211-215.

EXHIBIT A

FIRE EXPERIENCE
NATIONAL BOARD OF FIRE UNDERWRITERS
COUNTRYWIDE 1956-1960

Habitational Risks*

Year	Earned Premium	Incurred Losses	Loss Ratio
1960	$467,714,243	$260,326,568	55.7
1959	484,595,363	260,231,058	53.7
1958	479,815,213	259,982,942	54.2
1957	476,098,977	241,409,062	50.7
1956	482,202,242	242,408,159	50.3

All Other Risks

Year	Earned Premium	Incurred Losses	Loss Ratio
1960	$740,696,287	$372,789,952	50.3
1959	708,208,395	348,314,686	49.2
1958	679,125,111	342,514,212	50.4
1957	659,039,234	348,945,812	52.9
1956	648,709,441	352,197,515	54.3

*The following classes comprise the Habitational Group: 002 Household Contents in Mercantile Buildings; 007 Boarding Houses; 009 Household Contents - Dwelling; 011 Seasonal Dwellings; 019 Dwelling Building & Contents; 021 Farm; 029 Dwelling Building Only; 030 Large Area Housing; 031 Apartment Buildings Without Mercantile; 032 Apartment Buildings With Mercantile; 033 Household Contents - Apartments.

EXHIBIT B

Homeowners Country-wide Experience By Amount (1)

Policies A and B and Forms 1, 2 and 3

Year	Amount of Insurance (2)	Premiums Written (3)	Losses Paid	Pd/Wr Ratio
1958	Under 10,000	26,688,036	7,560,083	28.3
	10,000-13,499	55,879,543	14,463,089	25.9
	13,500-17,499	50,918,911	12,487,932	24.5
	17,500-24,999	40,105,224	10,870,453	27.1
	25,000-29,999	12,008,300	3,468,385	28.9
	30,000-37,499	8,204,221	2,688,935	32.8
	37,500-50,000	3,794,129	1,595,471	42.1
	Over 50,000	1,359,034	661,495	48.7
1959	Under 10,000	40,742,586	10,793,856	26.5
	10,000-13,499	84,341,827	19,825,524	23.5
	13,500-17,499	77,177,235	16,938,253	21.9
	17,500-24,999	60,398,753	14,327,476	23.7
	25,000-29,999	18,439,863	4,944,833	26.8
	30,000-37,499	13,462,466	3,586,510	26.6
	37,500-50,000	6,714,229	2,099,968	31.3
	Over 50,000	2,585,278	578,640	22.4
1960	Under 10,000	66,469,051	21,080,238	31.7
	10,000-13,499	120,858,215	35,270,108	29.2
	13,500-17,499	108,136,926	29,787,823	27.5
	17,500-24,999	82,481,401	23,211,658	28.1
	25,000-29,999	26,077,475	8,011,340	30.7
	30,000-37,499	20,025,059	6,194,680	30.9
	37,500-50,000	10,497,262	3,739,947	35.6
	Over 50,000	4,789,051	2,727,350	56.9
1958-1960	Under 10,000	133,899,673	39,434,177	29.5
	10,000-13,499	261,079,585	69,558,721	26.6
	13,500-17,499	236,233,072	59,214,008	25.1
	17,500-24,999	182,985,378	48,409,587	26.5
	25,000-29,999	56,525,638	16,424,558	29.1
	30,000-37,499	41,691,746	12,470,125	29.9
	37,500-50,000	21,005,620	7,435,386	35.4
	Over 50,000	8,733,363	3,967,485	45.4

(1) Experience of stock companies under National Board of Fire Underwriters "1958 Statistical Plan" and earlier statistical plans. Developed from figures compiled by Inter-Regional Insurance Conference and Actuarial Bureau of National Board of Fire Underwriters.

(2) Amount of insurance on the dwelling building.

(3) No adjustment has been made to reflect rate changes.

DISCUSSION BY ROBERT L. HURLEY

The reader should have very little difficulty with Mr. Buffinton's interesting paper on "The Low Valued Risk." Its purpose is indicated by the subtitle, "A Study of the Premium Required for Habitational Risks of Various Policy Amounts." Within the specified framework, the reviewer found himself often in accord with the author's observations. There were, however, some phases of the argument on which we should like to comment.

The author summarized his paper with five conclusions. These will serve as a basis for specific evaluation of the author's thesis after some general remarks on the developing argument.

In an early section of his paper, the author correctly, I believe, maintained the position that the fire loss ratio on the habitational classifications has advanced with the switch of the "better" business to the Homeowners policy. The value judgment, "better," is used in the, maybe, general belief that the "fire" loss ratio on Homeowners (if we had such a figure) certainly could not be as unpalatable as those currently shown on straight fire dwelling business. It is hoped that the Dwelling Loss Constant Plan being filed by many Fire Rating Bureaus will help to improve the generally current unsatisfactory experience in the dwelling fire classes.

However, at this point the author seemed to imply that the situation is quite all right on the fire business, otherwise current fire rates are even redundant for other classes. This, unfortunately, is not so. There are those who believe that even an incurable optimist might well entertain some misgivings on current outlook for fire loss ratios on most classifications. The reviewer would like to be spared a recital of the unfavorable factors affecting the outlook for fire classification loss ratios. Maybe it would suffice just to note that Mr. Buffinton used five year written and paid loss ratios of happier days. They constitute a most imperfect representation of the prospective incurred loss to earned premium at effective rate levels for the years ahead.

The reviewer read with interest the section of the paper dealing with the Dwelling Loss Constant Plan, which has been filed by a number of Fire Rating Bureaus in response to the abnormally unfavorable experience on these risks. Mr. Buffinton noted that his study evidenced a similarity of results with the schedule of rates filed by the Fire Bureau. However, in going over the various exhibits, the reviewer noted that the figures indicated only a relatively slight trend towards higher loss cost per $100 insurance on the smaller risks.

For example, Exhibit 4 shows practically the same loss cost for the risks under $2,500 liability as for those in the size group $2,501-$5,000. The actual decrease is from 15.50¢ to 14.95¢, or only 3.5%. Moreover, the loss cost shown for the risk size $25,001-$50,000 (i.e., above which the data are extremely thin) is only 15% less than for the smallest risks. Similar observations might be made on Exhibit 5 although the trend in Section C (Habitational Lines only) is somewhat more pronounced. It would appear that the justification for the rate graduations in this paper would be influenced to a considerable degree by the treatment of expenses.

On the other hand, the Bureaus' Dwelling Fire Loss Constant Plans were based primarily on considerations related to the loss portion of the premium dollar. The Bureaus in their studies noted that there was apparently no significant trend in the average loss per payment as the risk size increased. Even more compelling were the data from a number of large companies showing that the loss ratios on dwellings insured for less than $2,500 were running almost 70% higher than the average for the class—and more than twice the loss ratio for risks insured for $10,000 or more.

The Fire Bureaus were not unaware that the expense ratio on a $2,000 dwelling policy was not likely the same as that on a $20,000 policy. However, since a direct justification might be offered from the loss portion of the dwelling premium dollar, there was little need to become involved in disputes on the handling of expenses, which some regard as an inexact science that can easily degenerate into a makeshift art.

Many readers may benefit from the author's disclosure of the effect of a concentration of a company's portfolio on a risk classification once thought desirable, now proved unprofitable. Now these so-called "bad" risks (i.e., solely with advertence to higher than average loss ratio and expense ratios) were always present in the portfolio. Their effect was submerged in the overall class average. This will ever be so when rates are made on a classification basis.

However, every refinement in classification will produce "better" and "worse" than average risks. Both the discomfort of the underwriter who finds himself with a preponderance of the worst risks from the prior overall class and the delight of his more successful rival may alike be sobered by some mature reflection.

The overextension of the classification principle can ultimately prove expensive to the very people for whose benefit it was allegedly devised, the policyholders. It is the policyholder who pays for the increase in expense in order to measure the insurance cost with ever greater refinement. Except for those policyholders favored with significantly lower rates, all others must bear not only the higher loss cost but also likely the larger share of the increased expenses. Moreover, there are students of the business who warn that classification refinement pursued indiscriminately could defeat the insurance principle itself. While the reviewer has not yet succumbed to panic on the classification issue, he must admit that a company which may have geared its merchandising to class deviations from Bureau rates might have some extra cause for alarm wherein the refined classifications seem to indicate the business is probably not as good as once imagined.

Let us now turn to the author's five conclusions on which, after paraphrasing, the reviewer will offer some comments.

1. *Fire and Allied Lines Rate Formula should include provisions for fixed expense, variable expense, losses, profit and catastrophe.* One can hardly disagree with the principle of this conclusion which says in effect that rates should cover all costs plus a profit and catastrophe factor. However, the reviewer has some reservations (not exclusively semantical) on the term "fixed." The misgivings on the word "fixed" stem back some years, when there was considerable discussion on the "fixed" cost of issuing a policy.

While there was, as I recall, some willingness to accept a figure in the neighborhood of $4.50 as a reasonably accurate figure for the "fixed" cost of issuing a fire policy, unfortunately this absolute standard did not remain "fixed" very long but drifted ever higher with the uptrend in the underlying economy.

Further, the exact method of establishing the rates so they provide for the total cost may possibly be subject to various treatments. The Bureaus now have a recommended formula which expresses certain expenses as varying with written premiums and other expenses as varying with earned premiums in the determination of Fire and EC overall rate levels.

2. *The premium required to pay losses and the policy size are related according to the functional relationship $y = ax^b$.* The reviewer, too, believes that the fire loss cost per $1,000 insurance on dwelling properties increases as the policy size decreases towards the lower end of the value scale. This may also be true for some other fire classifications, although it does not seem likely to be characteristic for those many fire classifications wherein the incidence of loss is of an abnormally small order of magnitude, and the severity factor pronounced.

The reviewer would be surprised if the author did not entertain the same reservations on the unassailability of any specific exercise in curve fitting despite the understandable delight to be derived from matching up some statistical observations against one of a number of theoretical curves.

With no thought of disparaging the author's ingenuity in fitting his data to a power formula, it is noted that the class in the top (open) end of the scale involved only $193,000 in losses over the entire experience review period. When we consider the effect that just one or two losses could have on the average loss cost for this size group, we would hesitate to credit such a limited sample as a base on which to predicate an Industry statistical law that the premium required to pay losses is related to policy size necessarily according to a power formula.

3. *Average premium size affects a company's expense ratio, particularly a company specializing in private dwelling business.* The reviewer agrees that a company specializing in low premium policies may well run higher expense ratios than a company with a better balanced book of business. It is hoped that the Dwelling Fire Loss Constant Plan will ameliorate this situation at least to some extent.

4. *The expense retentions written into rates should vary by class of business.* The reviewer doubts that the author really intended that the expense as well as the loss experience for each class must be reviewed in the occupancy class adjustment procedure as he stated on page 17. The Bureau has over 600 class breakdowns to review losswise for each state. Mr. Buffinton could not have seriously meant that a statistical system be set up to collect expenses in any such detail, but would settle for a very limited number of broad classification groupings.

However, to get expenses allocated with reasonable accuracy on just a line basis by state is no easy task. To dig down below the line by state figure into the understrata of occupancy class may be a cost accountant's dream, but it could be a nightmare expensewise.

The pursuit of absolute equity is a burden not lightly to be undertaken. Attempts presumably could be made to arrange our scale of prices with ever increasing precision. But neither Insurance nor any other industry can afford not to question the net social value of such a project. Reasonable equity is all the Industry can expect and maybe is all the buying public can afford.

5. *This study indicates that current Fire and Allied Lines rating practices develop inadequate rates for dwellings and excessive rates for high premium risks or occupancy classes.* As mentioned previously, he would be a rare fire

underwriter who believes that he can afford to be sanguine on the prospects for the general run of fire classifications. There is, of course, the pleasing deception, sometimes irresistible, that, because the prospects for losses "A" through "M" (say, dwellings) are unfavorable, those for Classes "N" through "Z" (say, all other) must be favorable. Still, as Montaigne observed years ago, "good" does not necessarily follow as an offset to evil, rather a second evil can occur, even worse than the first.

The reviewer, too, likes to be optimistic. The Fire and Allied Lines business has the prospect of brighter days if it can solve some really difficult problems. But quite probably there are no longer any "sure for a profit" classes in fire insurance. The reverse is more likely true.

The reviewer enjoyed Mr. Buffinton's paper. It should prove a valuable addition to our Proceedings.

THE LATEST REPORTED STOCK INSURANCE COMPANY EXPENSES FOR 1961

BY

FRANK HARWAYNE

A previous paper[1] generated a number of comments and requests that expenses by company size of premium volume for each line of business be analyzed for lines of business such as fire, extended coverage, multiple peril, etc. Accordingly, calendar year 1961 expenses for almost every line of business have been reviewed and summarized for stock insurance companies as will be set forth later.

The description of premium range used and expense items (sections A through E) is identical to that of the previous paper[2] and will not be repeated here. A review of the individual figures in Exhibits 1 through 20 indicates a somewhat erratic pattern of expenses by premium volume for many of the lines of business, particularly the fire lines. This might be related to the effects of reinsurance, allocation methods, mix of different types of risks within the line of business, etc.

Auto Bodily Injury Total Expenses can be summarized by the formula

$$10^{y} P^{.00170} = 2.016$$

where y is the total expense ratio and P is the premium expressed in millions of dollars.

By "quasi-least squares", the formula[3] for the comparable 1960 data is

$$10^{y} P^{.00114} = 2.053$$

Section E (Total Expense Ratios) of each exhibit described below indicates a difference between the total average expense ratio and the highest figure of any premium range bracket in the average column as follows:

SECTION E—TOTAL EXPENSE RATIOS

Exhibit 1—Fire	+ 2.5%
Exhibit 2—Extended Coverage	+ 3.5%
Exhibit 3—Other Fire	+ 3.9%
Exhibit 4—Homeowners Multiple Peril	+ 6.1%
Exhibit 5—Commercial Multiple Peril	+ 2.6%
Exhibit 6—Inland Marine	+ 2.4%

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[1] Frank Harwayne, "Observations on the Latest Reported Stock Insurance Company Expenses for 1960", *PCAS XLVIII*, pp. 109-120.

[2] ibid, p. 109-110.

[3] ibid, p. 111. It should be noted that due to clerical error the formula was printed as $10^{y} P^{.03252} = 2.1062$.

Exhibit 7—Group Accident and Health	+ 12.7%
Exhibit 8—Workmen's Compensation	+ 5.9%
Exhibit 9—Bodily Injury Liability Other Than Auto	+ 2.3%
Exhibit 10—Property Damage Liability Other Than Auto	+ 2.6%
Exhibit 11—Auto Bodily Injury Liability	+ 4.2%
Exhibit 12—Auto Property Damage Liability	+ 5.0%
Exhibit 13—Auto Physical Damage (collision)	+ 9.0%
Exhibit 14—Auto Physical Damage (fire, theft and comprehensive)	+ 8.6%
Exhibit 15—Fidelity	+ 5.4%
Exhibit 16—Surety	+ 4.7%
Exhibit 17—Glass	+ 3.2%
Exhibit 18—Burglary and Theft	+ 0.8%
Exhibit 19—Boiler and Machinery	+ 21.9%
Exhibit 20—All Lines of Business	+ 2.7%

With respect to ratemaking, the difference between stock company average expense and the highest figure for any premium range may be absorbed by minimum premiums in group accident and health insurance, expense constants in workmen's compensation insurance and inspection expense in boiler and machinery insurance. For the automobile lines, the stock company average is depressed on account of the inclusion of non-bureau companies; correspondingly the extreme percentages above would be dampened if the expenses of independent companies were not included. For homeowners multiple peril the figure may not be representative as the group used consists mostly of companies recently entering the field and writing less than half a million dollars of premiums.

Subject to the foregoing comments, most of the lines of business appear to provide a margin for profit or contingencies greater than these differences; certainly the 2.7% average for all lines of business is not inconsistent with the 2.5% to 6.0% afforded in the regulated lines of insurance. This suggests that the sum of average expenses plus existing profit or contingency allowances as an expense loading in rates would provide every prudent company of every size sufficient dollars to cover its expenses.

Other comments related to individual needs undoubtedly will occur to those who study the exhibits in detail.

EXHIBIT 1

CALENDAR YEAR 1961 FIRE EXPENSE RATIOS

No. Cos.	Premium Range (In Millions)	Section A – General Expense Ratios: Avg.*	A: Extreme Expense Ratios: Lowest	A: Extreme Expense Ratios: Highest	A: Extreme Ratios To Mean: Lowest	A: Extreme Ratios To Mean: Highest	Section B – Other Acquisition Ratios: Avg.*	B: Extreme Expense Ratios: Lowest	B: Extreme Expense Ratios: Highest	B: Extreme Ratios To Mean: Lowest	B: Extreme Ratios To Mean: Highest	Section C – General Expense and Other Acquisition Ratios: Avg.*	C: Extreme Expense Ratios: Lowest	C: Extreme Expense Ratios: Highest	C: Extreme Ratios To Mean: Lowest	C: Extreme Ratios To Mean: Highest
15	1/4-1/2	6.1%	1.6%	12.0%	-74%	+97%	3.3%	-	7.5%	-100%	+127%	9.3%	1.6%	17.1%	-83%	+84%
15	1/2-1	7.1	0.7	13.5	-90	+90	3.1	-	7.4	-100	+139	11.2	0.8	23.1	-93	+106
18	1-2	7.8	3.7	13.8	-53	+77	4.3	1.2%	8.6	-72	+100	12.1	6.6	16.4	-45	+36
6	2-4	7.2	2.6	13.0	-64	+81	4.6	1.4	6.9	-70	+50	12.5	5.9	16.3	-53	+30
17	4-8	7.0	4.0	10.9	-43	+56	4.7	1.3	8.9	-72	+89	11.9	5.6	18.4	-53	+55
15	8-16	7.8	4.3	11.6	-45	+49	5.1	2.9	7.2	-43	+41	12.9	8.1	19.3	-37	+50
12	16-32	8.4	6.5	11.1	-23	+32	5.3	3.6	7.3	-32	+38	13.8	10.2	17.0	-26	+23
6	32-64	9.1	8.3	9.7	-9	+7	5.6	4.5	7.9	-20	+41	15.0	12.7	17.1	-15	+14
3	64-128	9.9	8.2	11.1	-17	+12	8.8	5.5	14.3	-37	+63	18.7	13.7	25.4	-27	+36
	Total	8.7%					6.1%					14.9%				

No. Cos.	Premium Range (In Millions)	Section D – Commission and Brokerage Ratios: Avg.*	D: Extreme Expense Ratios: Lowest	D: Extreme Expense Ratios: Highest	D: Extreme Ratios To Mean: Lowest	D: Extreme Ratios To Mean: Highest	Section E – Total Expense Ratios: Avg.*	E: Extreme Expense Ratios: Lowest	E: Extreme Expense Ratios: Highest	E: Extreme Ratios To Mean: Lowest	E: Extreme Ratios To Mean: Highest
15	1/4-1/2	30.5%	23.7%	41.0%	-22%	+34%	39.9%	32.9%	49.9%	-18%	+25%
15	1/2-1	25.6	0.3	36.5	-99	+43	37.2	21.6	49.8	-42	+34
18	1-2	25.8	13.8	36.9	-47	+43	38.6	27.2	44.8	-30	+16
6	2-4	27.1	24.0	30.0	-11	+11	40.8	37.2	44.1	-9	+8
17	4-8	28.0	22.7	32.4	-19	+16	39.5	25.6	45.7	-35	+16
15	8-16	28.6	22.9	32.5	-20	+14	41.8	38.8	49.5	-7	+18
12	16-32	25.8	24.0	27.5	-7	+7	39.6	36.4	42.9	-8	+8
6	32-64	24.7	23.3	26.1	-6	+6	39.5	38.4	42.1	-3	+7
3	64-128	24.5	23.7	25.8	-3	+5	43.2	37.4	51.2	-13	+19
	Total	25.9%					40.7%				

*Lowest and highest cos. in all groups except the last one have not been included in determination of averages. Total average is average of all cos. included in exhibit.

NOTE: Expenses are expressed as ratios to adjusted direct premiums earned except commissions and other acquisition expenses which are expressed as ratios to written.

CALENDAR YEAR 1961 EXTENDED COVERAGE
EXPENSE RATIOS

EXHIBIT 2

		SECTION A - GENERAL EXPENSE RATIOS					SECTION B - OTHER ACQUISITION RATIOS					SECTION C - GENERAL EXPENSE AND OTHER ACQUISITION RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
No. Cos.	Premium Range (In Millions)	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
18	1/4-1/2	7.8%	2.7%	19.2%	-65%	+146%	4.8%	0.2%	9.2%	-96%	+92%	12.9%	5.6%	26.1%	-57%	+102%
12	1/2-1	5.0	1.7	12.8	-66	+156	3.0	1.1	5.9	-63	+97	8.3	3.7	16.2	-55	+95
13	1-2	7.6	2.9	11.8	-62	+55	4.8	1.2	7.4	-75	+54	12.8	4.1	19.0	-68	+48
19	2-4	7.7	4.1	12.1	-47	+57	5.4	3.0	7.8	-44	+44	13.2	8.6	19.0	-35	+44
11	4-8	7.4	5.0	10.1	-32	+36	6.5	4.6	10.3	-29	+58	13.9	10.5	16.7	-24	+20
12	8-16	7.9	5.8	9.8	-27	+24	6.1	4.6	9.3	-25	+52	14.0	11.9	17.2	-15	+23
3	16-32	9.5	8.2	10.6	-14	+12	9.8	6.8	14.9	-31	+52	19.3	16.0	25.5	-17	+32
	Total	8.0%					6.6%					14.7%				

		SECTION D - COMMISSION AND BROKERAGE RATIOS					SECTION E - TOTAL EXPENSE RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
No. Cos.	Premium Range (In Millions)	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
18	1/4-1/2	26.1%	11.3%	36.5%	-57%	+40%	38.2%	24.9%	52.0%	-35%	+36%
12	1/2-1	29.4	17.9	36.8	-39	+25	37.3	26.4	43.9	-29	+18
13	1-2	28.8	22.7	32.7	-21	+14	41.8	36.8	47.9	-12	+15
19	2-4	29.4	25.7	33.1	-13	+13	42.7	38.5	50.7	-10	+19
11	4-8	27.5	23.1	31.4	-16	+14	41.7	36.2	45.3	-13	+9
12	8-16	25.8	23.4	26.9	-9	+4	39.3	37.0	41.9	-6	+7
3	16-32	25.6	25.0	26.6	-2	+4	44.9	41.1	52.1	-8	+16
	Total	26.9%					41.4%				

*Lowest and highest cos.in all groups except the last one have not been included in determination of averages.
Total average is average of all cos.included in exhibit.

NOTE: Expenses are expressed as ratios to adjusted direct premiums earned except commissions and other acquisition expenses which are expressed as ratios to written.

CALENDAR YEAR 1961 OTHER FIRE
EXPENSE RATIOS

EXHIBIT 3

No. Cos.	Premium Range (In Millions)	SECTION A - GENERAL EXPENSE RATIOS					SECTION B - OTHER ACQUISITION RATIOS					SECTION C - GENERAL EXPENSE AND OTHER ACQUISITION RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
		Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
11	1/8-1/4	7.4%	1.7%	18.9%	-77%	+155%	3.5%	0.1%	6.5%	-97%	+86%	11.4%	2.9%	30.4%	-75%	+167%
7	1/4-1/2	7.8	5.2	11.0	-33	+41	4.7	1.4	6.9	-70	+47	12.4	6.6	17.9	-47	+44
10	1/2-1	5.3	1.3	10.2	-75	+92	3.8	1.4	6.4	-63	+68	9.2	3.6	16.8	-61	+83
4	1-2	4.3	1.1	7.6	-74	+77	2.9	0.6	4.6	-79	+59	7.2	1.7	12.2	-76	+69
8	2-4	6.9	2.7	12.3	-61	+78	4.0	1.0	10.0	-75	+150	11.5	7.5	14.9	-35	+30
4	4-8	7.3	1.9	11.5	-74	+58	7.1	2.9	9.9	-59	+39	14.4	4.8	21.4	-67	+49
	Total	6.7%					5.0%					11.9%				

No. Cos.	Premium Range (In Millions)	SECTION D - COMMISSION AND BROKERAGE RATIOS					SECTION E - TOTAL EXPENSE RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
		Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
11	1/8-1/4	24.4%	17.5%	31.0%	-28%	+27%	35.6%	29.6%	42.0%	-17%	+18%
7	1/4-1/2	21.4	14.1	31.9	-34	+49	34.1	26.4	38.9	-23	+14
10	1/2-1	29.7	22.8	36.3	-23	+22	38.8	32.2	45.2	-17	+16
4	1-2	21.9	12.0	28.2	-45	+29	31.4	26.2	37.6	-17	+20
8	2-4	22.0	19.7	25.5	-10	+16	32.8	29.7	38.9	-9	+19
4	4-8	22.3	20.6	25.5	-8	+14	36.7	25.4	43.7	-31	+19
	Total	23.0%					34.9%				

*Lowest and highest cos. in all groups except the last one have not been included in determination of averages.
Total average is average of all cos. included in exhibit.

NOTE: Expenses are expressed as ratios to adjusted direct premiums earned except commissions and other acquisition expenses which are expressed as ratios to written.

CALENDAR YEAR 1961 HOMEOWNERS MULTIPLE PERIL
EXPENSE RATIOS

		SECTION A - GENERAL EXPENSE RATIOS					SECTION B - OTHER ACQUISITION RATIOS					SECTION C - GENERAL EXPENSE AND OTHER ACQUISITION RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
No. Cos.	Premium Range (In Millions)	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
14	1/4-1/2	7.0%	1.4%	13.7%	-80%	+96%	4.0%	-	7.6%	-100%	+90%	11.2%	2.1%	19.1%	-81%	+71%
15	1/2-1	8.3	3.4	17.2	-59	+107	4.2	0.3%	10.0	-93	+138	12.6	3.7	24.6	-71	+95
13	1-2	7.6	4.2	10.8	-45	+42	5.6	2.8	8.6	-50	+54	13.3	8.9	18.0	-33	+35
11	2-4	6.8	5.6	8.5	-18	+25	4.7	3.6	6.0	-23	+28	11.7	9.2	13.8	-21	+18
19	4-8	7.0	4.5	11.3	-36	+61	5.2	2.1	7.7	-60	+48	12.3	9.2	17.3	-25	+41
11	8-16	5.5	4.0	8.2	-27	+49	5.8	4.4	9.0	-24	+55	11.3	8.4	13.3	-26	+18
7	16-32	6.2	4.7	8.6	-24	+39	5.5	4.3	6.6	-22	+20	12.0	9.7	15.3	-19	+28
1	32-64	5.0	-	-	-	-	5.5	-	-	-	-	10.5	-	-	-	-
	Total	6.2%					5.4%					11.8%				

		SECTION D - COMMISSION AND BROKERAGE RATIOS					SECTION E - TOTAL EXPENSE RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
No. Cos.	Premium Range (In Millions)	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
14	1/4-1/2	32.2%	26.4%	40.1%	-18%	+25%	43.4%	37.4%	54.2%	-14%	+25%
15	1/2-1	28.6	22.4	32.8	-22	+15	40.0	33.2	50.5	-17	+26
13	1-2	28.0	20.3	31.8	-27	+14	40.9	25.2	49.1	-38	+20
11	2-4	28.1	26.2	30.6	-7	+9	39.9	37.8	42.7	-5	+7
19	4-8	28.7	24.0	31.7	-16	+10	40.5	35.0	46.9	-14	+16
11	8-16	26.4	24.6	28.4	-7	+8	37.6	35.0	40.9	-7	+9
7	16-32	23.3	18.0	27.1	-23	+16	35.0	30.4	39.1	-13	+12
1	32-64	21.5	-	-	-	-	32.0	-	-	-	-
	Total	25.7%					37.3%				

*Lowest and highest cos.in all groups except the last one have not been included in determination of averages. Total average is average of all cos.included in exhibit.

NOTE: Expenses are expressed as ratios to adjusted direct premiums earned except commissions and other acquisition expenses which are expressed as ratios to written.

CALENDAR YEAR 1961 COMMERCIAL MULTIPLE PERIL
EXPENSE RATIOS

EXHIBIT 5

No. Cos.	Premium Range (In Millions)	SECTION A - GENERAL EXPENSE RATIOS					SECTION B - OTHER ACQUISITION RATIOS					SECTION C - GENERAL EXPENSE AND OTHER ACQUISITION RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
		Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
17	1/8-1/4	6.4%	-	16.6%	-100%	+159%	2.6%	-	6.5%	-100%	+150%	9.2%	-	18.5%	-100%	+101%
14	1/4-1/2	5.2	0.4%	10.5	-92	+102	3.2	0.2%	7.2	-94	+125	8.8	0.6%	17.7	-93	+101
16	1/2-1	9.1	3.3	18.9	-64	+108	4.3	0.9	7.4	-79	+72	13.3	6.7	22.0	-50	+65
9	1-2	7.2	1.5	16.8	-79	+133	4.2	1.5	7.3	-64	+74	11.8	3.0	21.5	-75	+82
7	2-4	9.5	7.1	13.3	-25	+40	5.8	4.2	11.8	-28	+103	15.3	11.5	22.4	-25	+46
2	4-8	8.8	8.3	9.3	-6	+6	5.4	4.4	6.3	-19	+17	14.2	13.7	14.6	-4	+3
1	8-16	8.7	-	-	-	-	10.7	-	-	-	-	19.4	-	-	-	-
	Total	8.4%					5.7%					14.2%				

No. Cos.	Premium Range (In Millions)	SECTION D - COMMISSION AND BROKERAGE RATIOS					SECTION E - TOTAL EXPENSE RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
		Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
17	1/8-1/4	22.4%	14.8%	28.6%	-34%	+28%	31.9%	17.3%	42.3%	-46%	+33%
14	1/4-1/2	23.8	14.0	39.8	-41	+67	33.8	26.2	48.0	-22	+42
16	1/2-1	23.5	17.7	30.1	-25	+28	37.6	26.4	46.9	-30	+25
9	1-2	21.7	15.8	27.4	-27	+26	33.7	20.7	41.8	-39	+24
7	2-4	21.1	19.7	22.7	-7	+8	36.5	29.8	43.0	-18	+18
2	4-8	18.2	17.8	18.6	-2	+2	32.4	31.5	33.2	-3	+2
1	8-16	15.6	-	-	-	-	35.0	-	-	-	-
	Total	20.5%					35.0%				

*Lowest and highest cos. in all groups except the last two have not been included in determination of averages. Total average is average of all cos. included in exhibit.

NOTE: Expenses are expressed as ratios to adjusted direct premiums earned except commissions and other acquisition expenses which are expressed as ratios to written.

EXHIBIT 6

CALENDAR YEAR 1961 INLAND MARINE
EXPENSE RATIOS

No. Cos.	Premium Range (In Millions)	SECTION A - GENERAL EXPENSE RATIOS					SECTION B - OTHER ACQUISITION RATIOS					SECTION C - GENERAL EXPENSE AND OTHER ACQUISITION RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
		Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
9	1/8-1/4	6.9%	1.6%	13.7%	-77%	+99%	3.3%	-	6.6%	-100%	+100%	10.7%	2.1%	16.7%	-80%	+56%
8	1/4-1/2	6.5	2.7	8.3	-58	+28	3.5	-	6.5	-100	+86	10.2	3.4	14.5	-67	+42
25	1/2-1	5.7	0.8	9.2	-86	+61	4.5	-	8.4	-100	+87	10.2	1.5	16.2	-85	+59
22	1-2	5.8	0.5	11.5	-91	+98	3.6	0.1%	8.8	-97	+144	9.6	0.5	17.0	-95	+77
11	2-4	7.3	3.9	10.7	-47	+47	5.6	3.5	7.7	-37	+38	12.9	7.4	18.3	-43	+42
6	4-8	7.7	6.1	9.0	-21	+17	6.4	4.7	8.3	-27	+30	14.3	11.8	17.1	-17	+20
7	8-16	7.1	5.3	9.0	-25	+27	7.5	3.8	10.7	-49	+43	14.6	11.1	19.9	-24	+36
4	16-32	8.3	6.6	11.9	-20	+43	6.6	5.8	7.3	-12	+11	16.0	12.8	19.2	-20	+20
	Total	7.3%					6.2%					13.9%				

No. Cos.	Premium Range (In Millions)	SECTION D - COMMISSION AND BROKERAGE RATIOS					SECTION E - TOTAL EXPENSE RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
		Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
9	1/8-1/4	22.4%	1.4%	31.7%	-94%	+42%	33.9%	11.7%	42.8%	-65%	+26%
8	1/4-1/2	25.4	21.9	30.8	-14	+21	35.1	31.0	40.8	-12	+16
25	1/2-1	23.5	13.8	34.4	-41	+46	33.6	22.9	43.5	-32	+29
22	1-2	24.1	10.8	32.1	-55	+33	33.9	23.3	40.3	-31	+19
11	2-4	23.7	22.2	27.1	-6	+14	37.0	31.0	42.8	-16	+16
6	4-8	25.0	23.3	28.5	-7	+14	38.5	36.2	43.2	-6	+12
7	8-16	21.8	20.8	22.8	-5	+5	36.5	32.3	41.1	-12	+13
4	16-32	20.2	18.7	21.4	-7	+6	35.8	33.0	38.0	-8	+6
	Total	22.3%					36.1%				

*Lowest and highest companies in all of the groups listed have not been included in determination of averages. Total average is average of all cos. included in exhibit.

NOTE: Expenses are expressed as ratios to adjusted direct premiums earned except commissions and other acquisition expenses which are expressed as ratios to written.

CALENDAR YEAR 1961 GROUP ACCIDENT AND HEALTH
EXPENSE RATIOS

EXHIBIT 7

No. Cos.	Premium Range (In Millions)	SECTION A - GENERAL EXPENSE RATIOS					SECTION B - OTHER ACQUISITION RATIOS					SECTION C - GENERAL EXPENSE AND OTHER ACQUISITION RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
		Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
4	1/4-1/2	6.6%	2.7%	9.6%	-59%	+45%	3.7%	1.5%	5.1%	-59%	+38%	11.5%	7.7%	13.9%	-33%	+21%
4	1/2-1	4.1	1.9	5.8	-54	+41	2.8	2.2	3.9	-21	+39	6.9	4.4	8.9	-36	+29
7	1-2	3.3	1.4	4.7	-58	+42	2.2	0.8	3.1	-64	+41	5.5	2.2	7.4	-60	+35
2	2-4	2.7	2.4	3.0	-11	+11	2.5	2.0	3.0	-20	+20	5.2	4.4	6.0	-15	+15
1	4-8	5.3	-	-	-	-	3.2	-	-	-	-	8.5	-	-	-	-
4	8-16	1.6	0.5	3.7	-69	+131	2.4	-	5.1	-100	+113	3.9	0.5	5.9	-87	+51
3	16-32	5.0	3.5	6.8	-30	+36	4.5	3.8	5.6	-16	+24	8.7	7.7	10.6	-11	+22
1	64-128	3.0	-	-	-	-	5.1	-	-	-	-	8.1	-	-	-	-
1	256-512	3.1	-	-	-	-	1.0	-	-	-	-	4.1	-	-	-	-
	Total	3.2%					2.2%					5.3%				

No. Cos.	Premium Range (In Millions)	SECTION D - COMMISSION AND BROKERAGE RATIOS					SECTION E - TOTAL EXPENSE RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
		Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
4	1/4-1/2	11.2%	7.1%	17.0%	-37%	+52%	22.7%	19.2%	28.5%	-15%	+26%
4	1/2-1	12.8	1.8	21.8	-86	+70	19.7	6.2	30.1	-69	+53
7	1-2	12.2	7.1	17.2	-42	+41	18.1	12.4	21.7	-31	+20
2	2-4	6.0	5.2	6.7	-13	+12	11.2	9.6	12.7	-14	+13
1	4-8	8.8	-	-	-	-	17.3	-	-	-	-
4	8-16	6.6	-	15.9	-100	+141	10.5	0.5	19.4	-95	+85
3	16-32	12.6	7.3	17.0	-42	+35	22.4	17.9	24.8	-20	+11
1	64-128	7.9	-	-	-	-	16.0	-	-	-	-
1	256-512	1.5	-	-	-	-	5.6	-	-	-	-
	Total	4.5%					10.0%				

*Lowest and highest cos.in the ¼-½, 1-2, and 16-32 range have not been included in determination of averages.
Total average is average of all cos.included in exhibit.

NOTE: Expenses are expressed as ratios to adjusted direct premiums earned except commissions and other acquisition expenses which are expressed as ratios to written.

CALENDAR YEAR 1961 WORKMEN'S COMPENSATION
EXPENSE RATIOS

EXHIBIT 8

		SECTION A - GENERAL EXPENSE RATIOS					SECTION B - OTHER ACQUISITION RATIOS					SECTION C - GENERAL EXPENSE AND OTHER ACQUISITION RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
No. Cos.	Premium Range (In Millions)	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
5	1/4-1/2	10.1%	3.6%	13.4%	-64%	+33%	3.8%	0.8%	6.7%	-79%	+76%	13.9%	8.1%	17.2%	-42%	+24%
4	1/2-1	3.9	0.8	6.3	-79	+62	3.3	-	9.7	-100	+194	8.2	0.8	13.5	-90	+65
10	1-2	10.1	6.3	12.9	-38	+28	3.2	1.5	4.7	-53	+47	13.4	8.8	17.6	-34	+31
10	2-4	8.4	4.4	10.6	-48	+26	4.6	2.2	6.8	-52	+48	13.0	6.7	15.6	-48	+20
6	4-8	9.8	7.4	12.3	-24	+26	3.8	2.8	5.0	-26	+32	13.4	10.5	16.2	-22	+21
10	8-16	8.6	6.4	12.1	-26	+41	3.1	1.8	4.9	-42	+58	11.8	9.4	17.0	-20	+44
8	16-32	8.1	7.0	10.5	-14	+30	2.9	1.5	3.9	-48	+34	11.1	8.5	14.4	-23	+30
3	32-64	8.4	7.6	9.0	-10	+7	3.2	2.0	4.9	-37	+53	11.6	9.6	13.9	-17	+20
2	64-128	7.3	6.9	7.6	-5	+4	2.7	2.0	3.3	-26	+22	9.9	9.6	10.2	-3	+3
	Total	8.2%					3.1%					11.2%				

		SECTION D - COMMISSION AND BROKERAGE RATIOS					SECTION E - TOTAL EXPENSE RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
No. Cos.	Premium Range (In Millions)	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
5	1/4-1/2	14.2%	12.1%	15.1%	-15%	+ 6%	28.8%	23.2%	32.1%	-19%	+11%
4	1/2-1	17.9	15.5	21.8	-13	+22	27.3	21.8	31.8	-20	+16
10	1-2	13.3	7.6	18.3	-43	+38	27.9	20.5	32.7	-27	+17
10	2-4	14.5	9.3	19.8	-36	+37	28.1	23.0	32.1	-18	+14
6	4-8	13.6	10.4	16.0	-24	+18	24.7	20.9	31.2	-15	+26
10	8-16	12.7	3.7	14.4	-71	+13	24.5	13.2	30.0	-46	+22
8	16-32	10.7	8.7	11.8	-19	+10	22.3	19.5	25.5	-13	+14
3	32-64	12.5	11.6	13.3	-7	+6	24.1	22.9	26.5	-5	+10
2	64-128	9.9	8.8	11.0	-11	+11	19.8	19.0	20.6	-4	+4
	Total	11.6%					22.9%				

*Lowest and highest cos.in all groups except the last two have not been included in determination of averages. Total average is average of all cos.included in exhibit.

NOTE: Expenses are expressed as ratios to adjusted direct premiums earned except commissions and other acquisition expenses which are expressed as ratios to written.

EXHIBIT 9

CALENDAR YEAR 1961 BODILY INJURY LIABILITY OTHER THAN AUTO
EXPENSE RATIOS

		SECTION A - GENERAL EXPENSE RATIOS					SECTION B - OTHER ACQUISITION RATIOS					SECTION C - GENERAL EXPENSE AND OTHER ACQUISITION RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
No. Cos.	Premium Range (In Millions)	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
15	1/4-1/2	8.8%	3.1%	13.2%	-65%	+50%	3.8%	-	7.8%	-100%	+105%	13.0%	3.1%	19.5%	-76%	+50%
10	1/2-1	7.4	0.9	14.2	-88	+92	4.5	0.6	8.5	-87	+89	12.7	1.5	21.5	-88	+69
11	1-2	9.1	4.8	11.8	-47	+30	4.9	2.5	7.8	-49	+59	14.4	10.0	19.5	-31	+35
11	2-4	9.5	6.2	11.7	-35	+23	5.5	2.8	7.6	-49	+38	14.5	11.7	18.8	-19	+30
10	4-8	10.9	8.0	12.8	-27	+17	4.4	2.8	5.9	-36	+34	15.6	11.9	17.5	-24	+12
8	8-16	10.9	7.8	13.5	-28	+24	5.0	2.9	7.5	-42	+50	16.1	13.1	19.0	-19	+18
3	16-32	9.7	7.7	11.2	-21	+15	4.2	4.0	4.6	-5	+10	14.2	12.0	16.5	-15	+16
3	32-64	10.8	10.5	11.3	-3	+9	5.1	3.8	6.0	-25	+18	15.8	15.1	16.4	-4	+4
	Total	10.4%					4.8%					15.3%				

		SECTION D - COMMISSION AND BROKERAGE RATIOS					SECTION E - TOTAL EXPENSE RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
No. Cos.	Premium Range (In Millions)	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
15	1/4-1/2	20.3%	7.6%	33.2%	-63%	+64%	33.6%	19.9%	42.4%	-41%	+26%
10	1/2-1	20.1	14.2	27.6	-29	+37	32.3	14.6	48.3	-55	+50
11	1-2	23.9	19.5	26.9	-18	+13	38.1	29.5	43.7	-23	+15
11	2-4	23.2	15.7	26.1	-32	+13	37.9	28.8	43.9	-24	+16
10	4-8	21.3	15.7	24.2	-26	+14	36.0	29.5	41.9	-18	+16
8	8-16	21.7	19.8	23.3	-9	+7	37.7	33.4	41.0	-11	+9
3	16-32	20.5	18.9	22.2	-8	+8	35.5	34.2	36.7	-4	+3
3	32-64	18.5	16.1	19.9	-13	+8	34.1	32.5	35.2	-5	+3
	Total	20.5%					35.8%				

*Lowest and highest companies in all of the groups listed have not been included in determination of averages.
Total average is average of all cos.included in exhibit.

NOTE: Expenses are expressed as ratios to adjusted direct premiums earned except commissions and other acquisition expenses which are expressed as ratios to written.

EXHIBIT 10

CALENDAR YEAR 1961 PROPERTY DAMAGE LIABILITY OTHER THAN AUTO
EXPENSE RATIOS

No. Cos.	Premium Range (In Millions)	SECTION A - GENERAL EXPENSE RATIOS					SECTION B - OTHER ACQUISITION RATIOS					SECTION C - GENERAL EXPENSE AND OTHER ACQUISITION RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
		Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
8	1/8-1/4	7.4%	2.1%	11.7%	-72%	+58%	3.2%	0.9%	7.3%	-72%	+128%	10.7%	3.3%	15.7%	-69%	+47%
9	1/4-1/2	10.6	5.7	18.2	-46	+72	5.1	2.0	8.2	-61	+61	15.6	9.4	26.4	-40	+69
10	1/2-1	10.3	6.9	15.0	-33	+46	6.5	4.5	10.3	-31	+58	16.6	13.4	22.8	-19	+37
11	1-2	11.7	7.9	16.2	-32	+38	4.8	2.8	6.9	-42	+44	16.8	11.4	23.6	-32	+40
6	2-4	11.1	8.6	14.3	-23	+29	5.6	2.8	7.0	-50	+25	16.9	12.9	19.7	-24	+17
3	4-8	12.1	7.5	16.3	-38	+35	4.2	2.4	6.0	-43	+43	16.3	9.9	22.3	-39	+37
4	8-16	11.8	8.9	16.3	-25	+38	6.1	5.5	6.7	-10	+10	17.5	15.2	23.5	-13	+34
	Total	11.5%					5.5%					16.9%				

No. Cos.	Premium Range (In Millions)	SECTION D - COMMISSION AND BROKERAGE RATIOS					SECTION E - TOTAL EXPENSE RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
		Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
8	1/8-1/4	21.8%	15.7%	27.7%	-28%	+27%	32.5%	15.9%	44.1%	-51%	+36%
9	1/4-1/2	23.6	20.1	26.9	-15	+14	39.3	35.5	50.6	-10	+29
10	1/2-1	18.8	0.1	26.0	-99	+38	35.8	14.1	45.6	-61	+27
11	1-2	22.9	21.4	24.7	-7	+8	39.8	33.5	45.8	-16	+15
6	2-4	21.8	20.1	24.1	-8	+11	38.1	32.8	42.6	-14	+12
3	4-8	20.3	16.8	22.9	-17	+13	36.6	26.7	43.5	-27	+19
4	8-16	19.4	16.9	20.5	-13	+6	36.5	32.1	43.4	-12	+19
	Total	20.6%					37.2%				

*Lowest and highest cos. in all groups except 4 - 8 range have not been included in determination of averages. Total average is average of all cos. included in exhibit.

NOTE: Expenses are expressed as ratios to adjusted direct premiums earned except commissions and other acquisition expenses which are expressed as ratios to written.

CALENDAR YEAR 1961 AUTO BODILY INJURY LIABILITY
EXPENSE RATIOS

No. Cos.	Premium Range (In Millions)	Section A - General Expense Ratios: Avg.*	Section A: Extreme Expense Ratios: Lowest	Section A: Extreme Expense Ratios: Highest	Section A: Extreme Ratios To Mean: Lowest	Section A: Extreme Ratios To Mean: Highest	Section B - Other Acquisition Ratios: Avg.*	Section B: Extreme Expense Ratios: Lowest	Section B: Extreme Expense Ratios: Highest	Section B: Extreme Ratios To Mean: Lowest	Section B: Extreme Ratios To Mean: Highest	Section C - General Expense and Other Acquisition Ratios: Avg.*	Section C: Extreme Expense Ratios: Lowest	Section C: Extreme Expense Ratios: Highest	Section C: Extreme Ratios To Mean: Lowest	Section C: Extreme Ratios To Mean: Highest
8	1-2	5.9%	1.2%	9.6%	-80%	+63%	4.3%	- %	7.8%	-100%	+81%	10.2%	1.2%	16.6%	-88%	+63%
16	2-4	6.6	3.6	9.8	-45	+48	5.6	3.5	9.0	-37	+61	12.4	7.9	17.4	-37	+40
9	4-8	5.9	3.0	10.0	-49	+69	4.2	2.9	5.8	-31	+38	10.1	6.3	15.8	-38	+56
13	8-16	7.0	5.4	8.3	-23	+19	4.8	2.4	7.1	-50	+48	11.7	8.4	13.9	-28	+19
10	16-32	6.3	5.0	8.3	-21	+32	4.2	3.2	5.2	-24	+24	10.5	8.4	13.2	-20	+26
7	32-64	5.8	4.8	7.1	-17	+22	4.7	2.9	7.6	-38	+62	10.9	7.9	13.9	-28	+28
4	64-128	6.1	5.1	6.6	-16	+8	4.5	2.9	5.7	-36	+27	10.6	9.5	12.2	-10	+15
1	128-256	5.5	-	-	-	-	10.2	-	-	-	-	15.7	-	-	-	-
	Total	6.1%					5.3%					11.5%				

No. Cos.	Premium Range (In Millions)	Section D - Commission and Brokerage Ratios: Avg.*	Section D: Extreme Expense Ratios: Lowest	Section D: Extreme Expense Ratios: Highest	Section D: Extreme Ratios To Mean: Lowest	Section D: Extreme Ratios To Mean: Highest	Section E - Total Expense Ratios: Avg.*	Section E: Extreme Expense Ratios: Lowest	Section E: Extreme Expense Ratios: Highest	Section E: Extreme Ratios To Mean: Lowest	Section E: Extreme Ratios To Mean: Highest
8	1-2	19.5%	18.1%	22.0%	-7%	+13%	30.3%	22.6%	36.5%	-25%	+20%
16	2-4	17.5	0.4	23.1	-98	+32	30.2	14.2	39.5	-53	+31
9	4-8	19.3	14.4	21.3	-25	+10	29.1	20.7	35.9	-29	+23
13	8-16	19.6	17.5	22.0	-11	+12	31.5	27.6	35.6	-12	+13
10	16-32	18.2	15.8	19.3	-13	+6	28.5	25.1	32.0	-12	+12
7	32-64	15.9	12.6	18.5	-21	+16	26.1	23.2	29.0	-11	+11
4	64-128	16.3	15.0	16.8	-8	+3	26.9	25.3	28.9	-6	+7
1	128-256	8.5	-	-	-	-	24.2	-	-	-	-
	Total	16.0%					27.3%				

*Lowest and highest cos. in all groups except the last two have not been included in determination of averages. Total average is average of all cos. included in exhibit.

NOTE: Expenses are expressed as ratios to adjusted direct premiums earned except commissions and other acquisition expenses which are expressed as ratios to written.

EXHIBIT 12

CALENDAR YEAR 1961 AUTO PROPERTY DAMAGE LIABILITY
EXPENSE RATIOS

		SECTION A - GENERAL EXPENSE RATIOS					SECTION B - OTHER ACQUISITION RATIOS					SECTION C - GENERAL EXPENSE AND OTHER ACQUISITION RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
No. Cos.	Premium Range (In Millions)	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
8	1/2-1	6.2%	3.0%	8.3%	-52%	+34%	4.8%	2.2%	8.0%	-54%	+67%	11.2%	8.5%	15.1%	-24%	+35%
14	1-2	6.9	4.3	8.9	-38	+29	5.3	2.4	8.7	-55	+64	12.7	8.8	16.2	-31	+28
12	2-4	7.5	3.4	11.9	-55	+59	5.7	3.8	7.8	-33	+37	13.3	7.9	19.9	-41	+50
12	4-8	7.0	5.1	8.6	-27	+23	4.8	2.4	6.5	-50	+35	11.8	8.5	13.8	-28	+17
11	8-16	6.4	4.2	8.6	-34	+34	4.6	2.2	6.0	-52	+30	11.2	7.4	14.0	-34	+25
2	16-32	7.5	6.0	8.9	-20	+19	4.4	4.1	4.6	-7	+5	11.8	10.6	13.0	-10	+10
4	32-64	6.8	6.0	7.4	-12	+9	5.0	3.3	6.4	-34	+28	11.9	10.7	12.8	-10	+8
1	64-128	5.5	-	-	-	-	10.2	-	-	-	-	15.7	-	-	-	-
	Total	6.6%					5.7%					12.4%				

		SECTION D - COMMISSION AND BROKERAGE RATIOS					SECTION E - TOTAL EXPENSE RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
No. Cos.	Premium Range (In Millions)	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
8	1/2-1	22.2%	18.8%	26.8%	-15%	+21%	33.8%	23.3%	37.1%	-31%	+10%
14	1-2	19.7	17.0	21.6	-14	+10	32.1	27.4	37.8	-15	+18
12	2-4	19.1	0.6	22.4	-97	+17	32.2	11.4	40.7	-65	+26
12	4-8	19.7	16.6	21.5	-16	+9	31.4	27.5	35.4	-12	+13
11	8-16	17.9	14.4	19.9	-20	+11	28.7	23.4	32.5	-18	+13
2	16-32	18.6	16.7	20.4	-10	+10	30.4	29.7	31.0	-2	+2
4	32-64	16.7	15.4	17.5	-8	+5	28.6	27.8	30.3	-3	+6
1	64-128	8.5	-	-	-	-	24.2	-	-	-	-
	Total	16.5%					28.8%				

*Lowest and highest cos. in all groups except last three have not been included in determination of averages.
Total average is average of all cos. included in exhibit.

NOTE: Expenses are expressed as ratios to adjusted direct premiums earned except commissions and other acquisition expenses which are expressed as ratios to written.

CALENDAR YEAR 1961 AUTO PHYSICAL DAMAGE
EXPENSE RATIOS
COLLISION

		SECTION A - GENERAL EXPENSE RATIOS					SECTION B - OTHER ACQUISITION RATIOS					SECTION C - GENERAL EXPENSE AND OTHER ACQUISITION RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
No. Cos.	Premium Range (In Millions)	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
14	1/2-1	7.0%	2.4%	14.9%	-66%	+113%	6.5%	2.1%	12.6%	-68%	+94%	14.3%	7.9%	35.2%	-45%	+146%
11	1-2	7.8	5.1	17.1	-35	+119	6.4	3.0	10.0	-53	+56	13.9	9.5	27.1	-32	+95
19	2-4	6.5	3.4	8.7	-48	+34	4.6	0.4	7.9	-91	+72	10.9	7.4	13.9	-32	+28
16	4-8	6.5	2.3	8.7	-65	+34	4.7	3.5	6.6	-26	+40	11.3	6.6	14.1	-42	+25
10	8-16	5.3	3.6	7.0	-32	+32	4.8	3.3	5.8	-31	+21	10.2	5.6	13.8	-45	+35
4	16-32	5.6	4.5	6.9	-20	+23	3.9	2.9	6.3	-26	+62	9.6	7.7	12.2	-20	+27
2	32-64	6.5	5.1	7.8	-22	+20	5.9	5.4	6.4	-8	+8	12.4	11.5	13.2	-7	+6
2	64-128	3.9	2.2	5.5	-44	+41	9.3	8.3	10.2	-11	+10	13.1	10.5	15.7	-20	+20
	Total	5.5%					6.1%					11.6%				

		SECTION D - COMMISSION AND BROKERAGE RATIOS					SECTION E - TOTAL EXPENSE RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
No. Cos.	Premium Range (In Millions)	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
14	1/2-1	21.3%	0.1%	32.7%	-100%	+54%	36.2%	16.3%	61.0%	-55%	+69%
11	1-2	23.7	16.3	27.9	-31	+18	38.4	35.6	43.4	-7	+13
19	2-4	22.3	12.7	25.6	-43	+15	33.3	19.7	42.4	-41	+27
16	4-8	23.2	19.8	34.7	-15	+50	34.7	31.0	38.0	-11	+10
10	8-16	17.2	3.5	22.5	-80	+31	27.1	10.9	34.4	-60	+27
4	16-32	17.2	4.3	22.9	-75	+33	26.7	12.8	32.6	-52	+22
2	32-64	20.6	20.5	20.6	-	-	32.9	32.0	33.8	-3	+3
2	64-128	12.5	8.5	16.4	-32	+31	25.6	24.2	26.9	-5	+5
	Total	17.8%					29.4%				

*Lowest and highest cos.in all groups except last three have not been included in determination of averages. Total average is average of all cos.included in exhibit.

NOTE: Expenses are expressed as ratios to adjusted direct premiums earned except commissions and other acquisition expenses which are expressed as ratios to written.

CALENDAR YEAR 1961 AUTO PHYSICAL DAMAGE
EXPENSE RATIOS
FIRE, THEFT AND COMPREHENSIVE

EXHIBIT 14

		SECTION A - GENERAL EXPENSE RATIOS					SECTION B - OTHER ACQUISITION RATIOS					SECTION C - GENERAL EXPENSE AND OTHER ACQUISITION RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
No. Cos.	Premium Range (In Millions)	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
6	1/4-1/2	6.9%	4.8%	9.3%	-30%	+35%	4.9%	3.8%	6.1%	-22%	+24%	12.4%	9.4%	14.5%	-24%	+17%
11	1/2-1	9.9	5.8	19.4	-41	+96	7.5	3.0	13.6	-60	+81	17.1	11.0	33.2	-36	+94
18	1-2	6.9	3.4	10.7	-51	+55	4.8	2.1	7.9	-56	+65	11.3	7.0	16.8	-38	+49
18	2-4	7.2	2.3	11.1	-68	+54	4.9	3.3	7.1	-33	+45	11.9	6.6	15.2	-45	+28
13	4-8	6.9	3.0	10.1	-57	+46	5.4	3.3	8.6	-39	+59	12.2	7.7	17.8	-37	+46
3	8-16	6.0	4.6	8.0	-23	+33	5.5	3.2	7.5	-42	+36	11.6	7.8	13.9	-33	+20
4	16-32	7.0	6.2	8.1	-11	+16	5.2	2.9	6.2	-44	+19	12.1	9.8	13.7	-19	+13
2	32-64	4.0	2.4	5.5	-40	+38	9.3	8.3	10.2	-11	+10	13.2	10.7	15.7	-19	+19
	Total	6.2%					6.2%					12.4%				

		SECTION D - COMMISSION AND BROKERAGE RATIOS					SECTION E - TOTAL EXPENSE RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
No. Cos.	Premium Range (In Millions)	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
6	1/4-1/2	27.3%	22.9%	31.7%	-16%	+16%	39.8%	37.4%	44.9%	-6%	+13%
11	1/2-1	22.8	15.0	27.9	-34	+22	39.4	30.7	48.2	-22	+22
18	1-2	22.8	12.7	26.7	-44	+17	34.5	19.7	42.8	-43	+24
18	2-4	23.7	21.0	34.7	-11	+46	36.1	31.3	45.7	-13	+27
13	4-8	17.7	4.3	23.6	-76	+33	30.0	12.3	40.1	-59	+34
3	8-16	19.9	16.3	22.9	-18	+15	31.4	29.3	34.3	-7	+9
4	16-32	20.7	20.3	21.1	-2	+2	32.8	30.9	34.0	-6	+4
2	32-64	12.8	8.5	17.1	-34	+34	26.0	24.2	27.8	-7	+7
	Total	18.8%					31.2%				

*Lowest and highest cos.in all groups except last three have not been included in determination of averages.
Total average is average of all cos.included in exhibit.

NOTE: Expenses are expressed as ratios to adjusted direct premiums earned except commissions and other acquisition expenses which are expressed as ratios to written.

CALENDAR YEAR 1961 FIDELITY
EXPENSE RATIOS

No. Cos.	Premium Range (In Millions)	Section A – General Expense Ratios: Avg.*	Section A: Extreme Expense Ratios – Lowest	Section A: Extreme Expense Ratios – Highest	Section A: Extreme Ratios To Mean – Lowest	Section A: Extreme Ratios To Mean – Highest	Section B – Other Acquisition Ratios: Avg.*	Section B: Extreme Expense Ratios – Lowest	Section B: Extreme Expense Ratios – Highest	Section B: Extreme Ratios To Mean – Lowest	Section B: Extreme Ratios To Mean – Highest	Section C – General Expense and Other Acquisition Ratios: Avg.*	Section C: Extreme Expense Ratios – Lowest	Section C: Extreme Expense Ratios – Highest	Section C: Extreme Ratios To Mean – Lowest	Section C: Extreme Ratios To Mean – Highest
9	1/8-1/4	11.1%	5.3%	14.8%	-52%	+33%	7.5%	2.1%	17.8%	-72%	+137%	18.6%	11.4%	30.7%	-39%	+65%
2	1/4-1/2	12.4	11.6	13.2	-6	+6	8.5	6.1	10.8	-28	+27	20.9	19.3	22.4	-8	+7
9	1/2-1	12.1	5.2	15.9	-57	+31	7.7	5.5	10.1	-29	+31	19.3	11.2	25.8	-42	+34
7	1-2	12.0	5.9	19.2	-51	+60	7.0	5.3	12.0	-24	+71	19.9	11.6	28.2	-42	+42
3	2-4	10.5	5.4	15.0	-49	+43	8.5	5.4	11.1	-36	+31	19.0	10.8	26.1	-43	+37
7	4-8	11.3	7.7	13.7	-32	+21	7.7	6.1	11.2	-21	+45	19.8	14.9	22.6	-25	+14
1	8-16	16.2	-	-	-	-	10.0	-	-	-	-	26.2	-	-	-	-
	Total	12.1%					8.0%					20.6%				

No. Cos.	Premium Range (In Millions)	Section D – Commission and Brokerage Ratios: Avg.*	Section D: Extreme Expense Ratios – Lowest	Section D: Extreme Expense Ratios – Highest	Section D: Extreme Ratios To Mean – Lowest	Section D: Extreme Ratios To Mean – Highest	Section E – Total Expense Ratios: Avg.*	Section E: Extreme Expense Ratios – Lowest	Section E: Extreme Expense Ratios – Highest	Section E: Extreme Ratios To Mean – Lowest	Section E: Extreme Ratios To Mean – Highest
9	1/8-1/4	23.6%	19.0%	27.3%	-19%	+16%	42.2%	27.8%	51.2%	-34%	+21%
2	1/4-1/2	17.9	17.2	18.5	-4	+3	38.7	37.8	39.6	-2	+2
9	1/2-1	22.0	18.8	24.4	-15	+11	40.7	32.9	50.5	-19	+24
7	1-2	21.2	19.0	22.6	-10	+ 7	41.4	33.4	50.8	-19	+23
3	2-4	19.5	18.1	20.8	-7	+7	38.5	28.9	45.6	-25	+18
7	4-8	18.1	16.5	20.5	-9	+13	38.0	35.9	39.5	-6	+4
1	8-16	19.1	-	-	-	-	45.3	-	-	-	-
	Total	19.2%					39.9%				

*Lowest and highest cos. in all groups except in ¼-½, 2-4 and 8-16 range have not been included in computing averages. Total average is average of all cos. included in exhibit.

NOTE: Expenses are expressed as ratios to adjusted direct premiums earned except commissions and other acquisition expenses which are expressed as ratios to written.

CALENDAR YEAR 1961 SURETY
EXPENSE RATIO

No. Cos.	Premium Range (In Millions)	SECTION A - GENERAL EXPENSE RATIOS					SECTION B - OTHER ACQUISITION RATIOS					SECTION C - GENERAL EXPENSE AND OTHER ACQUISITION RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
		Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
5	1/8-1/4	13.6%	7.7%	18.0%	-43%	+32%	9.3%	6.3%	13.4%	-32%	+44%	22.9%	18.7%	27.6%	-18%	+21%
8	1/4-1/2	9.3	2.2	14.2	-76	+53	4.7	0.7	8.3	-85	+77	14.3	3.9	18.9	-73	+32
4	1/2-1	11.6	7.9	15.2	-32	+31	7.9	6.2	10.8	-22	+37	19.6	16.6	21.3	-15	+9
8	1-2	16.0	12.6	19.4	-21	+21	8.2	5.6	14.3	-32	+74	24.9	18.3	32.7	-27	+31
3	2-4	16.2	14.9	17.2	-8	+6	7.2	6.3	8.7	-12	+21	24.2	21.2	26.1	-12	+8
5	4-8	13.3	10.3	17.8	-23	+34	7.2	5.7	7.8	-21	+ 8	20.9	16.8	25.6	-20	+22
7	8-16	11.6	6.2	17.1	-47	+47	7.8	5.5	9.7	-29	+24	19.8	13.8	26.3	-30	+33
1	16-32	11.1	-	-	-	-	7.0	-	-	-	-	18.1	-	-	-	-
	Total	12.4%					7.5%					20.3%				

No. Cos.	Premium Range (In Millions)	SECTION D - COMMISSION AND BROKERAGE RATIOS					SECTION E - TOTAL EXPENSE RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
		Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
5	1/8-1/4	27.1%	19.2%	29.8%	-29%	+10%	50.0%	37.9%	57.0%	-24%	+14%
8	1/4-1/2	30.5	26.9	34.5	-12	+13	45.9	38.5	55.5	-16	+21
4	1/2-1	29.1	27.1	30.6	-7	+5	51.6	47.2	57.8	-9	+12
8	1-2	28.8	27.4	30.1	-5	+5	53.0	45.7	60.7	-14	+15
3	2-4	29.3	28.1	30.0	-4	+2	53.3	51.2	55.8	-4	+5
5	4-8	27.8	22.5	31.9	-19	+15	48.9	47.9	50.1	-2	+2
7	8-16	27.1	26.1	28.6	-4	+6	46.9	42.8	52.1	-9	+11
1	16-32	31.7	-	-	-	-	49.8	-	-	-	-
	Total	28.2%					48.6%				

*Lowest and highest cos.in all groups except the last one have not been included in determination of averages. Total average is average of all cos.included in exhibit.

NOTE: Expenses are expressed as ratios to adjusted direct premiums earned except commissions and other acquisition expenses which are expressed as ratios to written.

CALENDAR YEAR 1961 GLASS
EXPENSE RATIOS

		SECTION A - GENERAL EXPENSE RATIOS					SECTION B - OTHER ACQUISITION RATIOS					SECTION C - GENERAL EXPENSE AND OTHER ACQUISITION RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
No. Cos.	Premium Range (In Millions)	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
11	1/8-1/4	9.8%	5.0%	16.3%	-49%	+66%	6.8%	2.9%	14.9%	-57%	+119%	17.5%	8.6%	38.8%	-51%	+122%
5	1/4-1/2	13.1	10.5	15.3	-20	+17	7.6	5.6	9.3	-26	+ 22	21.6	17.0	24.3	-21	+13
13	1/2-1	10.0	3.6	14.0	-64	+40	7.2	4.2	14.8	-42	+106	16.8	12.5	22.8	-26	+36
5	1-2	10.8	8.0	13.2	-26	+22	7.9	6.2	10.0	-22	+27	19.8	17.5	21.9	-12	+11
2	2-4	15.0	12.5	17.4	-17	+16	9.3	8.0	10.6	-14	+14	24.3	20.5	28.0	-16	+15
	Total	11.5%					7.9%					19.7%				

		SECTION D - COMMISSION AND BROKERAGE RATIOS					SECTION E - TOTAL EXPENSE RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
No. Cos.	Premium Range (In Millions)	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
11	1/8-1/4	29.4%	27.6%	32.6%	-6%	+11%	47.3%	36.5%	71.4%	-23%	+51%
5	1/4-1/2	28.6	28.0	29.0	-2	+1	50.2	46.4	52.8	-8	+5
13	1/2-1	28.5	26.9	29.9	-6	+5	45.3	41.1	50.6	-9	+12
5	1-2	26.2	25.4	27.4	-3	+5	46.2	42.9	49.0	-7	+6
2	2-4	26.1	25.1	27.1	-4	+4	50.4	45.6	55.1	-10	+9
	Total	27.4%					47.2%				

*Lowest and highest cos.in all groups except the last one have not been included in determination of averages.
Total average is average of all cos.included in exhibit.

NOTE: Expenses are expressed as ratios to adjusted direct premiums earned except commissions and other acquisition expenses which are expressed as ratios to written.

CALENDAR YEAR 1961 BURGLARY AND THEFT
EXPENSE RATIOS

EXHIBIT 18

No. Cos.	Premium Range (In Millions)	SECTION A - GENERAL EXPENSE RATIOS					SECTION B - OTHER ACQUISITION RATIOS					SECTION C - GENERAL EXPENSE AND OTHER ACQUISITION RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
		Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
7	1/8-1/4	8.5%	5.4%	10.0%	-36%	+18%	6.1%	3.6%	9.4%	-41%	+54%	14.5%	11.4%	19.4%	-21%	+34%
13	1/4-1/2	9.6	5.7	13.6	-41	+42	7.0	3.3	14.1	-53	+101	16.2	10.6	35.1	-35	+117
5	1/2-1	10.9	9.3	13.2	-15	+21	6.7	4.5	9.1	-33	+36	17.9	14.2	22.9	-21	+28
12	1-2	11.9	7.0	14.6	-41	+23	6.2	4.2	7.8	-32	+26	18.3	12.7	21.4	-31	+17
4	2-4	12.3	8.9	15.4	-28	+25	6.2	5.6	7.3	-10	+18	18.3	14.9	21.0	-19	+15
5	4-8	11.5	10.1	13.8	-12	+20	9.2	7.2	13.3	-22	+45	21.3	18.3	24.4	-14	+15
	Total	11.5%					7.6%					19.3%				

No. Cos.	Premium Range (In Millions)	SECTION D - COMMISSION AND BROKERAGE RATIOS					SECTION E - TOTAL EXPENSE RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
		Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
7	1/8-1/4	28.4%	26.4%	30.8%	-7%	+8%	43.4%	40.8%	46.7%	-6%	+8%
13	1/4-1/2	26.4	15.0	29.9	-43	+13	42.4	28.3	63.1	-33	+49
5	1/2-1	28.5	27.5	29.1	-4	+2	45.5	41.7	48.8	-8	+7
12	1-2	27.5	26.2	28.5	-5	+4	45.8	40.1	48.9	-12	+7
4	2-4	26.7	26.4	27.4	-1	+3	44.7	42.5	46.4	-5	+4
5	4-8	25.4	23.3	27.0	-8	+6	46.3	45.1	48.4	-3	+5
	Total	26.5%					45.5%				

*Lowest and highest companies in all of the groups listed have not been included in determination of averages.
Total average is average of all cos.included in exhibit.

NOTE: Expenses are expressed as ratios to adjusted direct premiums earned except commissions and other acquisition expenses which are expressed as ratios to written.

EXHIBIT 19

CALENDAR YEAR 1961 BOILER AND MACHINERY
EXPENSE RATIOS

		SECTION A - GENERAL EXPENSE RATIOS					SECTION B - OTHER ACQUISITION RATIOS					SECTION C - GENERAL EXPENSE AND OTHER ACQUISITION RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
No. Cos.	Premium Range (In Millions)	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
1	1/8-1/4	57.7%	-	-	-	-	3.4%	-	-	-	-	61.1%	-	-	-	-
4	1/4-1/2	43.6	11.1%	86.5%	-75%	+98%	4.6	1.2%	8.6%	-74%	+87%	48.2	19.7%	89.9%	-59%	+87%
1	1/2-1	37.3	-	-	-	-	2.7	-	-	-	-	40.0	-	-	-	-
1	1-2	41.7	-	-	-	-	3.9	-	-	-	-	45.6	-	-	-	-
3	2-4	41.7	33.1	46.1	-21	+11	4.6	3.3	6.7	-28	+46	45.5	37.0	50.2	-19	+10
2	4-8	41.3	39.9	42.6	-3	+3	5.5	3.8	7.1	-31	+29	46.7	43.7	49.7	-6	+6
1	8-16	31.0	-	-	-	-	7.4	-	-	-	-	38.4	-	-	-	-
1	16-32	32.3	-	-	-	-	8.6	-	-	-	-	40.9	-	-	-	-
	Total	35.9%					6.9					42.6%				

		SECTION D - COMMISSION AND BROKERAGE RATIOS					SECTION E - TOTAL EXPENSE RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
No. Cos.	Premium Range (In Millions)	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
1	1/8-1/4	21.2%	-	-	-	-	82.3%	-	-	-	-
4	1/4-1/2	19.2	10.8%	24.5%	-44%	+28%	67.3	42.3%	100.7%	-37%	+50%
1	1/2-1	19.3	-	-	-	-	59.3	-	-	-	-
1	1-2	15.2	-	-	-	-	60.8	-	-	-	-
3	2-4	20.0	19.9	20.1	-	+1	65.6	57.2	70.1	-13	+7
2	4-8	21.8	20.5	23.0	-6	+6	68.5	66.7	70.2	-3	+2
1	8-16	15.6	-	-	-	-	54.0	-	-	-	-
1	16-32	16.0	-	-	-	-	56.9	-	-	-	-
	Total	17.8%					60.4%				

*Lowest and highest cos.in the two to four premium range have not been included in determination of averages. Total average is average of all cos.included in exhibit.

NOTE: Expenses are expressed as ratios to adjusted direct premiums earned except commissions and other acquisition expenses which are expressed as ratios to written.

CALENDAR YEAR 1961 EXPENSE RATIOS
ALL LINES OF BUSINESS

EXHIBIT 20

		SECTION A - GENERAL EXPENSE RATIOS					SECTION B - OTHER ACQUISITION RATIOS					SECTION C - GENERAL EXPENSE AND OTHER ACQUISITION RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
No. Cos.	Premium Range (In Millions)	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
19	5-10	6.4%	0.6%	12.1%	-91%	+89%	3.8%	0.1%	9.6%	-97%	+153%	10.5%	0.7%	18.1%	-93%	+72%
14	10-20	5.9	3.2	8.7	-46	+47	4.2	0.6	10.1	-86	+140	10.4	6.2	16.7	-40	+61
22	20-40	6.8	2.1	18.8	-69	+176	4.8	2.1	8.6	-56	+79	11.4	5.1	28.3	-55	+148
18	40-80	7.6	4.6	10.0	-39	+32	5.3	3.0	6.7	-43	+26	12.8	9.4	15.2	-27	+19
11	80-160	8.0	5.9	9.9	-26	+24	4.7	2.8	6.1	-40	+30	12.7	10.3	14.7	-19	+16
7	160-320	8.2	6.2	9.5	-24	+16	5.1	4.4	6.3	-14	+24	13.5	11.6	14.6	-14	+8
6	320-640	7.3	5.0	8.9	-32	+22	5.7	3.6	7.6	-37	+33	13.4	10.1	15.7	-25	+17
	Total	7.6%					5.2%					12.9%				

		SECTION D - COMMISSION & BROKERAGE RATIOS					SECTION E - TOTAL EXPENSE RATIOS					SECTION F - LOSS ADJUSTMENT EXPENSE RATIOS				
			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean			Extreme Expense Ratios		Extreme Ratios To Mean	
No. Cos.	Premium Range (In Millions)	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest	Avg.*	Lowest	Highest	Lowest	Highest
19	5-10	22.4%	13.8%	31.9%	-38%	+42%	32.7%	23.3%	40.0%	-29%	+22%	9.3%	3.8%	13.4%	-59%	+44%
14	10-20	22.2	3.6	29.0	-84	+31	32.7	12.7	39.8	-61	+22	8.6	6.2	11.6	-28	+35
22	20-40	21.9	-	30.9	-100	+41	34.6	10.0	52.6	-71	+52	8.5	5.8	12.4	-32	+46
18	40-80	22.2	13.0	27.5	-41	+24	35.1	25.6	40.1	-27	+14	9.2	6.8	12.7	-26	+38
11	80-160	21.2	16.6	23.2	-22	+9	33.8	29.7	38.0	-12	+12	8.9	7.3	10.1	-18	+13
7	160-320	21.3	19.4	22.3	-9	+5	34.4	33.0	36.9	-4	+7	8.4	7.4	8.7	-12	+4
6	320-640	15.7	8.6	18.8	-45	+20	29.1	24.0	32.7	-18	+12	7.7	4.8	9.5	-38	+23
	Total	19.5%					32.4%					8.4%				

*Lowest and highest companies in all of the groups listed have not been included in determination of averages.
Total average is average of all cos.included in exhibit.

NOTE: Expenses are expressed as ratios to adjusted direct premiums earned except commissions and other acquisition expenses which are expressed as ratios to written.

NEGATIVE BINOMIAL RATIONALE

BY

THOMAS O. CARLSON

"If thou art wise thou knowest thine own ignorance"—Luther

To one who did his statistical teething in what I would term the era of the 'Lexis Theory', the arrival of more searching tools upon the actuarial scene through the notable contributions of Harwayne, Dropkin, Simon, Hewitt, Bailey, Roberts and others of a younger generation, which has been likened by others to an invasion from Mars, is more accurately analogous to the kegling that awoke Rip Van Winkle. When, at our meeting last spring, I felt called upon to defend vigorously this 'New Look' of our Proceedings, a closer survey of these frontiers appeared to be in order.

Because I still have very strongly the childhood instinct to look into the "why" of everything in my experience, my attention has focused principally upon the rationale underlying the utilization of the negative binomial distribution in actuarial analysis. We are all interested in finding tools that work. But we should not be satisfied as actuaries without probing into any unfamiliar mathematical model until we know why it works, because thus only do we learn whether it is the best model for the purpose or whether it can be improved upon, and also what extensions of its utility may be available. The arbitrary use of the Pearson Type III distribution in the derivations of the negative binomial presented to us in detail in this body raises questions in many minds not answered by the excellent, yet to me too brief, paper presented last spring by Mr. Simon ("An Introduction to the Negative Binomial Distribution and its Applications"). I should like therefore to take the time to review that paper and the pioneering introduction to this valuable tool presented by Mr. Dropkin ("Some Considerations on Automobile Rating Systems Utilizing Individual Driving Records," PCAS XLVI, p. 165) so as to extract therefrom and interpret the material relating to rationale; and then I shall present new material not yet considered in our Proceedings which I think casts important light on the investigation.

The most frequent derivation, and the one with which we have here become familiar, stems from the assumption of a variability in the accident-expectancy from individual to individual in a statistical population, with such variability following the Pearson Type III distribution, but with the distribution for each value of the accident expectancy so determined following the Poisson. It is natural to ask: "Why Pearson Type III?" The answer, as given by Dropkin, is threefold:

a) it is a skew distribution,
b) it leads to conveniently "simple" (sic!) equations, and
c) there are tables (of the Incomplete Gamma Function) available for use in the resulting evaluation.

To this rationale must be added a fourth consideration: d) it works better than its predecessor formula, the Poisson distribution.

The skewness of the Pearson Type III formula satisfies our intuitive knowledge of accident proneness in individuals. As respects the simplicity of the resulting equations, this is due in large measure to the fact that the number of parameters is only two, which is not the case in the non-degenerate Pearson forms; thus we might add a fifth reason to our rationale which can be considered a subreason partially explanatory of b) above: e) the total number of parameters is held to two.

But all this still leaves the rationale of the Pearson Type III utilization upon an empirical basis. It leaves our curiosity unsatisfied. Let us turn therefore to other derivations of the final formula, so well summarized in Simon's paper already referred to. He mentions a number of derivations not utilizing the Pearson Type III assumption. The historically original derivation by Yule in 1910 develops, to quote Simon, "the distribution of the number of fatalities that would occur during the n^{th} exposure to a disease in excess of r exposures where r is the minimum number which will be fatal and the effects of repeated attacks of the disease act cumulatively." In terms of accidents this could read: the distribution of the number of accidents occurring during the n^{th} exposure in excess of r exposures where r is the minimum number to produce an accident and the successive exposures to accident act cumulatively; i.e., the probability that r + n exposures to accident are required for the occurrence of n accidents.

Let us examine this derivation briefly. (Wilks: Mathematical Statistics has perhaps the clearest presentation.)

Let P (success) $= \frac{1}{q}$, P (failure) $= \frac{p}{q}$, i.e., $q - p = 1$, since $\frac{1}{q} + \frac{p}{q} = 1$.

The probability of $n - 1$ successes and r failures in $r + n - 1$ trials is

$$\frac{(r+n-1)!}{(n-1)!\,r!} \cdot \left(\frac{1}{q}\right)^{n-1} \cdot \left(\frac{p}{q}\right)^{r}$$

and if we multiply by $\frac{1}{q}$ we have the probability that $r + n$ trials are required for n successes, or

$$\frac{(r+n-1)!}{(n-1)!\,r!} \cdot \left(\frac{1}{q}\right)^{n} \cdot \left(\frac{p}{q}\right)^{r} \tag{1}$$

which is the general term in the expansion of

$$(q-p)^{-n}$$

This form incidentally indicates most clearly why the terminology "negative binomial" is commonly attached to this distribution. If we substitute $P = \frac{1}{a}$ in (1) we have

$$\frac{a^{n}}{r!\,\Gamma(n)} \cdot \frac{\Gamma(r+n)}{(1+a)^{r+n}} \tag{1a}$$

which is the form presented in Dropkin's original paper on the negative binomial (his formula (7)).

It is not unreasonable to conjecture that Yule in 1920, in his collaboration with Greenwood, recognized the Pearson Type III expression upon differentiation of the formula developed by him in 1910, and backtracked thence to the now familiar and most common derivation by assuming a Pearson Type III distribution for the Poisson parameter, and deduced therefrom the interpretation as respects the variation of accident expectation (or accident proneness) among the individuals exposed to accident hazard.

Simon's first model (in the paper already referred to) illustrates the Yule 1910 approach, his second model the 1920 approach of Yule and Greenwood.

The analogy between the Yule 1910 development and the Markov-chain approach of Bartlett, under which the chance of an additional accident depends upon the number which have already ocurred, is apparent, explaining perhaps more clearly, however, the use of the negative binomial (e.g., by Polya and Eggenberger in Zeitschrift f. agen. Math. u. Mech. III, p. 279, 1933) for determining the probability of x cases occurring in an epidemic, the so-called "contagion function" use. It may be noted that the two Kendall derivations referred to but not elaborated by Simon are those of 1) Yule and Greenwood in 1920 and 2) Yule in 1910.

This brings us to a derivation and an interpretation not yet discussed in these Proceedings. Simon has noted that Arthur L. Bailey used the negative binomial in the Proceedings in 1950; Mr. Bailey's source was the "Theory of Probabilities" by Jeffreys which we had both picked up the year before and discussed together, and which is still a most informative reference on the subject. Jeffreys develops a distribution of the number of claims on the basis of certain assumptions connecting the distributions of multiple-claim accidents, and produces a negative binomial distribution for the number of claims starting with a Poisson distribution for each group of n-claim accidents. A more general development along these lines, of which Jeffreys' is only a particular case, is to be found in an article by R. Lüders, in German, in Biometrika ("Die Statistik der Seltenen Ereignisse," Biometrika, Volume 26, p. 180, 1934). Both of these references could well be added to Simon's bibliography presented to us last spring.

The rationale of Lüders' development, which should be of particular interest to actuaries, is predicated upon the assumption that single-claim accidents as a group follow the Poisson distribution, as does the group of two-claim accidents, the group of three-claim accidents, and so on. The development initially assumes that these respective Poisson distributions are independent; but this complex multiple Poisson distribution of the number of claims reduces to the negative binomial distribution when the parameters of the independent distributions are reduced to two by making them interdependent through the assumed relationship

$$a_k = \frac{a_1}{k} \cdot b^{k-1} \tag{2}$$

a_1 and a_k being the parameters of the accident distributions involving respectively a single claim or k claims in an accident. In other words, the negative binomial here provides a distribution of claims corresponding to a Poisson distribution of accidents with the expectations of an accident involving 1, 2, 3, ... claims inter-connected by the modified power-series relation (2).

Since the development involves some interesting by-products on the way I shall indicate it as briefly as practicable.

$$\text{Let } P_{x_m} = \frac{e^{-a_m} \cdot a_m^{x_m}}{x_m!} \qquad (m = 1, 2, 3, \ldots) \tag{3}$$

represent the probability that exactly x_m accidents with m claims associated with each will occur.

Let $r = x_1 + 2x_2 + 3x_3 + \ldots.$

represent the number of claims.

Then the probability of exactly r claims occurring, assuming that the respective simple Poisson distributions (3) are independent is

$$P(r) = e^{-a_1 - a_2 - \ldots\ldots} \cdot \sum_{r = x_1 + 2x_2 + \ldots} \frac{a_1^{x_1} \cdot a_2^{x_2} \ldots.}{x_1!\, x_2! \ldots.} \tag{4}$$

Since this is a general formula that assumes that the occurrence of single-claim accidents is independent of the occurrence of two claim accidents, and so on, there is developed below an evaluation of the first three moments, which will be of use later. The factorial-moment generating function is

$$f(z) = \sum_r z^r\, P(r)$$

$$= e^{-a_1 - a_2 - \ldots} \cdot e^{a_1 z + a_2 z^2 + \ldots\ldots} \tag{5}$$

It is immediately obvious that

$$\sum_r P(r) = f(1) = 1$$

If we set

$$A(z) = \log f(z) = -a_1 - a_2 - \ldots. + a_1 z + a_2 z^2 + \ldots \tag{6}$$

then $f(z) = e^{A(z)}$

and $f'(1) = \sum_r r \cdot P(r) = a_1 + 2a_2 + 3a_3 + \ldots. = \text{mean}$ (7a)

By further differentiation and the use of formulas relating factorial moments with ordinary moments (see, for example, Korn and Korn: Mathematical Handbook, 18.3-10.), we find that

$$\mu_2 = a_1 + 2^2 a_2 + 3^2 a_3 + \ldots\ldots = \text{variance} \tag{7b}$$

$$\mu_3 = a_1 + 2^3 a_2 + 3^3 a_3 + \ldots\ldots = \text{3rd moment about mean} \tag{7c}$$

Now let us reduce the number of parameters to two by use of the relation (2), setting $a = a_1$:

$$A(z) = -a\left(1 + \frac{b}{2} + \frac{b^2}{3} + \ldots\right) + a\left(z + \frac{bz^2}{2} + \frac{b^2z^3}{3} + \ldots\right)$$

$$= -\frac{a}{b}\Big[-\log(1-b)\Big] + \frac{a}{b}\Big[-\log(1-bz)\Big]$$

Therefore $f(z) = (1-b)^{\frac{a}{b}} \cdot (1-bz)^{\frac{-a}{b}}$

But $P(r)$ is the coefficient of z^r in the expansion of

$$f(z) = \sum_r z^r \cdot P(r),$$

or $$P(r) = \frac{f^{(r)}(o)}{r!}$$

Now $$f^{(r)}(z) = (1-b)^{\frac{a}{b}} (-b)^r \left[(-1)^r \cdot \frac{a}{b} \cdot \left(\frac{a}{b}+1\right) \cdots \left(\frac{a}{b}+r-1\right)\right] \cdot (1-bz)^{-\left(\frac{a}{b}+r\right)}$$

so that $$P(r) = (1-b)^{\frac{a}{b}} \cdot \binom{-a/b}{r} \cdot (-b)^r \qquad (8a)$$

which is the exact form obtained by Dropkin in his formula (7) referred to above, if we substitute

$$a = \frac{n}{1+d}, \quad b = \frac{1}{1+d}$$

Dropkin's form being

$$P(r) = \left(\frac{d}{1+d}\right)^n \cdot \binom{-n}{r} \cdot \left(\frac{-1}{1+d}\right)^r \qquad (8b)$$

(8a) is the general term in the expansion of

$$\left(\frac{1}{1-b} - \frac{b}{1-b}\right)^{\frac{-a}{b}} \text{ and}$$

(8b) is the general term in the expansion of

$$\left(\frac{1+d}{d} - \frac{1}{d}\right)^{-n}$$

To make connection with the form (1) shown above, substitute

$$p = \frac{1}{d} \quad q = 1 + p, \text{ so that } \frac{1}{q} = \frac{d}{1+d}, \quad \frac{p}{q} = \frac{1}{1+d}$$

Then $$P(r) = \left(\frac{1}{q}\right)^n \cdot \binom{-n}{r} \cdot \left(\frac{-p}{q}\right)^r$$

$$= \frac{(r+n-1)!}{r!\,(n-1)!} \cdot \left(\frac{1}{q}\right)^n \cdot \left(\frac{p}{q}\right)^r \qquad (8c)$$

which is the general term in the expansion of $(q - p)^{-n}$, being identical with (1).

The moments are most neatly derived from this form by use of the moment-generating function, as demonstrated by Simon ("The Negative Binomial and Poisson Distributions Compared", *PCAS XLVII*, p. 20.)

$$\varphi(\theta) = \sum_r P(r) \cdot e^{\theta r} = (q - pe^{\theta})^{-n}$$

$$\text{whence } E(r) = \frac{\partial \varphi(o)}{\partial \theta} = n\,p \qquad \text{(for 8c)}$$

$$= \frac{n}{d} \qquad \text{(for 8b)}$$

$$= \frac{a}{1-b} \qquad \text{(for 8a)}$$

$$\text{Similarly } E(r^2) = \frac{\partial^2 \varphi(o)}{\partial \theta^2} = n\,p + n(n+1)\,p^2$$

$$\text{Whence } \mu_2 = n\,p\,q = n\,p + n\,p^2 \qquad \text{(for 8c)}$$

$$= \frac{n}{d} + \frac{n}{d^2} \qquad \text{(for 8b)}$$

$$= \frac{a}{(1-b)^2} \qquad \text{(for 8a)}$$

By a similar process,

$$\mu_3 = np + 3\,np^2 + 2\,np^3 \qquad \text{(for 8c)}$$

$$= \frac{n}{d} + 3\,\frac{n}{d^2} + 2\,\frac{n}{d^3} \qquad \text{(for 8b)}$$

$$= \frac{a\,(1+b)}{(1-b)^3} \qquad \text{(for 8a)}$$

These may be cross-checked by applying the same process to $\varphi(\theta) = \left(\frac{1 - be^{\theta}}{1-b}\right)^{-\frac{a}{b}}$ for the moments of (8a) directly, or to $\varphi(\theta) = \left(1 - \frac{e^{\theta} - 1}{d}\right)^{-n}$ for the moments of (8b) directly.

The clarity of the significance of the parameters in the (8a) form should be noted: a is the expectancy of single-claim accidents, b is the factor which links this expectancy with those of two-claim accidents, of three-claim accidents, and so on, through formula (2).

The number of parameters in the general formula (4) can be reduced by a variety of assumptions, producing a number of related formulas. For example, if we let $a_2 = a_3 = a_4 = \ldots\ldots = 0$, we have the one-parameter Poisson distribution for which m (= mean), μ_2 and μ_3 are the first terms in the three expressions (7a)—(7c) above; if we let $a_3 = a_4 = \ldots\ldots = 0$, we have a two-parameter distribution in which m, μ_2 and μ_3 are the first two terms in (7a)—(7c); similarly, the three-parameter distribution derived by letting $a_4 = a_5 = \ldots\ldots = 0$, has m, μ_2 and μ_3 equal to the first three terms of (7a)—(7c) respectively.

It is interesting to note that this particular three-parameter distribution provides a closer fit than the negative binomial distribution for data on the number of railway accident fatalities in the Saar in a test made by Lüders; in other words, the assumption that such fatalities occur only singly or in pairs or in three's but with these three expectancies unrelated each to each, accords a closer fit in this case than the assumption that they occur in groupings of 1, 2, 3, . . . at a time with the frequencies of these occurrences linked as in relation (2) herein; or, if you will, which is also significant, closer than the assumption that the probability of a fatal accident varies by individual in accordance with a Pearson Type III distribution. This reminds us that the modified power-series relationship assumed in (2) is of course essentially as arbitrary as the Pearson Type III assumption; yet the underlying idea and the results open a fertile area for further investigation, which should include the associated formulas developed herein.

The final justification of any of these formulas lies in the results of tests. I have not had the facilities or the time to test the ideas suggested by these various developments and hope that this will in due course be done by others having both. In particular the possibility of utilizing the negative binomial formula for fitting a distribution of the number of claims is worthy of more study, since what actuaries have at hand usually is a claim count rather than an accident count. We should determine whether its fit is closer with claim distributions than with accident distributions, or more exactly, whether its fit is closer with multiple occurrences in a single accident counted separately than with a strict accident count.

As Simon has remarked, a study of the negative binomial opens up a rather amazing variety of applications and interpretations, many of them of interest to us as actuaries. These observations on rationale by no means exhaust the subject, but should really serve to whet our curiosity, and they merely bear out the quotation that prefaced this paper. In closing, let me say that once again Pope's dictum has been fulfilled: "There is no study that is not capable of delighting us after a little application to it."

PANEL DISCUSSION — NOVEMBER 1962 MEETING

RATEMAKING IN THE FUTURE

CHAIRMAN: HUBERT W. YOUNT

RATEMAKING AND PRICING IN THE MARKETPLACE

BY: HAROLD E. CURRY

This topic invites reflection and encourages speculation. It has caused me to look back over the more than three decades I have been involved in ratemaking, compare current ratemaking techniques with those prevailing in the earlier years of this span of time and project this historical background into the probable future developments in ratemaking.

These musings suggest the conclusion that the role of the actuary has been undergoing a change, a change that should be of interest to all of us in the actuarial profession now and to those contemplating actuarial work as a business career. These changes are of significance to those of us charged with the task of selecting and training new men for future actuarial responsibility in the organizations which we are associated with as they may have an appreciable impact on the future development of this Society.

My acquaintance with ratemaking started in 1929 and involved only automobile insurance, the line that has been my major interest during the intervening years. At that time the prevailing rating systems were quite simple in comparison to those in use today. Ratemaking was sort of a semi-accounting which involved the totalling of earned premium and incurred losses, using few if any breakdowns insofar as rating territories, type and classification are concerned and adjusting rates up or down to some permissible loss ratio. Many companies even avoided this task thru affiliation with established rating organizations or by maintaining rate schedules bearing some fixed relationship to those promulgated by the national rating organizations. Rates were not subject to approval by state regulatory authorities, the purchase of such insurance was a somewhat casual transaction involving nominal sums and generally limited to those individuals or corporations with substantial assets subject to pursuit for indemnity in the event of accident involvement.

In such a market atmosphere it was not uncommon to find the actuary occupying a rather secondary place in a company's organization chart. In fact, a great many companies did not even have an employee so titled! A reasonable understanding of basic statistical methods and reasonable college training in mathematics were the essentials an individual needed to do a creditable actuarial job. There was one exception among the casualty insurance lines, workmen's compensation, where more advanced ratemaking techniques were being used in any appreciable degree. The actuary was accorded reasonable respect by company management but dubbed a mathe-

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Editor's Note: The Panel Chaired by Mr. Hubert W. Yount included Mr. William Leslie, Jr., Establishing Net Rates Including Expenses; Mr. Seymour E. Smith, Multiple Peril Ratemaking and Statistical Problems; Mr. Joseph M. Muir, Problems in Rating Organizations; Mr. Harold E. Curry, Ratemaking and Pricing in the Marketplace; and Mr. James B. Donovan, Regulation of Ratemaking. Panelists' remarks were completely off-the-record. Mr. Leslie and Mr. Donovan chose not to reduce their remarks to writing. Mr. Smith, Mr. Muir and Mr. Curry edited their own remarks.

matical nut by production personnel and a person to be tolerated but who, obviously, knew nothing about marketing.

This portrayal may be distorted slightly but in those days the actuary did, too often, content himself with a narrow and conservative interpretation of the statistical data available and made a very meager attempt to evaluate the attitudes of the buying public with respect to price or scope of coverage offered.

This attitude toward the actuary continued into the middle 1930's. In the interim, we had been enduring a depression. Many companies had undergone severe retrenchment programs, were struggling to maintain income levels and had developed a sensitivity to prices and quality of product and service. The actuary was consulted more frequently for ideas to aid sales but at the same time safeguard the financial stability of the company. This tended to force the actuary out of his statistical shell and into consideration of the factors that would improve the saleability of the product. The caution born of depression stimulated public interest in insurance protection and, in the automobile line, the enactment of financial responsibility laws tended to add some compulsion to the purchase of insurance.

To the best of my recollection it was in the years immediately following when the actuary started to be recognized as a human being capable of taking diverse statistical facts and ideas and fitting them together to form a workable operating pattern. The more aggressive companies with established actuarial departments started to enlarge these staffs and many companies with no such facility began to shop for actuarial talent or diverted personnel with mathematical ability from other activities to a ratemaking function.

The advent of World War II arrested this development but, in a way, stimulated interest in the actuarial profession. Modern warfare depends heavily on mathematics for successful execution. Actuaries were found to be valuable in many phases of war. Individuals with an aptitude for mathematics discovered, for the first time, the opportunities in our profession.

Two events that occurred shortly after the end of World War II (1) the S.E.U.A. decision and the subsequent enactment of rate regulatory legislation and (2) a tremendous upward surge in automobile use and ownership created a big demand for actuarial talent that could accurately interpret the ever increasing volume of statistical data and, of equal importance, devise rating systems and policy products that would attract sales and still be acceptable to the state regulatory authorities.

There were market stimuli that have tended to increase the demand for actuarial talent such as:

1. More stringent safety responsibility laws.
2. The conviction on the part of many company managements that the automobile line is the key contact for other personal insurance needed by every family.
3. A public demand for new forms of coverage, extension of existing forms, and rating systems that differentiate between risk groups presenting differences in exposure.

All of these factors lumped together are resulting in a change in the stature of the actuary in relation to other segments of company management and even in the personality traits management desires in the actuarial talent they employ.

In past periods there was a tendency to evaluate talent by the single criteria of the depth of his mathematical and statistical knowledge. Little attention was given to his personal appearance, his ability to express himself clearly to a non-technical audience, his knowledge of market conditions, or training in business management.

The actuary today must be more versatile than formerly. Interest in his mathematical and statistical skills has not diminished and these skills are the basic tools of the actuarial profession. In addition he must be able to present his rating conclusions persuasively to company management and to state regulatory authorities (and not infrequently to representatives of the buying public), he must be sensitive to market needs, he must be capable of explaining rating changes to sales people not only to improve understanding but also to expose salient sales aids, he must develop some method of direct contact with the buying public so he can spot weaknesses in the rating system used or breadth of coverage afforded, he must counsel with the underwriting and claims departments in matters of risk selection and policy interpretation and, above all else, he must sponsor rating systems and rate schedules that will result in a profitable operation and be workable in the complex electronic equipment so widely used today. Simply stated, the actuary today is an important part of the total management team. The actuary can no longer deal a fatal blow to an idea by terming it "actuarially unsound" or "discriminatory." He must take basic ideas that are attractive to the buying public and build a rating program that is sound and equitable. In the final analysis, as a part of the management team, he is just as interested as anyone in a profitable operation for his organization, perhaps even more so because his professional competence is at stake.

Rating systems must be such that the buying public accept them as reasonable. The price charged must be one the buying public is willing and can afford to pay. If either the system or the price is not compatible with the buying public's concepts of reasonableness and equity the entire operation will fail to succeed. Therefore, it seems to me that the ultimate test of sound ratemaking is the marketplace. No amount of regulation of ratemaking by state authorities can be an effective substitute for public acceptance. It can *aid* or *impede* the company's response to a market need depending upon the attitude taken.

I have long been chagrined about the quantity of casualty and fire actuaries who attain top company management positions in comparison to the life insurance industry. In this latter branch of the insurance business we find many company presidents who are actuaries by profession whereas in the casualty and fire lines very few company presidents have come up over the actuarial route. I sincerely hope this picture will become more balanced during the lifetime of the younger members of this Society, at least.

As to the future, I believe we have a long ways to go in developing rating systems that are properly sensitive to market needs. Under our American competitive system these deficiencies can be overcome. A lion's share of the responsibility to make this an accomplished fact rests upon the ingenuity and competence of the members of the actuarial profession.

PROBLEMS OF RATING ORGANIZATIONS

BY: JOSEPH M. MUIR

The present movement toward experimentation, flexibility and diversity in rating systems in the casualty insurance field raises a question as to the future status of casualty rating organizations. Traditionally, these organizations have been leaders in their fields with rating systems designed to meet the needs of their affiliated companies with what has been considered to be sufficient latitude within those rating systems to place their members and subscribers in a position to compete among themselves, as well as to compete with non-bureau companies. This concept of bureau operation, with basic manual rates being based upon a broad spread of compatible statistics, is taking on an entirely new complexion. The advent of the agency filing system promoted from within rating organizations, particularly in relation to automobile liability insurance; the construction currently being placed upon the deviation section of the casualty rate regulatory laws in some quarters; and the ever-growing desire on the part of individual companies enrolled in rating organizations to experiment, is bringing about a complete change in the position, from the standpoint of ratemaking, which rating organizations hold in the industry.

It is common knowledge that during the past three years agency filings and alternate filings by rating organizations on behalf of individual companies have increased in number at a substantial rate. Initially, only the most daring management of a bureau affiliate ventured outside the fold of the rating organization's orthodox rating systems. As time went on, however, other companies became more venturesome and joined in the movement. The extent to which this situation now prevails is evidenced by the number of such filings which the three principal rating organizations in the automobile field; namely, the National Bureau, Mutual Bureau and National Automobile Underwriters Association, have processed.

If we accept what seems to be true that this movement has gained such momentum that the participants—having experienced the questionable virtues of freedom of choice in their rating systems—have adopted the premise that competition is an underwriting factor that should be met through diversity in the rating structure, then future ratemaking as a function of a rating organization, compared with the traditionally accepted practice, will be unrecognizable.

As diverse rating systems become more prevalent, the statistics developed thereunder will become less compatible. This results in weakening the broad statistical base used by rating organizations and necessitates the introduction of new stabilizing elements into the ratemaking program. It is not suggested that time, experience and tradition have brought into being a ratemaking system which currently uses all the appropriate elements and is beyond the stage of improvement. It is suggested, however, absent a broad, sound statistical ratemaking base, such as that derived from a common statistical plan, a common grant of coverage, a common class of business, and a common underwriting practice, innovations in ratemaking techniques will require reasonable checks and balances to assure their worth and effectiveness. Companies which have relied upon a rating organization's rate promulgations to give them a reasonable and profitable book of business, may be placed in a difficult position to maintain their standing if the rating organization's statistical base should narrow to the point of producing unreliable results and not be offset by stabilizing ratemaking elements. A problem facing rating organizations in performing their ratemaking functions is the establishment of techniques to offset the drain on the reservoir of compatible data.

If it is feasible to establish a common denominator among the various diverse rating systems processed by a rating organization, the likelihood of determining pure premiums for very broad classifications or for very broad territories, offers a means by which such data may be utilized with reasonable assumptions. If the volume of business in this category should be substantial by the very nature of the number of contributors, a rating organization's functions may narrow to more closely resemble those of a statistical organization. Under such circumstances there is a question whether a rating organization, with its path molded to a future as a statistical source primarily, can service its affiliated companies with pure premium experience from which rates may be developed. If there is an average pure premium which will meet the requirements of all companies, a rating organization's ratemaking functions can contribute immeasurably to the entire industry. Even if this is not the case, perhaps several sets of pure premiums could be established to reflect different degrees of exposure. For example, in a simple sense, a de luxe offering might be made with a companion in the economy-type class, the latter being streamlined to include only the necessities.

Packaging, such as we have in the multi-peril field, can chip away at traditional forms of coverage and leave what may be considered the least desirable exposure from a loss and expense standpoint. Ratemaking in connection with such combination of coverages in package policies reflects the elimination of adverse selection with respect to certain elements of exposure, and lays emphasis upon the "sweetening" effect from the spread of risk. This leaves the standard coverage form with the high hazard elements of the exposure subject to rating on a basis that must be marketable and at the same time not unprofitable. Packaging of coverages has become an integral part of our business, and schedule forms are losing their popularity as well as their identity in some cases. A problem of a rating organization is designing a rating structure for such forms as we move through the transition to what eventually may be solely a packaging concept.

In the general area of service to its affiliated companies, a rating organization distributes statistical exhibits in various forms. In order to keep abreast with the multiplicity of rating systems used by the principal competitors of bureau companies, more elaborate statistical exhibits should be prepared by the bureau. The problem is to determine the forms which will be most productive and usable for the purpose intended. An improper interpretation placed upon the data by a company specializing in a particular area could prove to be costly. Errors resulting from such a situation could be troublesome to a company in retaining what it considered to be a desirable distribution of business. It should be the responsibility of the rating organization to see that its statistical releases are clear and understandable. Conveying to bureau companies the extent to which such data can be given credibility is a problem for the rating organization to resolve.

Where rate filings of rating organizations are not recognized, such as is the case in the State of Tennessee with respect to automobile insurance within the past year, individual member companies may elect to adopt the agency filing route with a ratemaking program based upon the rating organization's rate revision compilations. If the individual carrier's experience indications are comparable to those produced by the rating organization's rate filing procedures, it is a safe assumption that the agency filing will be given clearance. On the other hand, if this is not so, particularly if the individual carrier's results are less favorable, question arises as to the propriety of using the bureau compilations for support on the premise that the provision of the statute with respect to adequacy may not be met.

The statutes specifically provide for companies to band together in rating organizations for the purpose of ratemaking and this recognizes that those who participate through this channel will be favored with rates that reflect the average experience. Presumably this meets the test of the statute with respect to reasonableness and adequacy. Rating organization filings for individual companies may have a different status in this respect. If so, the rating organization is faced with the problem of supporting the individual company filings and may be up against the proposition of justifying the inclusion of experience for certain affiliated companies in producing the over-all average where such companies have introduced revisions of their own.

Changes in the rating laws will play an important role in the ratemaking problems of a rating organization. It is conceivable that under a "file-and-use" statute for example, the rapidity with which competitive rate filings could cross the desks of state supervisory officials could put considerable pressure on a rating organization's ratemaking schedule. It is not clear how state supervisory officials would process such filings and it is just as unclear how a rating organization would keep its companies competitive with all the schemes that would be tried, and do so by timing its activities to recognize promptly the effect such competitive "file-and-use" filings would have upon a bureau company's business. Prior approval legislation, on the other hand, has posed numerous problems to the industry, and there is no reason to believe that in the future that type of legislation would produce any different results under comparable administrative machinery.

To the extent rating organizations have been recognized as being proper parties in interest, they have been in a position to represent their companies. In some quarters, however, the status of a rating organization as a proper party in interest has been challenged. Supporting rate filings before state supervisory officials or in connection with judicial proceedings is one of the major responsibilities a rating organization has in its relationship with its companies. To keep it that way should be an industry objective.

For several years reference filings have been accepted by various states where the reference was to a rating system or coverage program introduced by a rating organization. The insurance departments which have adopted this system have relieved reference filers of any responsibility for supporting their use of the bureau rating system. Contrarywise, rating organizations have supported their filings and in many instances this has been done at considerable expense. The double standard which results from this type of administration is not conducive to enhancing the stature of a rating organization. In fact, if it continues to spread it could create serious problems.

Some time ago we entered the motor age and industry girded itself to accommodate a nation on wheels. We have now advanced to another phase of mechanization which is the electronic era. Electronic accounting machines are giving way to electronic computers, and electronic computers are revolutionizing our industry. Ratemaking functions of rating organizations are moving closer to this electronic computer atmosphere with all of its attendant complications. Many companies have spent years in programming their operations and are beset with problems. Rating organizations are no exception and their experience may be expected to follow the same pattern in the ratemaking field. As rating systems become more refined—there is a very definite trend in that direction—ratemaking material will follow the same pattern. As statistics become more refined, more operations are involved in producing them. This poses a problem for rating organizations in their relations with companies which delay in filing their statistical reports. It may be anticipated that this problem will increase in magnitude unless means are found to handle this function more expeditiously.

While more directly related to rate promulgations and rate administration than to ratemaking as such, a rating organization's relations with the public are of considerable importance. Ratemaking which has a substantial effect upon a particular community may aggravate company-policyholder relations. Where the company is affiliated with a rating organization, a complaint generally finds its way to the lap of the latter. Ways and means must be found to cope with this problem which cannot be permitted to become serious.

Rating plans which provide for modifying basic rates to reflect the degree of hazard in individual risks or to measure the variation of expenses among risks, fall into the general category of ratemaking. On a very limited scale, some rating plans in use are predicated upon objective standards and are designed to produce like results under like conditions. On the other hand, flexibility in rating plans is the rule rather than the exception, and competition is the controlling factor in determining what the individual risk's rate shall be. When rate regulatory statutes were enacted more than a decade and a-half ago and the states took steps to put implementing machinery into operation, it was reasoned that the transition from non-regulation to regulation necessitated the acceptance of certain rating influences. Among these was flexibility in rating plans. It is hardly conceivable that representations can now be made that the transition period is still with the industry. Rating plans are being reviewed in certain quarters and it may be expected that these rating devices will be subject to closer and closer scrutiny as to the propriety of perpetuating them.

The production segment of the insurance industry came to the fore in the State of New York sponsoring legislation which, when enacted, required the state supervisory officials, in approving rates, to give consideration to commissions paid during the most recent annual period. While it may not be altogether clear what the practical effect this legislation will have from the standpoint of a rating organization's ratemaking functions, it is common knowledge that the legislation prompted considerable controversy and was found objectionable by other segments of the industry. Just recently it was announced in the press that the same source that sponsored the so-called Barrett-Russo Law, to which I just referred, is also planning to submit a proposed "Statistical Rating Law" to the 1963 Legislature of the State of New York. The word is out that the intent of this latest legislation is that "Rates shall be based on the most comprehensive statistics available" and also that "the standards . . . enunciated shall apply to all filings . . . whether designed as deviation, independent, group, bureau or otherwise." It is also reported that elsewhere in the proposed bill it is required that consideration shall be given to past and "provable" prospective loss experience "of all insurers" and also to past and "provable" prospective other expenses—whatever that may mean in this sense. If this legislation or similar legislation should become the law, it would materially affect the ratemaking practices of the rating organizations.

Adverse developments in classification loss experience prompting a refinement in classification differentials brings to the fore the question as to the propriety and desirability, in the ratemaking process, of establishing limitations on the maximum change in the high hazard classifications. If this principle is to be put into practice in order to keep the classification system reasonable and marketable, the correction in the off-balance with further limitation to prevent wide fluctuations in rates requires investigation and study.

Experiments are being carried on in the personal lines automobile liability field to determine the reliance which may be placed upon new measurements of exposure. Exposures by occupational pursuits have been studied for some time. More recently the academic standing of youthful drivers has been investigated and psychological testing of drivers is currently quite prevalent. The extent to which these studies will produce results that will eventually find their way into ratemaking systems is yet to be determined.

In conjunction with the future ratemaking problems of rating organizations it appears that a very important appendage must be added in the form of an expansion of existing research functions. With the electronic equipment now available, the demand will very likely increase for more activity in statistical research. This will necessitate carriers furnishing much more additional statistical information than is presently reported and it is conceivable that in due course rating organizations, in addition to performing in their own field, may be called upon to handle operations for affiliated companies which are now performed by those companies individually.

MULTIPLE PERIL RATEMAKING AND STATISTICAL PROBLEMS

BY: SEYMOUR E. SMITH

The growing development of package policies embracing two or more major lines of insurance presents problems of considerable magnitude in both the statistical and ratemaking areas. The statistical problem might appropriately be mentioned first. Up to this point, with the exception of the homeowners policies, the various individual rating organizations have taken the position that statistical data for the coverages or lines of insurance which fall within their normal jurisdiction should be separately broken out and reported within their usual classification assignments. For the long pull, this seems to offer a rather serious problem so long as the development of the various package policies is geared toward what are considered to be the most desirable risks. While it is not known whether or not this will be the pattern in the future, at least up to this point, generally speaking, the various packages have been developed by companies or groups of companies with the apparent objective of attracting to themselves so-called "cream" business.

If experience under these package policies, which are written at a discount from normal rates, flows back into the normal classification slots, it is quite likely that the result could lead to inadequate rate levels. Experience to date under the homeowners policies is a classic example of what could conceivably happen in this connection. For many years residence fire risks were properly considered as highly desirable business. Following the introduction of homeowners policies and the rapid growth of this form of coverage, the more desirable risks tended to flow into the package area with the result that the residual experience for residence fire business consisted of, in the aggregate, the less desirable business. As a result, residence fire business per se has recently been unprofitable and substantial rate increases have been called for in many areas. If this homeowners business had been channeled back into the normal residence fire classifications, inadequate rate levels overall would have prevailed with no statistical indication as to what or where the trouble was. So long as these package policies are developed for the more desirable class of business, it appears to be highly desirable that statistical data be kept separate for these packages and that it not flow back into the normal classification channels. Even if future developments should be such that packages are developed for average rather than cream business, it would still appear desirable to keep such statistics out of the normal channels since it is at least possible that experience under package policies, for a variety of reasons, could be different from that of other risks.

In connection with this statistical problem, it might be considered of some importance that the expense of breaking out all of the various component parts could negate to a substantial degree the assumed inherent expense savings in the packaging of a number of individual coverages into a single policy. In fairness, I do not believe that my criticism of this statistical requirement should be directed to the various rating organizations since this is merely a reflection of the position taken by the company representatives in the organization. It appears to be a company problem which, while understandable, is not very fruitful to progress. The problem seems to be that basically many corporations have not as yet been able to gear themselves organizationally to cope with the problem involved in cutting across internal areas of responsibility that have heretofore been compartmented.

The second basic problem under these package policies concerns the making of rates. So far, for practically all packages, the rates have been developed by the application of judgment discounts to the existing standard rates for the various component parts. This is probably the only feasible way of starting a new package and will undoubtedly be true for a number of years for various new packages as they are launched. For the long pull, however, it would seem reasonable to assume that those packages which develop any sizable amounts of premium should carry their own weight. This would seem to require that experience be developed for each of the various major packages in total so that underwriters or rate regulatory officials can reasonably determine whether or not the over-all price for the package is proper. My own personal view is that the greatest efficiency would be served by considering the package as a whole rather than attempting to analyze it too finely into its various component parts. By this I mean that if the experience for a particular package indicates that the over-all rate is just about right, it does not particularly matter whether any one piece of it has good, bad or indifferent experience. For discussion purposes, I would suggest that the most feasible system would be rating on an over-all basis coupled with sampling techniques to determine reasonable cost variations to reflect hazard variations or coverage options within the individual package. Specifically, this would involve the use of an indivisible premium with statistical policy designators indicating hazard or coverage variations. For example, under a motel policy, does it or does it not have a swimming pool; does it or does it not have a neon sign, etc., etc. With this approach as an exposure base and with losses coded by type of loss, it would seem that a reasonable and inexpensive rating procedure could be developed. In my own opinion, this would be practical to apply and would avoid the expensive process of dividing the statistical experience into a large number of individual pieces which, I suspect, under current requirements would be so finely broken out as to be rather worthless for useful application to ratemaking. As these packages grow and develop, it seems to me that in the future we will substitute existing line, territory, and classification breakouts for breakouts made up of individual packages further refined by statistical designators to reflect hazard and coverage variables which will be handled by sampling techniques.

REPORT

AN INTRODUCTION TO CREDIBILITY THEORY

BY

L. H. LONGLEY-COOK

1. PREFACE

Credibility Theory is one of the cornerstones of actuarial science as applied to casualty and property insurance. Although the literature of this theory is extensive, there is no elementary introduction at present available. Nearly all the numerous papers[1] bearing on credibility theory which have appeared in the Proceedings of the Casualty Actuarial Society are difficult to follow without a knowledge of the subject and many of them are very long and involve fairly abstruse mathematics. At the request of the Educational Committee of the Society, the author has prepared this introduction to provide actuaries and others interested in credibility theory with a framework into which they can fit these papers so that they can better appreciate the large body of research which has been carried out in this field. The author has tried to keep mathematics to a minimum and has concentrated on principles rather than details. It must be stressed that this is merely an introduction to the subject and it is only by studying the many original papers that a full comprehension of the subject can be obtained.

2. MEANING OF CREDIBILITY

The basis for these credibility formulas has been a profound mystery to most people who have come into contact with them.

—Arthur L. Bailey[2]

The word credibility was originally introduced into actuarial science as a measure of the credence that the actuary believes should be attached to a particular body of experience for rate making purposes. Thus we say that the loss experience under a new class of insurance is "still too small to be credible", implying that the experience which will develop in the future may well be very different from that so far collected, and also implying that we have more confidence in our prior knowledge based on other data such as current rates for similar classes. Again, the statement that the private passenger automobile liability experience in Pennsylvania is "fully credible for rate making", implies that the experience, after adjustment by trend factors, is adequate to establish the overall rate level in the state without reference to previous rates or data or to experience in other states.

In many cases a body of data is too small to be fully credible but large

[1] See Appendix A.

[2] Credibility Procedures—CAS XXXVII, p. 7 (1950)

enough to have some credibility. A scale of credibility has been established which gives 0 credibility to data too small to be any use for rate making and 1 credibility to data which are fully credible. Credibility theory is concerned with establishing measures of credibility and standards of full credibility.

Arthur L. Bailey[2] has pointed out the special recognition given to prior knowledge in credibility theory

> "At present, practically all methods of statistical estimation appearing in textbooks on statistical methods or taught in American universities are based on an equivalent to the assumption that any and all collateral information or *a priori* knowledge is worthless. . . . It appears to be only in the actuarial field that there has been an organized revolt against discarding all prior knowledge when an estimate is to be made using newly acquired data."

As a corollary of the recognition of prior knowledge, the amount of credibility to be attached to a given body of data is not entirely an intrinsic property of the data. For example, there is always stated or implied in any measure of credibility the purpose to which data are to be used. Thus certain data obtained from the reports of Fire Marshalls in the State of Oregon may have a high credibility for establishing the variations of fire rates by protection grading in that state. The same data will have a lower credibility when applied to establishing the variation of fire rates by protection grading in the states of Pennsylvania or New York.

The term credibility has been extended to represent the weight to be given to certain data in various experience rating formulae. Much confusion has resulted from assuming that the credibility of data used in an experience rating plan is the same as the credibility of the same data if it were to be used for some other purpose such as independent rate making.

Hence, we see that credibility is not a simple property of data which can be calculated by some mathematical formula as can the standard deviation or other measures of the effect of chance variation on a body of statistical data. While credibility and statistical variance are related, the former is meaningful only against a stated or implied background of the purpose for which the data are to be used and a consideration of the value of the prior knowledge available.

3. THE NEED FOR A MATHEMATICAL MODEL

> *The calculus of probability is a fascinating subject, and one which is destined to play a large part in actuarial science; and a day may come when it can truly be said of the actuary that he has fused together the theories of finance and probability.*
>
> —E. W. Phillips[3]

The application of mathematics to science follows a fairly standard pattern. First certain "laws" are established usually by a combination of careful research and general reasoning. From these laws a mathematical model is constructed and is tested against actuality. The model is then used for further research and as a means of forecasting what will occur in designated

[3] Biometry of the Measurement of Mortality—privately published, p. 5 (1935)

special circumstances. In the "exact" sciences the models are very close to reality; in the less exact sciences the models are only approximate. Since the model follows directly from the laws by the application of pure mathematics, it is convenient to use the term model for both the laws themselves and the mathematical development therefrom.

Thus in dynamics the laws are usually Newton's laws of motion and the model deduced therefrom allows, for example, the accurate prediction of an eclipse of the sun many years hence. This model is almost, but not completely, exact.

In the actuarial science of life insurance the original law was a rate of mortality which depended upon the age and sex of the life but was independent of any other variable. The actual rates of mortality would depend upon the body of lives under review but for any individual problem the law was assumed to hold. The model developed from this law was the mortality table and the whole theory of life contingencies, without which it would not be possible to transact life insurance as we understand it today, is based thereon. The model was later developed to allow for selection and further developments were required to deal with special problems such as impaired lives and options. However for much actuarial work in the life insurance field the original model is still the basis of all calculations. It was early realized[4] that the rate of mortality represented the average mortality of all lives in the group only, but it was rarely if ever necessary to reflect this in the actuarial work of life insurance and nearly all life insurance calculations can be made on assumption that the rate of mortality applies to each individual life.

In other fields of insurance the development of suitable models has been difficult and the applications of the models nearly always require not only the use of average values, but a consideration of the distribution of the variations from the average. In the United States the development of these models and their application to practical problems have been associated mainly with rate making and credibility. While the word credibility was originally introduced to indicate the credence that the actuary believes should be attached to a particular body of experience for rate making purposes, the use of the term has been extended to many rate making techniques associated with this general idea. On the continent of Europe, the development and applications of these models have been referred to as the Theory of Risk and the main application has been the study of the effects of chance variation on the surplus of an insurance company.

4. STATISTICS FOR INSURANCE RATE MAKING

We who serve our Lady Casualty,
Should be of all men first,
Most resolutely to hope for the best,
Most wisely prepare for the worst.

—Clarence W. Hobbs[5]

Before we can begin to construct a model appropriate for the study of

[4] On the Improvement of Life Contingency Calculation—E. J. Farren. Journal of the Institute of Actuaries, Vol. 5, p. 185 (1855)

[5] The Lady Casualty and Her Servitors—CAS XXVI, p. 168 (1935)

problems of casualty and property insurance we must understand clearly the purpose for which the model is primarily intended and certain of the characteristics of this branch of insurance. It is important to realize that casualty insurance is a contract of indemnity and hence the amount payable in case of a loss must be determined by the individual circumstances of each case and may depend upon a legal action and a jury verdict. For this reason loss experience will never be stable for any length of time and rate revisions are frequent. We are concerned with analyzing the past, mainly to enable us to develop premium rates for the future.

It is appropriate here to quote some remarks of Arthur L. Bailey[6], the actuary who has contributed more than anyone else to our knowledge of credibility, on the difference in philosophy of the casualty actuary and the statistician in the more usual fields of statistical study.

> "First, there is the belief of casualty underwriters that they are not devoid of knowledge before they have acquired any statistics. This belief is probably held by operating personnel in all businesses. When a new form of insurance is initiated or a new classification or territory established, there may be a considerable variety in the opinions of individual underwriters as to what the rate should be; but the consensus of opinion invariably produces a rate. This rate soon becomes embedded in the minds of the underwriters as the 'right' rate. Later, when statistics as to the actual losses under the new coverage, classification or territory, finally are acquired, the problem is not 'what should the rate have been?' but 'how much should the existing rate be changed as a result of the facts observed?' In revisions of rates for regular coverages, classes and territories, this is always the question.
>
> "The statistical methods, developed by the mathematicians and available in the standard textbooks on statistical procedures, deal with the evaluation of the indications of a group of observations, but under the tacit or implicit assumption that no knowledge existed prior to the making of those particular observations. The credibility procedures, used in the revisions of casualty rates, have been developed by casualty actuaries to give consistent weightings to additional knowledge in its combination with already existing knowledge.
>
> "A second belief of casualty actuaries is that they are in a continuing business. Also that a more or less wide spread of risks is being taken at any time. The rate maker in such an organization as the National Bureau of Casualty Underwriters literally has thousands of rates to be revised at relatively frequent intervals. Being called upon to make a large number of estimates, the casualty statisticians can relinquish the condition, usually imposed by other statisticians, that each estimate be unbiased. In its place they may impose the less restrictive condition that a particular group of estimates be unbiased in the aggregate. This permits them to make a material reduction in the error variances below what could be obtained by applying the usually taught and presented methods of statistical estimation. It produces another type of credibility formula which appears to be unique to casualty insurance.

[6] Discussion by Arthur L. Bailey, Journal of the American Teachers of Insurance, Vol. 17, p. 24 (1950)

"The third peculiarity is that casualty underwriters consider each insured to differ from all other insureds. For example, each automobile driver is assumed to have habits and eccentricities unlike any other; each fleet of trucks is assumed to travel routes and engage in operations which make its hazards different from all others, even those engaged in the same industry in the same territory. The propriety of this assumption has been verified in so many instances that the differences between risks has become a basic concept or axiom. Experience rating plans are used in almost all lines of casualty insurance to measure the peculiarities of individual risks.

"Despite this uniqueness of the 'inherent hazard' of different insureds, each and all of them are subject to the vagaries of chance and the random errors of classification and measurement common to all statistics. Statistical methods generally taught and published in textbooks deal with populations for which the entire variation is produced by the vagaries of chance or the random errors of measurement. Populations in casualty insurance, however, consist of individuals having a variation of expectations other than that due to these two items. Their inherent hazards must be assumed to differ even if it is impossible to postulate or to precisely measure the differences. This dealing with heterogeneous populations produces some very interesting results which most statisticians would sneer at as 'impossible', but which are, nevertheless, wholly sound and justifiable."

While the above remarks by Arthur L. Bailey are specifically directed to casualty insurance, similar considerations apply to property insurance.

5. DISTRIBUTION OF NUMBER OF LOSSES—THE FIRST MODEL

In the early history of navigation, we find it taken almost as the basis of the science that the compass needle pointed in a fixed direction, and that such a direction was due north. The utility of so simple an assumption in early days can scarcely be overrated. —E. J. Farren[4]

The scientist does not need to invoke Einstein's relativity theory for each simple calculation on moving bodies. In most cases the laws of motion developed by Newton are sufficient for his purpose. Nor need the actuary assume a complex model when a simple model will suffice. In most types of casualty and property insurance, more than one loss (accident) can occur in a year. In our first model it will be assumed that the probability of an accident in any period of time is the same for each individual exposure (person, automobile, etc.) and that it is proportional to the length of the time exposed. Further, it will be assumed that we are either concerned with studying the number of accidents and not the amounts of loss or, alternatively, that the amount of loss for each accident is the same.

If the number of exposures over a period of one year is n and the probable number of accidents in any period dt is nqdt, then the most probable total number of accidents in the year is nq and the average number of accidents to any one individual is q. It is necessary to determine the probability that an individual has exactly none, one, two, etc., accidents in the year and that the total number of accidents is within k percent of the most probable nq. The solution of this problem will be found in most textbooks on statistics since this is the well-known *Poisson Distribution* and is developed in Appendix B. The results are as follows:

The chance of exactly r accidents out of n individuals is

$$\frac{(nq)^r e^{-nq}}{r!}$$

In the case of a single individual this becomes

$$\frac{q^r e^{-q}}{r!}$$

The mean number of accidents is nq and the variance is also nq.

Further, the probability P that the number of accidents will be within $\pm$ 100k% of the expected nq is equal to

$$P = 2\left[\frac{1}{2\pi}\int_0^{k\sqrt{nq}} e^{-\frac{t^2}{2}}\,dt\right]$$

when n is large and k is not large. (See Appendix B).

This formula is used to establish standards of full credibility.

6. NUMBER OF CLAIMS REQUIRED FOR FULL CREDIBILITY

> *A dependable pure premium is one for which the probability is high, that it does not differ from the true pure premium by more than an arbitrary limit.*
>
> —Albert H. Mowbray[7]

When the actuary says certain data are fully credible, he is not implying that, if it were possible to collect another body of data of the same size under identical conditions the result would be for all practical purposes identical, but rather that the volume of data is adequate for rate making without reference to other experience data and without reference to the premium rates previously charged. While it may be of some interest to know what volume of data is required to meet the former test, it will normally be so large that it could never be available, and hence the enquiry is academic. Insurance data are unlike data available in biometric and similar studies where practically any volume of data desired can be collected if we go to the necessary trouble and expense. Normally we are concerned with the whole of the data for a particular classification and no further identical data are available. It is only when the data for a single insurance company are being studied that a larger volume of data, that of all similarly operated companies, may be available. Even in this case it is important to stress the words "similarly operated". In

[7] How Extensive a Payroll Exposure is Necessary to Give a Dependable Pure Premium? CAS I, p. 24 (1914)

many lines of business the experience of stock and mutual companies are not the same nor that of direct writers and agency companies and a combination of the experience of differently operated companies will not produce greater credibility for establishing the over-all rate level. However, it may well produce greater credibility for establishing rate differentials for classification sub-groups.

Our first model can be used to establish the number of claims required to reduce to negligible proportions the probable departure from the number observed which could be attributed to chance variation. On the basis of the formula set out at the end of the preceding section, using published statistical tables, we establish the number of claims necessary to meet some typical values of P (the probability that the number of accidents will be within $\pm$ 100k% of the expected number of accidents) and k as follows:

Maximum Departure from expected (k)	*Probability of meeting test (P)* 99%	95%	90%
	Number of claims required		
2½%	10,623	6,147	4,326
5 %	2,656	1,537	1,082
7½%	1,180	683	481
10 %	664	384	271

The figure corresponding to P equals 90%; and k equals 5%, namely 1,082, is frequently used as an accepted standard of credibility.

It will readily be appreciated that when a more realistic model is used and allowance is made for the variation in the amount of claim from accident to accident, the volume of data required to meet full credibility for, say, pure premiums, will be higher. (The development of the relationships of the credibility for Claim Frequencies, Claim Costs, Pure Premiums and Trends is set forth in Appendix C.) However, since the choice of P and k are in any case arbitrary, we can justify the use for Pure Premiums of the standard already established for loss frequency by a suitable variation in the values chosen for these factors. Further, in practice, the selection of too high a standard for full credibility would considerably delay the response of premiums to changed accident conditions and might well lead to over-all inadequacy of premium levels. The standard of full credibility is not normally important in itself, but is important as a means of introducing consistency in the rate making procedure and establishing proper relationships as respects reliability between different volumes of experience.

While the number of claims is the most appropriate measure for establishing credibility, it is not always the most practical one and it is often necessary to use premiums instead. A standard of $5,000,000 of premiums or some similar figure for full credibility has been customary in fire insurance although the volume should vary according to the average size of loss. A larger volume is theoretically necessary for industrial than for habitational risks.

The earliest paper in the Proceedings of the Casualty Actuarial Society on the standard for full credibility was presented by Albert H. Mowbray in

1914[7] and the most useful general reference to the subject will be found in a paper by Francis S. Perryman[8].

7. PARTIAL CREDIBILITY—RATE REVISIONS

How much weight the indications of specific volumes of data are to be given in the casualty business has continued to be a matter of individual judgment.

—Arthur L. Bailey[2]

If we have a certain loss frequency based on past experience and a new set of data which is not large enough to provide full credibility, on the basis we have accepted for the type of business under discussion, how should the two sets of information be combined for future rate making? Obviously we should be wrong to discard the new data because it is not fully credible, nor should we ignore the old rate which may be based on a vast volume of data. Clearly some combination of the two is required. It is tempting to proceed as follows. The probability of a claim in the old data is $p_0 = l_0/E_0$ where l_0 is the number of claims and E_0 the exposure units in the old data. The probability of a claim in the new data is $p_1 = l_1/E_1$ where l_1 and E_1 are the claims and exposure units in the new data. Combining the data from the two sources we have as the best estimate of the true probability

$$p = \frac{l_0 + l_1}{E_0 + E_1}$$

There are a number of reasons why this procedure is not practical. We rarely know the precise basis of p_0. It may be based on a certain number of claims and exposure units. It may be adjusted to reflect in part some previous experience, or it may reflect informed judgment. Further it may be partially obsolete because of trends which have occurred in the interval since the data were collected. It must also be noted that a formula of this form does not produce $p = p_1$ if p_1 has full credibility. Another approach is therefore necessary.

If we have a sufficient volume of data for p_1 to meet our requirement of full credibility then

$$p = p_1$$

Again if the volume of data is so small as to be meaningless it is probably wise to assume

$$p = p_0$$

For all other volumes of data, p must lie between p_0 or p_1. Expressed mathematically this means

$$p = p_0\,(1\text{-}Z) + p_1 Z$$

or

$$p = p_0 + Z\,(p_1 - p_0)$$

where Z lies between 0 and 1. It will be noted that if the data have full credibility $Z = 1$ and if the data have no credibility $Z = 0$. The value of Z is called the credibility assigned to the new data.

What value of Z, credibility, should be assigned to a volume of new data less than that to which full credibility is assigned? To get some insight into

[8] Some Notes on Credibility—CAS XIX, p. 65 (1932)

this problem we will first turn to the approach suggested at the beginning of this section. The expression for p there developed may be written

$$p = \frac{E_0 p_0 + E_1 p_1}{E_0 + E_1}$$

$$= \frac{(E_0 + E_1) p_0 + E_1 (p_1 - p_0)}{E_0 + E_1}$$

$$= p_0 + \frac{E_1}{E_0 + E_1} (p_1 - p_0)$$

Various assumptions can be made as to the relationship of E_0 to the value of E_1 required for full credibility. However, whatever assumptions we make we shall get a somewhat similar curve which should give us insight into the true shape of the Credibility curve. If we assume E_1 is equal to twice E_0 when E_1 has a volume corresponding to our criterion of full credibility we get the following results.

Volume of new data as a percentage of data for full credibility $E_1/2E_0$	*Indicated Credibility* $E_1/(E_0 + E_1)$	*Column (2) multiplied by 1.5*
100%	.67	1.00
90%	.64	.96
80%	.62	.92
70%	.58	.87
60%	.55	.82
50%	.50	.75
40%	.44	.67
30%	.38	.56
20%	.29	.43
10%	.17	.25
0%	0	0

The final column is the suggested scale of credibility obtained by increasing all the indicated credibilities in the same proportion so as to make the indicated credibility 1.00 for the volume of data we have agreed will correspond with full credibility. Other assumptions can be made concerning the relationship of E_1 to E_0. If we assume full credibility corresponds to a lower multiple of E_0 the curve becomes more nearly a straight line. If we assume full credibility corresponds to a higher multiple of E_0 the curve becomes less steep at its upper end and steeper at its lower end. It will be noted that the "indicated credibility" takes the form

$$Z = \frac{n}{n + k}$$

when n is the number of losses or some other measure of the volume of data and k is a constant. This is a form originally suggested by Albert W. Whitney[9].

For another approach to the problem we can take a quotation from a

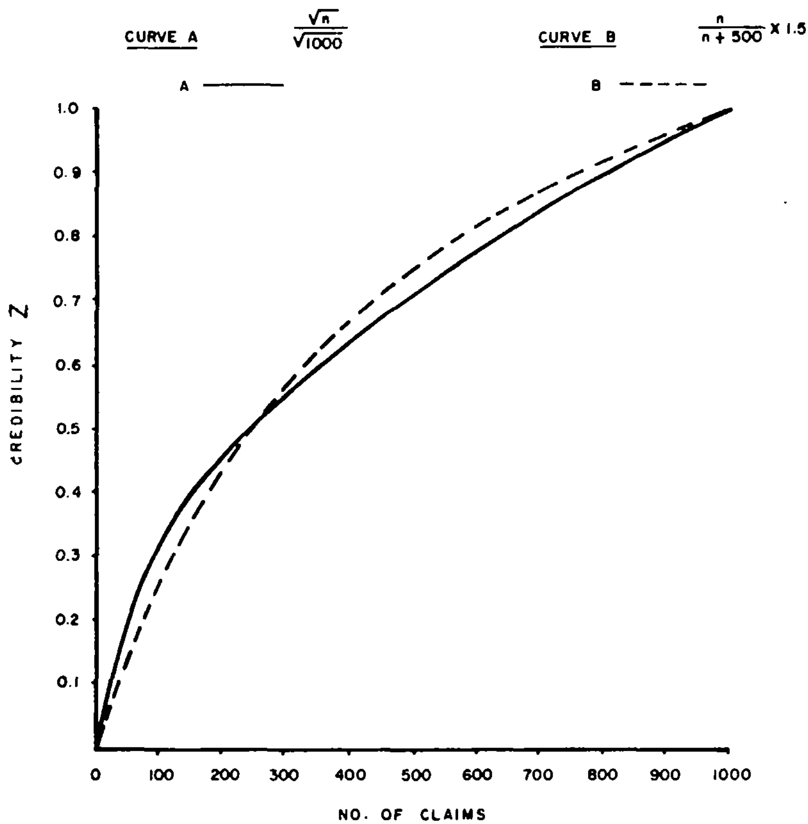
[9] The Theory of Experience Rating—CAS IV, p. 274 (1918)

paper by Francis S. Perryman[s]. "The reasons prompting the use of this do not appear very explicitly in casualty actuarial literature, but it seems to be based on the rule used in 'combination of observations' (in such sciences as astronomy, engineering) that the best weight to be assigned an observation is the reciprocal of its standard deviation: according to this the relative weights of two experiences, one (exposure n) entitled to 100% credibility and other (exposure $\frac{n}{r}$) would be in the ratios of the reciprocals of their standard deviations or as $\frac{\sqrt{n}}{\sigma}$ to $\frac{\sqrt{\frac{n}{r}}}{\sigma}$ that is 1 to $\frac{1}{\sqrt{r}}$.

"The rule seems plausible and practical. It is to be noted, however, that the principles upon which it was derived for use in other branches of science are not especially applicable to casualty rate making."

Values obtained by this method are very similar to those developed in the previous approach as the following table, based on 1000 claims for full credibility, shows.

GRAPHICAL REPRESENTATION OF CREDIBILITY CURVES



No. of Claims	Credibility $\frac{\sqrt{n}}{\sqrt{1000}}$	Credibility $\frac{n}{n+500} \times 1.5$
1000	1.00	1.00
900	.95	.96
800	.89	.92
700	.84	.87
600	.77	.82
500	.71	.75
400	.63	.67
300	.55	.56
200	.45	.43
100	.32	.25
0	0	0

The $\sqrt{n}$ approach is the one most generally used at the present time.

When we come to consider a less simple mathematical model and take note of the distribution of losses by size, we shall find that the distribution of credibility by volume of business will not necessarily follow the simple $\sqrt{n}$ rule.[10]

Another approach to credibility which has been tried in fire insurance is to measure credibility by the average annual variance of the ratio of incurred losses to earned premiums from the five year average.[11] The loss ratio should be first adjusted for trend, as indicated by the all classifications' loss ratios, and also for rate revisions; but even without these adjustments, a good idea of credibility can be obtained by noting the amount of stability in loss ratios from year to year.

In addition to the papers referred to above the problem of partial credibility has been studied extensively by Arthur L. Bailey[2, 12, 13].

8. STABILITY IN RATE REVISIONS

A rate-level determination upon statisical foundations is always a compromise between the two conflicting considerations of responsiveness to recent experience indications and stability sufficient to avoid frequent and undue disturbances in the field.

—T. O. Carlson and L. H. Longley-Cook[14]

We must always remember insurance is a business and rates and premiums are more than mere statistical developments. They determine the actual sums

[10] Robert L. Hurley, A Credibility Framework for Gauging Fire Classification Experience—CAS XLI, p. 161 (1954)

[11] Experience Credibility Formula—Middle Department Association of Fire Underwriters (1949)

[12] Sampling Theory in Casualty Insurance—CAS XXIX, p. 50 (1942) and CAS XXX, p. 31 (1943).

[13] A Generalized Theory of Credibility—CAS XXXII, p. 13 (1945)

[14] Multiple Line Insurance—Michelbacher p. 98, McGraw-Hill (1957)

of money payable for insurance coverage and these sums may be considerable. While it is essential that premium rates correctly follow overall trends, year to year fluctuations in rates can prove most unfortunate. Such fluctuations not only cast doubt in the mind of the public and of regulatory authorities on the correctness of the rate making procedure, but may have a number of side effects, such as leading to the cancellation and rewriting of a number of policies prior to expiration.

The method of establishing partial credibility in Section 7, while having a reasonable plausibility and the sanction of long practical use, is open to quite serious criticism. Where the volume of current data is small, the volume of past data on which the old rates were based will almost invariably be small also and hence the relative weights to be given to old and new data should be much the same whatever the volume of data. If we are concerned with revising a rate for some special class of insurance which is in no way related to any other class, the partial credibilities developed in the previous section are probably too small and higher credibility factors are almost certainly desirable. However, such cases rarely occur in practice and, as we shall see in the next section, individual rates are normally part of a pattern of rates which cannot be ignored at a rate revision. It is mainly for this reason that the system of partial credibilities has proved satisfactory in practice.

The actuary will normally seek, by suitable grouping, to establish a body of associated data which is sufficiently large to be fully credible for determining the overall rate level. Thus he will group together all private passenger automobile liability insurance in the State of Pennsylvania, all fire insurance in California, all personal property floater business nationwide, etc. Subgroups within these broad groups will not normally be fully credible and the partial credibility techniques discussed in the previous section will be used for rate revisions. The indicated rate revisions so developed will usually be adjusted by rule or by judgment to avoid major variations in individual rates. Unless the overall data indicate a major change in rate levels, it is often the rule to limit individual revisions to increases or decreases of 25%.

9. RATE RELATIVITIES

In the several papers in our Proceedings and in the Transactions of the Actuarial Society of America dealing with compensation premium or rate making, the starting point has been a classification pure premium derived by the well-known formula, $\pi = L/P$. It has been generally recognized that it will be impossible to determine the pure premiums in this way for each classification, and that some process of association must be resorted to in order to develop premiums for those classifications where the data is insufficient.

—Albert H. Mowbray[15]

When we come to consider the revision of any important body of rates such as Fire insurance in New York or Automobile Liability insurance in

[15] The Determination of Pure Premiums for Minor Classifications on which the Experience Data is Insufficient for Direct Estimate—CAS II, p. 124 (1915)

Pennsylvania, we normally have a volume of data which is fully credible for the purpose of determining the overall rate level which is required. However, each of these major classes includes a very large number of subclasses and there will never be sufficient data to provide credible rate revisions for each individual rate. Most rating systems contain patterns of association between various rates to which the term "rate relativities" is applied. Thus, for each sub-territory of an individual state, there will be a relationship between the liability rates for various driver classifications which will follow a definite pattern. The determination of these patterns is one of the most important parts of rate making. In, for example, the complex problem of schedule rated fire insurance risks, the various relativities depending upon types of construction are based almost entirely upon engineering judgment; in less complex rating plans, the assumption is made that the rates in one classification are related by some simple rule to the corresponding rates in another classification. The rule, which may be based on judgment alone or may be derived by some special study, will usually take the form of a percentage or constant differential but more complex rules are occasionally used. To make this method clear let us suppose that the rates for a certain type of insurance within a certain state have three types of classification: (1) territorial, (2) type of insured, (3) degree of inherent hazard. If there are five breakdowns in each classification—five territories, five types of insured, etc.—there will be $5 \times 5 \times 5 = 125$ subgroups of the data, no one of which could be individually credible. If however we assume that the change in rates between territories raises or lowers all rates in equal proportion, then by grouping all data by territory only with the necessary adjustments to reflect differences in distribution by the other classifications we can establish territorial differentials with a reasonable degree of credibility. By regrouping the data in other ways, other classification differentials can be established. We may liken our statistics to a large crumbly loaf cake, which we may cut in slices to obtain easily edible helpings. The method of slicing may be chosen in different ways—across the cake, lengthwise down the cake, or even in horizontal slices—but only one method of slicing may be used at a time. If we try to slice the cake more than one way at a time, we shall be left with a useless collection of crumbs.

It has been pointed out earlier that the combination of stock and mutual data will not normally provide a more credible estimate of the overall rate level because the experience of the two groups may be fundamentally different; however, such a combination and other similar combinations will usually provide more credibility in establishing rate relativities between subclasses.

Recently Robert A. Bailey and LeRoy J. Simon[16] have suggested that with modern electronic computors it should be possible to determine classification rate relativities in a single procedure giving the correct credibility weight to each subdivision of the data. This development would be a valuable advance in rate making techniques if we could introduce into the input not only the total data but also certain judgment rules which would insure an orderly pattern in the rate relativities.

It will be noted that in rate revisions we try to avoid as much as possible the use of data with only partial credibility and thus keep the rates as re-

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[16] Two Studies in Automobile Ratemaking—CAS XLVII, p. 1 (1960)

sponsive as possible to the latest data. Where this is not possible, we must use credibility techniques and judgment to maintain a stable rate structure.

10. DISTRIBUTION OF LOSSES BY SIZE—THE SECOND MODEL

> *As the pure premium is the accident frequency multiplied by the average claim cost, we must see how possible variations in the average claim cost affect the pure premium and how we must modify our credibility requirements accordingly.* —Francis S. Perryman[8]

Arthur L. Bailey[12] in a discussion of the distribution of losses by size writes,

> "The various distributions of claims by size of claim are uniform in that they all exhibit a concentration of frequency at the low amounts with a tapering off of the frequencies up to and including very high amounts. This produces a skewness far in excess of that usually encountered in the study of frequency distributions. The only type of frequency distribution which has been found to fit these distributions of claims by size is the Normal Logarithmic Distribution. Tests of the goodness of fit of this type of distribution have indicated that, except for the concentration of claims at such round-figures values as $50, $100, $500 and $1,000, the departures of the actual distributions from the Normal Logarithmic are not greater than would frequently occur in samples of the size tested."

It may be explained that the Normal Logarithmic or Log-normal distribution implies that, if a curve is plotted of the distribution of the logarithms of the amounts of individual claims, a normal curve will result. Arthur L. Bailey in the same context goes on to state,

> "The only condition necessary to produce a Normal Logarithmic Distribution is that the amount of an observed value be the product of a large number of factors, each of which is independent of the size of any other factor. Reflection as to the conditions entering into the determination of the amount of a claim settlement in casualty insurance, the variations in the seriousness of accidents for which claims are made, and all of the factors eventually recognized in making the final settlement makes it apparent that the necessary condition is at least approximated in the data with which we are concerned. When this condition is met, the logarithms of the observations become the sum of a large number of independent elements, which is the only condition necessary to result in a Normal Distribution. Thus, we shall expect to find the logarithms of the claim amounts normally distributed."

The generalized Normal Logarithmic Distribution provides an additional degree of freedom in fitting to actual conditions by adding or subtracting a constant amount to each loss before taking the logarithm and fitting the curve in the manner described. Arthur L. Bailey uses this distribution in much of his work. Robert A. Bailey[17] has found indications that the log-normal distribution is approximate also to fire insurance.

In our second model we assume that the probability of accident in any

[17] Experience Rating Reassessed—CAS XLVIII, (1961)

period of time is the same for each individual exposure and that it is proportional to the time exposed as in our first model; but instead of assuming that the amount of each loss is the same, we assume that the amount of each loss is distributed by some frequency curve which may be expressed as a log-normal curve or some other appropriate curve. The effect of this assumption is to increase considerably the number of claims required for full credibility of pure premiums and other functions involved in rate making. The mathematical development of these credibility standards is set out in Appendix C. As already explained, this does not alter the standards of full credibility used in practice, but it is important, for example, in showing that a trend factor based on two averages of equal volume requires twice as many claims in each average to produce the same level of credibility.

With models of this nature, we can approach more complex problems of relative credibilities such as the credibility requirements for various types of fire insurance classifications. Robert L. Hurley[10] develops a table of credibilities for Dwellings, Mercantile Contents and Manufacturing fire insurance risks which specifies the following volumes of premium for full credibility:

Dwellings	$ 2,000,000
Mercantile Contents	16,000,000
Manufacturing	60,000,000

The importance of these figures lies not in their absolute amounts, but in showing how much more readily dwelling experience acquires full credibilty than does the experience of commercial risks.

The development of the basic formulae for the distribution of insurance statistics due to chance fluctuations only, when we have a skew distribution of losses by size combined with a distribution of the number of losses according to the Poisson formula, has been worked out in detail by Arthur L. Bailey[12].

11. CREDIBILITY AND EXPERIENCE RATING PLANS

The problem of experience rating arises out of the necessity, from the standpoint of equity to the individual risk, of striking a balance between class-experience on the one hand and risk experience on the other. —Albert W. Whitney[9]

Experience rating plans, which first developed in the rating of Workmen's Compensation Risks, are as old as the Casualty Actuarial Society itself and are an important application of actuarial theory to insurance rate making. Such plans are used in practically all branches of casualty insurance and have recently been used for various types of property coverage.

Arthur L. Bailey[12] has pointed out that there are two kinds of credibility; the one we have so far discussed for rate revisions and the one used in experience rating plans. He calls the first the "limited fluctuation credibility" and the other the "greatest accuracy credibility". While the purpose of the formulae used in these two applications of credibility are not the same, it is difficult to accept such a simple definition in either case. While limiting fluctuations is important in rate revisions, responsiveness to trends is even more important and higher standards for full credibility would be used if we were concerned only with rate stability. Experience rating plans are so varied that one cannot help concluding that competitive expediency has played an important part in their design and there is some doubt that the majority of formulae give sufficient credibility to the individual experience to justify the appellation "most accurate".

Experience rating plans provide an adjustment in manual rates to reflect the experience of the individual risk; in the most usual form of plan the premium charged is in the form

$$\text{Manual Premium x} \left[1 - Z + Z \frac{A}{E} \right]$$

where A and E are the actual and expected losses and Z is the credibility factor. It will be noted that when $Z = 0$ the manual premium is charged; when $Z = 1$ the manual premium is adjusted in the ratio of the actual experience of the risk to expected experience of the risk under the manual premium plan. In the latter case the risk is said to be self-rated. The formulae actually used in experience rating plans are not so simple as this because they normally contain adjustments to reduce the effect of individual large losses.

Arthur L. Bailey[2] describes these adjustments as follows:

> "In addition to the relatively simple concept that more consideration or weight should be given to a greater volume of observational data, the casualty actuaries have devised credibility procedures to give more weight to the frequent occurrence of small losses than to the occasional or fortuitous occurrence of large losses of the same total amount. (It should be noted that negative losses cannot occur.) For example, the rate making procedure for workmen's compensation insurance separates the actual losses into 'Serious', 'Non-Serious' and 'Medical' losses and uses three differing schedules of credibility for the three components of the total loss. Several experience rating plans give a greater schedule of credibility to the first G dollars of each loss than is given to the excess of any loss over G dollars. The 'Multi-Split Experience Rating Plan' for workmen's compensation insurance carries this even further by providing, in effect, a separate schedule of credibilities for each interval of G dollars of which a loss is composed".

A discussion of the details of various experience rating plans would be out of place in this outline, but Robert A. Bailey[17] has set down the following criteria for such plans:

I. Each dollar of loss, or absence thereof, should contribute to the risk's adjusted rate an amount equivalent to the amount of information it provides regarding the future losses of the same risk for the same amount of exposure.

   A number of other criteria are imposed which are in the nature of limitations on this fundamental criterion. They are:

II. The risk's premium should not fluctuate widely from year to year. If it fluctuates too widely, the purpose of insurance is defeated.

III. One dollar of actual loss should not increase the adjusted losses by more than one dollar.. Otherwise the insured might find it to his advantage to pay his own losses. (The term "adjusted losses" means the weighted average of the actual and expected losses which is used to determine the adjusted rate for the risk.)

IV. The experience rating plan should not be too expensive to administer.

It is also desirable to quote the conditions which the credibility Z should satisfy as formulated by Francis S. Perryman[18].

(i) The credibility should be not less than zero and not greater than unity.
(ii) The credibility should increase (or more strictly speaking not decrease) as the size of the risk increases.
(iii) As the size of the risk increases the percentage charge for any loss of given size should decrease.

The Educational Committee of the Casualty Actuarial Society is preparing a students' guide to Experience Rating which will provide a fuller introduction to this important field.

12. VARIATIONS IN INHERENT LOSS FREQUENCY—THE THIRD MODEL

It is recognized that individual risks within a classification are not alike and that there exist inherent differences . . . These differences are of such a nature that it is difficult to label them definitely and they cannot be associated with conditions measureable in advance.

—Paul Dorweiler[19]

In order to establish rating plans data are classified into a large number of breakdowns. For example in private passenger automobile insurance, there are classifications by state, territory within the state, type of automobile, use of automobile, age of automobile and age and sex of driver. Rates are established for each combination of these classifications; and in the models we have so far developed, we assume that the probability of accident is the same for all exposures in any single combination of classifications. The probability of accident (all other factors being equal) will not vary by a marked jump as we proceed over the boundary line from one territory to another but will vary continuously as we move across the state. Practical necessity calls for the use of a limited number of classifications which are chosen on a judgment basis to provide groups of reasonable homogeneity, but it is clear that there must be variation in the true probability within a single classification group. However, there is every reason to believe that there is considerably more heterogeneity in each group than that suggested by the above argument. The criteria used to determine classifications are not the only possible ones. For example mileage, horsepower, occupation and many other classifications are possible in automobile insurance. There can be no question that in most cases an actual classification will embrace quite a wide distribution of probabilities of accident. For this reason we assume in our third model that the probability of accident within a classification is not fixed but is distributed over a range defined by some frequency curve.

It is usual to assume that the distribution of probabilities of accident within the classification follow a Pearson Type III curve because this is a

[18] Experience Rating Credibilities—CAS XXIV, p. 60 (1937)

[19] Presidential Address—CAS XXI, p. 1 (1934)

skew form and because it leads to a conveniently simple equation for fitting. It is further assumed that the probability for a given individual remains constant throughout the experience period. The result of this is to replace the Poisson Distribution by the Negative Binomial Distribution in the model.[20, 21, 22] It is sometimes possible to experiment with this more accurate model and to avoid, at least in preliminary studies, the rather extensive arithmetic of the negative binomial distribution, by substituting a three-point or five-point probability distribution.[23] Thus we may assume ½ the exposures have a probability of accident within one year of .10; ¼ a probability of .05 and ¼ a probability of .15. A skew distribution can, of course, be used. While this method is often helpful in preliminary studies, it may, when used by the inexperienced, suggest misleading results.

In testing certain actual automobile experience against the model, using the negative binomial distribution, excellent agreement between actual and theoretical distributions was observed.[24] This model has been found to be particularly helpful in the field of merit rating discussed in the next section.

13. MERIT RATING

In writing private passenger automobile liability insurance there has always been a need for underwriters to select the good business and turn down the poor because the rate classification system has never been perfect.

—Robert A. Bailey[25]

In the third model described in the preceding section, we have assumed that within each classification there is quite a wide range of variation in the probability of loss; we have also assumed that the probability remains constant for a given individual. This suggests a new form of classification which depends on the loss history of the individual and varies the classification according to the period elapsed since the last loss or to the number of losses in a recent period of time. It is not difficult to show that, on the basis of the model, significantly different class rates will develop for risks classified in this manner. Variation of rates according to loss history is used in private passenger automobile, homeowners and other lines of insurance and is called merit rating. Such rating is usually associated with other forms of classifications. Sometimes merit rating is determined not only by actual loss history, but also by a combination of loss history and of some data closely correlated to the potential loss experience such as traffic violation records. It is necessary, of course, to test the appropriateness of the model

[20] Lester B. Dropkin, Some Considerations on Automobile Rating Systems Utilizing Individual Driving Records—CAS XLVI, p. 165 (1959)

[21] LeRoy J. Simon, The Negative Binomial and Poisson Distributions Compared—CAS XLVII, p. 20 (1960)

[22] Charles C. Hewitt, Jr., The Negative Binomial Applied to the Canadian Merit Rating Plan for Individual Automobile Risks—CAS XLVII, p. 55 (1960)

[23] This approach is similar to the n-ages method of approximate valuation in life insurance.

[24] LeRoy J. Simon, Fitting Negative Binomial Distributions by the Method of Maximum Likelihood—CAS XLVIII, (1961)

[25] Any Room Left for Skimming the Cream?—CAS XLVII, p. 30 (1960)

against the actual development of experience under a merit rating plan and this test has proved satisfactory.

Considerable misunderstanding exists about the principles of merit rating[26] because of failure to realize that merit rating is a system of classification to which the normal credibility criterions for rate making apply. A merit rated risk is one of a large class of similar risks all of which meet certain classification standards including one defined in terms of past loss experience. Normal rate making methods can be used to develop the correct rate relativities under such a plan. Such relativities are called merit credits and debits.

Robert A. Bailey[25] in the paper from which the quotation at the head of this section is taken discusses some of the impact of merit rating upon existing classification plans. A point not touched upon is that since the distribution of loss frequency within the separate territorial and other classifications is not uniform, the introduction of merit rating, particularly if the credits and debits are large, may well lead to a reduction in the rate differentials required for territorial and other classifications and could possibly lead to a simplification in the overall classification system.

A number of important papers on merit rating have been published in recent volumes of the Proceedings of the Casualty Actuarial Society; and reference should be made to these for further discussion of this aspect of credibility.[16, 20, 27, 28, 29, 30]

The following conclusions from one of these studies[28] provides a fitting ending to this section.

"In summary, we feel that the Canadian merit rating data for private passenger cars leads to the following conclusions:

(1) The experience for one car for one year has significant and measurable credibility for experience rating.

(2) In a highly refined private passenger rating classification system which reflects inherent hazard, there would not be much accuracy in an individual risk merit rating plan, but where a wide range of hazard is encompassed within a classification, credibility is much larger.

(3) If we are given one year's experience and add a second year we increase the credibility roughly two-fifths. Given two years' experience, a third year will increase the credibility by one-sixth of its two-year value."

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[26] LeRoy J. Simon, Merit Rating Myths and Mysteries—Automobile Insurance Rate Making. Casualty Actuarial Society, 1961

[27] Herbert E. Wittick, The Canadian Merit Rating Plan for Individual Automobile Risks —CAS XLV, p. 214 (1958)

[28] Robert A. Bailey and LeRoy J. Simon, An Actuarial Note on the Credibility of Experience of a Single Private Passenger Car—CAS XLVI, p. 159 (1959)

[29] Frank Harwayne, Merit Rating in Private Passenger Automobile Liability Insurance and the California Driver Record Study—CAS XLVI, p. 189 (1959)

[30] Lester B. Dropkin, Automobile Merit Rating and Inverse Probabilities—CAS XLVII, p. 37 (1960)

14. REINSURANCE, SURPLUS PROBLEMS, ETC.

> *The object of the theory of risk is to give a mathematical analysis of the random fluctuations in an insurance business and to discuss the various means of protection against their inconvenient effects.*
>
> —Harold Cramer[31]

The third model introduced earlier provided for variations of losses by size and for variations in the individual probabilities of loss. We have so far applied this model to discuss classification rate making, but the same or similar models can be applied to a whole class of business or, indeed, to the whole portfolio of an insurance company. Such a model can be used to study many problems in reinsurance, particularly excess of loss and stop loss coverages. Again it can be used to determine retention limits when these are dependent on capacity alone and not on underwriting or other considerations.

The model, with appropriate developments, can be further used to discuss surplus requirements and similar problems. There is an extensive literature on this subject under the general title of the Theory of Risk, mostly published in Western Europe. No attempt has been made to include these writings in the bibliography in Appendix A.

15. CONCLUSION

> *—the business finds itself with still a large number of problems on its hands, many of which we know the actuary will eventually have to solve. Let him, therefore—the casualty actuary about whom I have been talking—continue to grapple with these problems, knowing full well that he has an enormous advantage in the possession of a scientific mind and of scientific methods; with these he will, on his merits, be called on to play a larger and most responsible part in the business of casualty insurance.*
>
> —Francis S. Perryman[32]

The above remarks from a Presidential Address to the Casualty Actuarial Society in 1939 are as true today as when they were spoken, further the duties of the actuary now extend to the property insurance as well as to casualty insurance. In this brief outline, an attempt has been made to provide the reader with a simple framework into which he can place the very large number of important contributions to credibility theory which have appeared in the Proceedings of the Casualty Actuarial Society. There is still much opportunity for original and important research in the field, even in the areas covered by the models already discussed. Particularly in the area of experience rating, much work and testing is needed.

Except for its application to merit rating, little practical use has been made so far of the third model, which recognizes the diversity of risks within an individual classification. Considerable development of the mathematics required for this field of study, when the skew distribution of losses by size

[31] On the Mathematical Theory of Risk, Skandia Jubilee Volume, Stockholm (1930)
[32] Presidential Address—CAS XXV, p. 291 (1939)

is also considered, has been undertaken by Arthur L. Bailey[12] and further study should lead to important developments.

The third model assumes that the loss frequency distribution is not correlated in any way with the probability of loss. It seems probable that within any classification group, the average amount of an individual loss of those persons with a low loss frequency may well be lower than the general average amount of loss for the group as a whole. The study and testing of models reflecting this idea may well lead to larger merit rating credits than are at present customary in the United States and Canada. Again, it is not entirely true that the probability of an accident remains constant for any one individual. The fluctuation which occurs in use of an automobile over the year must be reflected in the probability of accident. Further, an automobile driver is likely to show special caution in a short period immediately following an accident and only slowly return to his pre-accident standards. Also, since there is a correlation between age of driver and accident proneness, there must be trends in probability of an individual having an accident. The construction *and testing* of new models is an important field of actuarial study, which will provide one of the most powerful means of attacking those problems which are still unsolved and the new problems which will arise in the future.

In conclusion the development of credibility theory is one of the more important aspects of actuarial science. Much has been accomplished in the nearly fifty years since the formation of the Casualty Actuarial Society, but more remains to be done. It is hoped that this brief outline will help the reader to obtain a grasp of the principles involved, or, if he is already familiar with the subject, to reassess some of the problems still awaiting final solution. It is perhaps necessary to stress that credibility procedures are not a substitute for informed judgment, but an aid thereto. Of necessity so many practical considerations must enter into any actuarial work that the student cannot substitute the blind application of a credibility formula for the careful consideration of all aspects of an actuarial problem.

Appendix A

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IV. *Mathematical Theory of Risk*

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Appendix B

The Poisson Distribution[33]

If the time interval of exposure is made sufficiently small the number of claims (including multiple claims as single claims) arising from a single exposure unit will be either zero or one. The distribution of the sum of the claims from all exposure units is then described by the binomial distribution.

Let q represent the true probability of a claim occurring in one year, and let n represent the number of exposure units with the yearly claim frequency q.

Then, the probability that the total number of claims will be exactly r out of ns trials, where s is large enough so that for each of the n exposure units not more than one claim will occur in time interval 1/s, is given by the (r + 1) th term in the expansion of the binomial $[(1 - q/s) + q/s]^{ns}$, where q/s is the probability of the occurrence of one claim in the time interval 1/s. This (r + 1) th term is

$$_{ns}C_r \, (1 - q/s)^{ns-r} \, (q/s)^r$$

The probability P that the number of accidents in ns trials will be within $\pm$ 100k% of nq (= ns.q/s = the expected value of r) is therefore equal to

$$\sum_{r=(1-k)nq}^{r=(1+k)nq} {}_{ns}C_r \, (1 - q/s)^{ns-r} \, (q/s)^r$$

By using Stirling's formula for factorials, it can be shown that this expression is approximated by

$$P = \frac{2}{\sqrt{2\pi \, nq}} \int_0^{knq} e^{\frac{-x^2}{2nq}} dx$$

as s becomes very large, and where n is large and k is not large.

---

[33] From a memorandum prepared by the National Bureau of Casualty Underwriters in 1949.

It may be shown that as s becomes large

$$ {}_{ns}C_r \, (1 - q/s)^{ns-r} \, (q/s)^r \text{ approaches } \frac{e^{-nq} (nq)^r}{r!} $$

which is the general term of the Poisson distribution of r with expected value nq. Thus, the expression for P is equally valid under the assumption that the number of claims has a Poisson distribution.

Change the variable to $t = x/\sqrt{nq}$, so that

$$ P = 2 \left[\frac{1}{\sqrt{2\pi}} \int_0^{k\sqrt{nq}} e^{-\frac{t^2}{2}} dt \right] $$

The upper limit of the integral in the brackets corresponding to a given value of P may be read from tables of the standard normal integral. Then the expected number of claims, nq, may be calculated for any given value of k. For example, if P = .95, a table of values of the integral shows that

$$ k\sqrt{nq} = 1.960, \text{ and if } k = .075 $$

$$ nq = \left(\frac{1.960}{.075} \right)^2 = 683 \text{ claims.} $$

Appendix C

Relationship of Credibility Standards for Claim Frequencies, Claim Costs, Pure Premiums and Trends[34]

The credibility tables commonly used in rate making are developed as the credibility of the claim frequency. For example, if the expected number of claims is 1082, the actual number will be within 5% of 1082 90% of the time. The formula is based on the Poisson distribution and the number of claims for 100% credibility is derived from the formula P^2/K^2 where $\pm$ P are the values of the normal curve corresponding to a selected probability, and K is the selected deviation from the expected. In the example cited above, the probability is 90%, P = 1.645 and K = .05.

If we need P^2/K^2 claims to provide a selected level of credibility for the claim frequency, how many claims do we need to provide the same level of credibility for the claim cost, the pure premium and trends?

DEFINITION OF SYMBOLS

N	= number of intervals each exposure year is divided into
Y	= number of exposure years
NY	= number of exposure intervals
M_f	= average claim frequency per exposure interval
M_c	= average cost per claim
M_{pp}	= $M_f M_c$ = average cost per exposure interval

[34] From a memorandum prepared by Robert A. Bailey

S_f^2 = variance of claim frequency
S_c^2 = variance of claim cost
S_{pp}^2 = variance of pure premium per exposure interval
$NY\ M_f$ = expected number of claims
P = value on the normal curve corresponding to a selected probability
K = selected deviation from the expected average.

The number of claims which provides the selected level of credibility is determined as follows:

Claim Frequency

$$KM_f + S_f/\sqrt{NY} = P$$
$$NYM_f = P^2/K^2 \times S_f^2/M_f$$
$$NYM_f = P^2/K^2, \text{ since } S_f^2 = M_f$$

Claim Cost

$$KM_c + S_c/\sqrt{NYM_f} = P$$
$$NYM_f = P^2/K^2 \times S_c^2/M_c^2$$

Pure Premium

$$KM_{pp} + S_{pp}/\sqrt{NY} = P$$
$$NYM_f = P^2/K^2 \times S_{pp}^2/M_c^2M_f$$
$$NYM_f = P^2/K^2 \times (1 + S_c^2/M_c^2)$$

since

$$S_{pp}^2 = \Sigma C^2/NY - (\Sigma C/NY)^2$$

but $(\Sigma C/NY)^2$ becomes insignificant as N is increased therefore

$$S_{pp}^2 = \Sigma C^2/NY$$
$$S_{pp}^2 = M_f\left[(\Sigma C/NYM_f)^2 + \Sigma C^2/NYM_f - (\Sigma C/NYM_f)^2\right]$$
$$S_{pp}^2 = M_f(M_c^2 + S_c^2)$$

Trends

The trend is actually a measurement of the difference between two averages. The variance of the difference between two independent variables is the sum of the variances of the two variables. This means that if two averages are based on approximately the same volume of experience, twice as many claims are needed in each average to produce the same level of credibility in the difference between them. If one average is based on twice or four times as much experience, then 1½ or 1¼ as many claims, respectively, are needed in the average based on the fewer claims to produce the same level of credibility in the difference.

Summary

If the expected number of claims needed to produce a selected level of credibility for the claim frequency is taken as 1, the number required to produce the same level of credibility is S_c^2/M_c^2 for the claim cost, and 1 plus S_c^2/M_c^2 for the pure premium. S_c^2/M_c^2 can be determined from a distribution of claims by size of claim and for most lines of insurance it ranges between 2 and 4. A trend factor based on two averages of equal volume requires twice as many claims in each average to produce the same level of credibility.

MINUTES OF THE MEETING

November 14, 15 and 16, 1962

HOTEL WARWICK, PHILADELPHIA, PENNSYLVANIA

The November 1962 meeting of the Society convened at 1:50 P.M. with the following 89 Fellows, 39 Associates and 36 Invited Guests in attendance:

FELLOWS

Allen, E. S.
Bailey, R. A.
Balcarek, R. J.
Barber, H. T.
Barker, G. M.
Bennett, N. J.
Berkeley, E. T.
Berquist, J. R.
Bevan, J. R.
Bondy, M.
Bornhuetter, R. L.
Carlson, T. O.
Coates, C. S.
Crowley, J. H., Jr.
Curry, H. E.
Day, E. W.
Dickerson, O. D.
Dropkin, L. B.
Elliott, G. B.
Espie, R. G.
Finnegan, J. H.
Fitzgibbon, W. J., Jr.
Foster, R. B.
Fowler, T. W.
Gillam, W. S.
Goddard, R. P.
Graham, C. M.
Graves, C. H.
Harwayne, F.
Haugh, C. J.
Hazam, W. J.
Hewitt, C. C., Jr.
Hobbs, E. J.
Hunt, F. J., Jr.
Hurley, R. L.
Johe, R. L.
Johnson, R. A.
Kallop, R. H.
Kates, P. B.
Klaassen, E. J.
Kormes, M.
Leslie, W., Jr.
Linder, J.
Lino, R.
Livingston, G. R.
Longley-Cook, L. H.
MacKeen, H. E.
Magrath, J. J.
Makgill, S. S.
Masterson, N. E.
McConnell, M. H.
McGuinness, J. S.
McNamara, D. J.
Menzel, H. W.
Morison, G. D.
Moseley, J.
Muetterties, J. H.
Murrin, T. E.
Niles, C. L., Jr.
Perkins, W. J.
Petz, E. F.
Phillips, H. J., Jr.
Pruitt, D. M.
Resony, A. V.
Roberts, L. H.
Rodermund, M.
Rowell, J. H.
Salzmann, R. E.
Schloss, H. W.
Simon, L. J.
Simoneau, P. W.
Skelding, A. Z.
Smith, S. E.
Stankus, L. M.
Sykes, Z. M.
Tapley, D. A.
Tarbell, L. L., Jr.
Thomas, J. W.
Trudeau, D. E.
Valerius, N. M.
Walsh, A. J.
Wieder, J. W., Jr.
Wilcken, C. L.
Williams, P. A.
Williamson, W. R.
Wilson, J. C.
Wolfrum, R. J.
Wright, B.
Yount, H. W.

ASSOCIATES

Aldrich, W. C.
Blumenfeld, M. E.
Buffinton, P. G.
Carson, D. E. A.
Curry, A. C.
DeMelio, J. J.
Ehlert, D. W.
Even, C. A., Jr.
Flack, P. R.
Gerundo, L. P., Jr.
Gillespie, J. E.
Ham, H. P.
Hillhouse, J. A.
Jensen, J. P.
Jones, N. F.
Margolis, D. R.
McDonald, M. G.
McIntosh, K. L.
McLean, G. E.
Mohnblatt, A. S.
Muir, J. M.

Nelson, S. T.
Peel, J. P.
Portermain, N. W.
Riccardo, J. F., Jr.
Richards, H. R.
Richardson, H. F.
Royer, A. F.
Scammon, L. W.
Shaver, C. O.
Smith, E. R.
Stern, P. K.
Stevens, W. A.
Stoke, K.
Strug, E. J.
Switzer, V. J.
Verhage, P. A.
Woodworth, J. H.
Young, R. G.

INVITED GUESTS

Borch, K.
*Burney, C. T.
*Callahan, W. E.
Cooper, W. P.
*Crain, J.
*Donovan, H. G.
Donovan, J. B.
Feay, H. L.
*Foody, W. M., Jr.
Gill, J. F.
Gilmartin, E. M.
*Hoyt, F. A.
Idler, J. F.
*Jones, C. R., Jr.
Kahn, P. M.
Kedrow, W. M.
Kenny, R.
*Knowlan, F.
Larson, A. W.
Marshall, R. E.
*Nagel, J. R.
O'Brien, L. W.
Perlet, H. F.
*Porch, C. C.
*Rathert, K. R.
Redd, T. B.
*Reiner, J. G.
*Rogers, D. J.
Sabbagh, M. J.
Smith, S. H.
Splaver, M. M.
*Staley, H. B.
*Strong, H L.
Tompa, P. M.
Van Orman, F.
Wells, C. C.

* Participants in Invitational Program.

After a short address of welcome by President Laurence H. Longley-Cook a Panel Discussion on, "Ratemaking in the Future," was held.

Chairman—Hubert W. Yount, Executive Vice President
Liberty Mutual Insurance Company.

PANEL MEMBERS

1. Harold E. Curry, Vice President
State Farm Mutual Automobile Insurance Co.
"Ratemaking and Pricing in the Marketplace"
2. James B. Donovan, Attorney
Member of the firm Watters & Donovan
"Regulation of Ratemaking"
3. William Leslie, Jr., General Manager
National Bureau of Casualty Underwriters
"Establishing Net Rates Excluding Expenses"
4. Joseph M. Muir, General Manager
Mutual Insurance Advisory Association
and Mutual Insurance Rating Bureau
"Problems of Rating Organizations"
5. Seymour E. Smith, Vice President and Actuary
Travelers Insurance Company
"Multiple Peril Rate Making and Statistical Problems"

After the panel members had completed their presentations of the subtopic assigned there was an exchange of comments and questioning directed by the individual members of the panel to the other members of the panel. This was followed by comments and questions from the floor.

This part of the November 1962 meeting was adjourned at 4:30 P.M.

The meeting reconvened at 9:15 A.M. on November 15 with the presentation of the report of the Secretary-Treasurer on receipts and disbursements for the fiscal period October 1, 1961 through September 30, 1962. During this period receipts exceeded disbursements by $3901.70. Copies of the detailed financial statement which will be printed in Volume XLIX, were made available to the membership at the meeting.

Seymour E. Smith, Chairman of the Nominating Committee, reported that, based on a tabulation of the ballots previously distributed to the Fellows of the Society, the Nominating Committee recommended the election of the following:

President	Laurence H. Longley-Cook*
Vice President	Thomas E. Murrin*
Vice President	Richard J. Wolfrum*
Secretary-Treasurer	Albert Z. Skelding*
Member of Council	Robert A. Bailey
Member of Council	Martin Bondy
Member of Council	Charles C. Hewitt, Jr.

*Incumbent

These nominations being seconded and there being no further nominations from the floor, the foregoing were duly declared elected.

The gathering was then informed that the council, subject to confirmation by the Fellows of the Society as required by Article V of the Constitution, had elected the following:

Editor	Harold W. Schloss*
Librarian	Richard Lino*
General Chairman of Examination Committee	Norman J. Bennett

*Incumbent

The Fellows present voted to approve the action of the Council and the foregoing were then declared elected to the post of Editor, Librarian and General Chairman of the Examination Committee respectively.

The President then announced that subsequent to the November 1961 meeting the Secretary-Treasurer had been notified of the following deaths:

Richard Fondiller (Fellow)	Edward Olifiers (Fellow)
Maurice L. Furnivall (Associate)	Otto C. Richter (Fellow)

Diplomas were then presented to the 8 new Fellows and announcement was made of the enrollment of 14 new Associates:

FELLOWS

RAFAL J. BALCAREK
Assistant Actuary
Standard Accident Insurance Co.
640 Temple Avenue
Detroit 32, Michigan

DANIEL J. MCNAMARA
Secretary
Nat. Bur. of Casualty Underwriters
125 Maiden Lane
New York 38, N. Y.

JAMES J. MEENAGHAN
Assistant Actuary
Nat. Bur. of Casualty Underwriters
125 Maiden Lane
New York 38, N. Y.

GEORGE D. MORISON
Actuarial Assistant
Actuarial Department
Aetna Casualty & Surety Co. and
Standard Fire Insurance Co.
151 Farmington Avenue
Hartford 15, Connecticut

R. WILLIS PARLIN
Actuary
Mutual Service Insurance Cos.
1919 University Avenue
St. Paul 4, Minnesota

LEO M. STANKUS
Actuary
Allstate Insurance Co.
7447 Skokie Boulevard
Skokie, Illinois

DONALD E. TRUDEAU
Actuarial Assistant
Cas., Fire & Marine Actuarial Dept.
The Travelers Insurance Co.
700 Main Street
Hartford 15, Connecticut

ALBERT J. WALSH, JR.
Assistant Actuary
Liberty Mutual Insurance Co.
175 Berkeley Street
Boston 17, Massachusetts

ASSOCIATES

WILLIAM P. AMLIE
Statistical Department
Lumbermens Mutual Casualty Co.
4750 Sheridan Road
Chicago 40, Illinois

PHILIP G. BUFFINTON
Vice President
State Farm Fire and Casualty Co.
Bloomington, Illinois

DAVID E. A. CARSON
Actuarial Department
Hartford Insurance Group
690 Asylum Avenue
Hartford 15, Connecticut

ALAN C. CURRY
Assistant Actuary
State Farm Mutual Automobile Ins. Co.
112 East Washington Street
Bloomington, Illinois

CHARLES A. EVEN, JR.
Cas., Fire & Marine Actuarial Dept.
The Travelers Insurance Co.
700 Main Street
Hartford 15, Connecticut

DANIEL FINKEL
Senior Statistician
The State Insurance Fund
199 Church Street
New York 7, N. Y.

LOUIS P. GERUNDO, JR.
Cas., Fire & Marine Actuarial Dept.
The Travelers Insurance Co.
700 Main Street
Hartford 15, Connecticut

JERRY A. HILLHOUSE
Ass't. Superintendent
Rating Division
State Farm Mutual Automobile Ins. Co.
112 East Washington Street
Bloomington, Illinois

JAMES P. JENSEN
Actuarial Assistant
Liberty Mutual Insurance Co.
175 Berkeley Street
Boston 17, Massachusetts

NEILL W. PORTERMAIN
Actuarial Specialist
Mutual Service Casualty Insurance Co.
1919 University Avenue
St. Paul 4, Minnesota

HENRY F. ROOD
Senior Vice President
Lincoln National Life Insurance Co.
1301-27 South Harrison Street
Fort Wayne, Indiana

EDWARD R. SMITH
Actuarial Department
Hartford Insurance Group
690 Asylum Avenue
Hartford 15, Connecticut

VERNON J. SWITZER
Superintendent
Rating Division
State Farm Mutual Automobile Ins. Co.
112 East Washington Street
Bloomington, Illinois

PAUL A. VERHAGE
Actuarial Analyst
Hardware Mutual Casualty Co.
200 Strongs Avenue
Stevens Point, Wisconsin

The gathering was then informed that beginning with the May 1963 examinations the General Mathematics part of the Associateship examinations would be a joint identical examination under the auspices of the Casualty Actuarial Society and the Society of Actuaries, and the General Mathematics examination would be held in May and November of each year.

President Laurence H. Longley-Cook then presented his Presidential Address "Actuarial Aspects of Industry Problems" which will appear in Volume XLIX of the Proceedings.

Following the Presidential Address the meeting recessed to enable the members to participate, in accordance with their previously indicated choice, in one of the following round-table discussions:

A. "New Developments in Package Policies"
Chairman, Gordon M. Barker

B. "Fire Insurance Development in Recent Years"
Chairman, Norman J. Bennett

C. "Surplus Lines Coverage—Current Uses and Rating Practices"
Chairman, Ernest T. Berkeley

D. "Merit Rating—Evaluation of Results To Date"
Chairman, William S. Gillam

E. "Management Data. Actuary's Role in Developing Meaningful Reports"
Chairman, Richard L. Johe

F. "Medical Care for the Aged. The Problem and Insurance Industry's Solution"
Chairman, W. Rulon Williamson

After the first session, from 10:15 A.M. to 11:15 A.M., there was a second session of these round-tables, from 11:30 A.M. to 12:30 P.M.

With the conclusion of the second round-table session, the November 1962 meeting of the CAS was recessed to reconvene at 9:15 A.M. the following day.

There was a brief Social Hour from 5:30 P.M. to 7:00 P.M. followed by a banquet at the Hotel Warwick. Following the banquet the gathering was privileged to hear an interesting talk by Past President Dudley M. Pruitt relating to his experiences in Japan from where Dudley had just returned after serving a tour of duty with the American Friends Service Committee.

At the November 16 session, the first order of business was consideration of the proposed Constitutional Amendment which had been bulletined to the membership under date of October 9, 1962.

John W. Wieder, Jr. then moved that the proposed amendment be adopted. This was seconded by Harold W. Schloss.

Charles C. Hewitt, Jr. then moved adoption of the following amendments to the Constitution Amendment as originally proposed:

1. In the first sentence of the third paragraph of the proposed amendment change "not more than one negative vote" to "not more than two negative votes."
2. Amend the second sentence of the fourth paragraph of the proposed Constitution Amendment to read "Otherwise, no one shall be admitted as a member unless recommended by a duly called meeting of the Council with not more than two negative votes in a secret ballot, followed by at least a three-fourths secret ballot of the Fellows present and voting at a meeting of the Society."

Mr. Hewitt's motion was seconded by Robert A. Bailey.

For further elucidation of the membership Norman J. Bennett, Chairman of the Temporary Committee on Rules and Procedures for Examinations, explained in detail that the proposed Constitutional Amendment was merely a revision of the Constitution to be consistent with the revised examination rules, particularly as respects waivers, which could not be put into effect unless appropriate changes were made in the Constitution.

After considerable discussion, and many questions from the floor, a vote was taken on the amendments offered by Mr. Hewitt. This was carried unanimously.

A vote was then taken on the original motion made by Mr. Wieder as amended by the foregoing action. This was carried with one negative vote.

At this point, the conducting of the meeting was turned over to Vice President Wolfrum.

Past President Norton E. Masterson then reported on activities and future programs of Astin and the International Congress of Actuaries.

Professor Karl Borch of Norway, visiting Professor at Princeton University, Economic Research Program, then presented a paper "Reformulation Of Some Problems In The Theory Of Risk."

The following new papers were presented:

1. "The Low Value Risk. A Study of the Premium Required For Habitational Risks of Various Policy Amounts" by P. G. Buffinton.

This paper was reviewed at the meeting by Frederic J. Hunt, Jr. and Robert L. Hurley.

2. "The Latest Reported Stock Insurance Company Expenses For 1961" by Frank Harwayne.
3. "Negative Binomial Rationale" by Thomas O. Carlson.

Reviews of previously presented papers were then given:

1. "An Introduction to the Negative Binomial and Its Applications" by LEROY J. Simon. Reviewed by Lester B. Dropkin and Lewis H. Roberts.
2. "Size, Strength and Profit" by LEROY J. Simon. Reviewed by Robert A. Bailey, Clyde H. Graves and Charles C. Hewitt, Jr. Mr. Simon then commented briefly on these reviews.

The November 1962 meeting of the CAS adjourned at 12:15 P.M.

Attachments: Financial Report of Secretary-Treasurer.
1962 Examinations—Successful Candidates.

FINANCIAL REPORT

Cash Receipts and Disbursements
from October 1, 1961 to September 30, 1962

Receipts

On deposit 10-1-61		$13,652.57
Members Dues	$10,737.00	
Sale of Proceedings	2,239.90	
Sale of Readings	6,987.22	
Examination Fees	3,367.50	
Luncheons and Dinners	2,475.00	
Interest on Bonds	243.76	
Michelbacher Fund	1,136.83	
Registration Fees	2,560.75	
Invitational Program	1,500.00	
Proceeds-Bonds on Maturity	4,000.00	
Foreign Exchange	—10.41	35,237.55
Total		$48,890.12

Disbursements

Printing & Stationery	$18,567.90
Secretary's Office	2,599.17
Examination Expense	2,194.98
Luncheons & Dinners	3,121.70
Library Fund	56.53
Insurance	47.40
Refunds—Lun. & Dins.	120.00
Refunds—Exam. Fees	61.00
Refunds—Regis. Fees	80.00
Refunds—Other	79.00
Purchase of Bonds	4,079.13
Miscellaneous	329.04
	$31,335.85
On deposit 9-30-62	17,554.27
Total	$48,890.12

Assets

Cash in Bank 9-30-62	$17,554.27
U. S. Savings Bonds	5,000.00
Total	$22,554.27

Liabilities

Surplus (Michelbacher Fund)	$13,641.74
Other Surplus	8,912.53
Total	$22,554.27

* * *

One U. S. Treasury Bond 3⅞% No. 24277 due for $1000 on May 15, 1968.

Two U. S. Treasury Bonds 3⅞% Nos. 3462-3 due for $1000 each on May 15, 1968.

Two U. S. Treasury Bonds 3⅞% Nos. 1673-4 due for $1000 each on November 15, 1974.

Employers' Fire Insurance Company Policy No. 31F23-85-62 for $5000 on books and book cases stored at 200 East 42nd Street and $2000 on material stored in library of Insurance Society of New York. Expires 9-14-67.

Fidelity Bond No. 044571 for $10,000 in Royal Indemnity Company.

Workmen's Compensation Policy No. 01-577362 in Maryland Casualty Company. Expires 5-10-63.

* * *

This is to certify that we have audited the accounts, examined all vouchers and investments shown above and find same to be correct.

October 23, 1962

HOWARD G. CRANE
Chairman, Auditing Committee

1962 EXAMINATIONS—SUCCESSFUL CANDIDATES

Following is a list of those who passed the examinations held by the Society on May 17 and 18, 1962:

ASSOCIATESHIP EXAMINATIONS

PART I	Adelstein, V. A.	Hull, L. G.	Price, E. E.
	Aminov, M. M.	Irwin, R. L.	Quinlan, J. A.
	Baine, M. B.	Kennedy, R. H.	Richardson, J. F.
	Batista, S.	Kennedy, T. A.	Richmond, G.
	Davis, R. C.	Lange, J. E.	Rogers, D. J.
	Dominguez, S.	Larson, R. M.	Romig, G. M.
	Douglas, D.	Levin, J. W.	Rose, J. C.
	Dunning, M. R.	Linquanti, A. J.	Rothenberg, L.
	Ford, H.	Lowe, R. F.	Schuler, R.
	Forker, D. C.	Matthews, J. L.	Sena, J. A.
	Frankovich, E.	Miller, D. E.	Sturgeon, P. K.
	Fulton, C. B., Jr.	Mulvihill, F. X.	Taylor, D. G.
	Glass, A.	Naffziger, J. V.	Wallace, A. B.
	Gregory, R. S.	Nelson, D. A.	Walton, H. L.
	Hartman, D. G.	Nelson, J. K.	Welch, J. P.
	Higgins, J. T.	Newman, S. H.	Williams, W. T.
	Holt, W. T.	Patricelli, A.	
PART II (a)	Baur, J. G.	Masterson, W. E., Jr.	Schuler, R.
	Blaha, J. M., Jr.	McClintock, J. S.	Sena, J. A.
	Bland, W. H.	Nelson, D. A.	Trees, J. S.
	Brian, R. A.	Quinlan, J. A.	Tucker, T. F.
	Cook, C. F.	Richardson, J. F.	Wilde, E. J., Jr.
	Durkin, J. H.	Richmond, G.	Williams, W. T.
	Faber, J. A.	Rose, J. C.	
	Finkel, D.	Ryan, K. M.	
PART II (b)	Baur, J. G.	Lorman, W. E.	Richmond, G.
	Bell, A. A.	Lowe, R. F.	Ryan, K. M.
	Carson, D. E. A.	Masterson, W. E., Jr.	Scheel, P. J.
	Dahme, O. E.	Mokros, B. F.	Torgrimson, D. A.
	Dunning, M. R.	Nelson, D. A.	Walton, H. L.
	Durkin, J. H.	Patricelli, A.	Welch, J. P.
	Dwyer, J. T.	Petersiel, A. S.	Williams, W. T.
	Forker, D. C.	Raid, G. A.	
	Kim, B. W.	Richardson, J. F.	
PART III (a)	Bell, A. A.	Forker, D. C.	Ryan, K. M.
	Bland, W. H.	Hanson, H. D.	Scheid, J. E.
	Capsalis, J.	Mokros, B. F.	Toren, C. J.
	Cook, C. F.	Richardson, W. S.	
	Finkel, D.	Rose, J. C.	

PART III (b)	Beardsley, C. M.	Chang, Y.	Portermain, N. W.
	Bell, A. A.	Crain, J.	Rosel, R. G.
	Brewer, R. T.	Dahme, O. E.	Ryan, K. M.
	Brian, R. A.	Goldberg, S.	Staley, H. B.
	Burns, W. O.	Jensen, J. P.	Toren, C. J.
	Capsalis, J.	Kemble, J. W.	Verhage, P.
	Center, A. C.	McClintock, J. S.	
PART IV	Amlie, W. P.	Herman, F. L.	Rosel, R. G.
	Brown, W. W., Jr.	Hillhouse, J. A.	Scheel, P. J.
	Cima, A.	Jensen, J. P.	Smith, E. R.
	Curry, A. C.	McDonald, C.	Switzer, V. J.
	Gerundo, L. P., Jr.	Portermain, N. W.	Verhage, P.
	Hammer, S. M.	Reilly, F. V.	

FELLOWSHIP EXAMINATIONS

PART I	Aldrich, W. C.	MacGinnitie, W. J.	Portermain, N. W.
	Crandall, W. H.	Margolis, D. R.	Smith, E. R.
	Even, C. A., Jr.	Oien, R. G.	Trudeau, D. E.
PART II	Ehlert, D. W.	Morison, G. D.	Royer, A. F.
	MacGinnitie, W. J.	Oien, R. G.	Trudeau, D. E.
	Margolis, D. R.	Riddlesworth, W. A.	Walsh, A. J.
PART III	Balcarek, R. J.	Greene, T. A.	Parlin, R. W.
	Craig, R. A.	MacGinnitie, W. J.	Piersol, D. E.
	Crandall, W. H.	McNamara, D. J.	Riddlesworth, W. A.
	DeMelio, J. J.	Miller, N. F.	Trudeau, D. E.
	Gillespie, J. E.	Morison, G. D.	Walsh, A. J.
PART IV	Balcarek, R. J.	Morison, G. D.	Stankus, L. M.
	Carson, D. E. A.	Parlin, R. W.	Trudeau, D. E.
	Meenaghan, J. J.	Richards, H. R.	

Note: There were no successful candidates for Part IV (a).

NEW ASSOCIATES

The following 12 candidates, having been successful in completing the examinations, will be admitted as Associates of the Society as of the date of the Annual Meeting in November 1962:

Amlie, W. P.	Finkel, D.	Portermain, N. W.
Carson, D. E. A.	Hillhouse, J. A.	Smith, E. R.
Curry, A. C.	Gerundo, L. P., Jr.	Switzer, V. J.
Even, C. A., Jr.	Jensen, J. P.	Verhage, P.

NEW FELLOWS

The following 8 Associates, having been successful in completing the examinations, will be admitted as Fellows of the Society as of the date of the Annual Meeting in November 1962:

Balcarek, R. J.	Morison, G. D.	Trudeau, D. E.
McNamara, D. J.	Parlin, R. W.	Walsh, A. J., Jr.
Meenaghan, J. J.	Stankus, L. M.	

REVIEWS OF PUBLICATIONS

FRANK HARWAYNE, Book Review Editor

Allen L. Mayerson, *Introduction to Insurance,* The Macmillan Company, New York, 1962, pp. XIII, 443.

The first six chapters of this book are exactly what the title indicates, an introduction to insurance. The remainder is as detailed a consideration of the various kinds of insurance as the available space permits.

It is stated in the Preface that the book is addressed to "the consumer or businessman who wants to learn enough about the elements of insurance to be able to plan his own insurance program intelligently." He can learn much about the details of the business (happily, the author prefers "business" to "industry").

A person subject to risk who approaches his problem needs, first, to be equipped to analyze it, and second, to evaluate the methods of solving it. To the extent that he is to consider insurance he must be able to determine what insurance he wants, and to compare the various promises of protection or service available and their comparative costs. This book, with his eyes wide open, will give him a good background, from which to take off rather than to apply directly. While it contains a great deal of information and suggestions for dealing with the many covers, there is little discussion of the principles of risk management.

There is a tendency to make general statements that imply a uniformity of practice which does not exist, and it seems often to be assumed that usual practices are necessary. A healthy scepticism is a useful tool for the "consumer." If an ill-informed person reads this volume he should acquire a good general idea of the principles and practices of insurance, but it is not a work of reference.

The author has not been so careful about many particulars as could be desired. For example: Lloyd's is not an insurer (p. 12); anti-selection is not only excerised consciously by intending insureds (p. 15); the first fire insurer was established in Charleston (p. 26); war risks are not uninsurable (pp. 111, 361); the appraisal clause of the Standard Fire Insurance Policy cannot, in most jurisdictions, be enforced by the insured (p. 209); a proof of a fire loss need not, in some jurisdictions, be furnished on the initiative of the insured (p. 212); there is no reserve fund in life insurance, nor are the reserve amounts "policyholder funds, held in trust by the insurer" (p. 338); the distinction between "accidental means" and "accidental injury" has disappeared in New York and is largely eroded elsewhere (p. 375).

It is not extraordinary that these and other individual points, small or important, should be subject to correction in a volume in which it is intended to cover the entire insurance field; they do call for careful checking.

RALPH H. BLANCHARD

J. Aitchison and J. A. C. Brown, *The Lognormal Distribution,* New York; Cambridge University Press, 1957.

The authors intend that this book be used by practicing statisticians and their method of presentation helps toward achieving that objective. The book brings together information published on the lognormal distribution from

1879 onward. The typical chapter opens with a review of what will be discussed, then proceeds to discuss it and, where necessary, ends with a summary.

The lognormal distribution has been found to exist in a number of places. Small particles often occur in nature or as the result of a grinding process in the form of a lognormal distribution. Distributions of incomes, household size, length of life in endurance tests and certain features of consumer behavior can be described by this distribution. The authors do not refer to the fact that insurance claims by size are often distributed in this fashion but mention was made of this as early as 1942 in these *Proceedings*. It is observed by the authors that the number of individuals in various census occupation classes seems to be distributed in this fashion. Is this possibly true of our insurance classification system also?

In the short span of ten pages, the reader is given a clear presentation of the general properties of the distribution and the discussion of the special cases of the three-parameter distribution. The chapter on the genesis of lognormal distributions is particularly interesting. It is shown that if the change in the variant at any step of the process is a random proportion of the previous value of the variant, then for large n the variant is distributed in the lognormal form.

Testing lognormality can be done by special tests described in the book or by the customary Chi-square test. However, this latter is less sensitive and, therefore, not too satisfactory. Chapter 8 treats the t-test, the f-test and analysis of variance for samples from a lognormal population in the short space of only two pages. Nevertheless, the treatment is clear and complete enough for the typical reader. A good portion of the book is allocated to discussing the problems of estimation for the mean and the variance, both in terms of the original values and in terms of the logarithm. The statistical difficulties associated with truncated and censored distributions mount rapidly but the authors' treatment will be very helpful for problems involving franchises or deductibles in the insurance field.

Little direct value seems to come from the chapters on economic problems and on probit analysis although this latter has an insurance analogy. Probits are principally used in an attempt to describe the tolerance levels of organisms to drug dosages of varying sizes. Perhaps there is an opportunity to analyze the insurance situation in terms of various "dosages" (of mileage driven, for example) in relationship to the tolerance for accidents.

This book makes a valuable addition to the actuary's store of mathematical models which will be helpful in describing the insurance process in abstract terms. From such abstractions, perhaps we can build a complete model of individual risk behavior which will give us a clearer insight into the underlying processes.

LEROY J. SIMON

OBITUARY

RICHARD FONDILLER
MAURICE L. FURNIVALL
WILLIAM LESLIE
EDWARD OLIFIERS
MICHAEL T. WERMEL

RICHARD FONDILLER
1884 — 1962

Mr. Richard Fondiller, President of Woodward and Fondiller, consulting actuaries, died in New York, April 29, 1962 at the age of 77.

Mr. Fondiller was a graduate of New York's City College and Columbia University, receiving Master of Arts and Bachelor of Laws degrees from the latter institution. He was admitted to the New York Bar in 1913.

After four years as assistant actuary of the New York State Workmen's Compensation Commission, he joined the Equitable Life Assurance Society, serving as superintendent in the group insurance department.

In 1922, Mr. Fondiller established the consulting actuarial firm of Woodward and Fondiller with the late Joseph H. Woodward. The firm provides actuarial services to insurance companies, state insurance funds, corporations, and fraternal organizations. Mr. Fondiller was also a specialist in actuarial calculations of taxes and served federal and state agencies in special actuarial investigations.

He was a member of the New York and Federal Bars; Fellow of the Society of Actuaries, Casualty Actuarial Society and Insurance Institute of America; member of the Conference of Actuaries in Public Practice, Fraternal Actuarial Association and Permanent Committee for International Congresses of Actuaries.

A nationally known actuary, authority on workmen's compensation insurance, and consultant to federal and state officers, Richard Fondiller will be remembered for his kindness, patience, keenness of mind, sense of humor, and for his tremendous interest in and efforts on behalf of his firm's clients.

Perhaps his greatest memorial will be the many young men and women he helped to enter and to develop in his beloved actuarial profession. Placing the progress of the profession on a par, at least, with the advancement of his own firm, he served for 35 years as Secretary-Treasurer of the Casualty Actuarial Society.

MAURICE LESTER FURNIVALL
1894 — 1962

Maurice Lester Furnivall, an Associate member of the Casualty Actuarial Society since 1929 died June 16, 1962 in Hartford after a long illness. He leaves his wife, a son, a daughter, and several grandchildren.

He was born January 28, 1894, in Arlington, Massachusetts and attended the public schools in Hartford. He graduated from Trinity College in 1915. While at college he participated in many undergraduate activities and was captain of the track team and president of his class. He was a member of Alpha Chi Rho social fraternity.

After receiving the degree of Bachelor of Science he worked for the Connecticut Highway Department before enlisting in the Army. He served overseas with the AEF and was discharged in 1919 with the rank of first lieutenant. He then joined the Travelers Insurance Company as an aide to the president and later became a member of the actuarial staff with interests centering in accident and health lines and annual statement work.

He participated in accident and health statistical committee meetings and took a keen interest in the affairs of this Society as evidenced by regular attendance at meetings and participation in programs. Several members of the Society began their careers under his guidance. He was named Assistant Actuary of the Travelers in 1931 and Associate Actuary in 1950. He retired in 1959.

His hobbies included bridge and travel; in fact, he was in Florida when stricken with the malady which led to his untimely passing. Possessed of a cheerful and friendly disposition, as well as a keen analytical mind, he will be greatly missed by his many friends and former business associates.

WILLIAM LESLIE
1890 — 1962

William Leslie, Past President of the Casualty Actuarial Society and retired General Manager of the National Bureau Of Casualty Underwriters, died in the Danbury, Connecticut Hospital on December 12, 1962. Mr. Leslie, who had lived in Scarsdale, N. Y., made his home in Newtown, Connecticut, following his retirement in 1958 after 28 years as executive head of the National Bureau.

Since December 1961 he had served, by appointment of Governor Nelson D. Rockefeller of New York, as a consultant to the Governor's Workmen's Compensation Review Committee. He had received many well-earned honors during his insurance career of more than a half-century. In 1946 the War Department awarded him the Certificate of Appreciation for his "patriotic services in a position of trust and responsibility for outstanding services rendered the War Department in its insurance procurement program during World War II while Chairman of the Joint Rating Committee for Comprehensive Rating Plan Covering War Projects." In 1947, he was the recipient of the Gold Medal Award of the General Brokers Association of New York for "the most valuable contribution in the field of insurance" during that year.

To the entire insurance industry, the name of William Leslie represented a rare contribution of integrity, keen analytical intellect and amazing ability for clear expression of ideas, no matter how technical. In his long career in casualty insurance he was confronted by many serious problems. On all occasions he presented these problems with the greatest skill, and the reasoning behind any proposal that he would advance for meeting a specific situation was always explained with such cogency that everyone was likely to be convinced.

To William Leslie's many friends, widely distributed throughout insurance activities—in bureau and non-bureau company ranks alike, both stock and non-stock, among insurance commissioners and their staffs, in technical societies and in producers' groups—he was familiarly known as "Bill." Whenever introduced at insurance gatherings, he invariably received the greatest applause, the expression of his friends' pleasure at his presence among them as well as of the high regard in which he was held by all.

Among his accomplishments in the casualty field were:

Establishment of the five per cent provision for underwriting profit and contingencies in casualty insurance other than workmen's compensation.

Expense gradation and retrospective rating for workmen's compensation and third party liability insurance.

Development of procedures for operating under the state rate regulatory laws that were enacted after the South-Eastern Underwriters Association decision in 1944.

Comprehensive rating plan for war projects.

Encouragement of a spirit of cooperation and good working relations with state supervisory authorities, which were particularly important in view of the rapid expansion of state rate regulation from only a few states prior to 1944 to all states.

Establishment of a program of conferences with representatives of national producers' organizations on important countrywide matters, as well as encouraging and developing cooperation with state agents' associations on local matters.

Introduction of trend factors.

Development of the standard policy provisions program.

William Leslie was born March 23, 1890 in Felton, California. He was educated in the public schools of the state and at the University of California where he received the degree of B.S. and later was Associate Professor of Insurance.

In his insurance career he was Actuary, Reliance Life Insurance Company, Pittsburgh, 1911-1913; Secretary-Actuary, California State Compensation Insurance Fund, San Francisco, 1913-1919; Actuary, New York Insurance Department, 1919-1920; Consulting Actuary, San Francisco, 1920-1923; and General Manager, National Council on Compensation Insurance, New York, 1923-1929. He became Associate General Manager of the National Bureau of Casualty Underwriters, New York, in 1930 and was elected General Manager in 1936.

Mr. Leslie was a charter member, Fellow and Past President of the Casualty Actuarial Society. He was also an associate of the Society of Actuaries, a member of the American Statistical Association, the American Economic Association and the Pi Kappa Alpha fraternity.

Mr. Leslie's first wife, Rose Barker Leslie, died in 1947. He is survived by his widow, Westray Battle Leslie; three sons and a daughter from his earlier marriage: William Leslie, Jr. of Bronxville, N. Y.; Edwin Barker Leslie of Miami, Fla.; Robert Elliott Leslie of Bronxville, N. Y.; and Mrs. Thomas P. Delehanty of Scarsdale, N. Y.; and ten grandchildren.

EDWARD CHARLES GUILLAUME OLIFIERS
1886 — 1961

Edward Olifiers died May 13, 1961 in Petropolis, Rio de Janeiro, Brazil at the age of 75.

He was born May 27, 1886 in Brussels, Belgium. After receiving his early education in Brussels, Mr. Olifiers studied Commercial and Financial Science at St. Ignace Institute in Antwerp. He later went to England where he specialized in life insurance, becoming an Associate of the London Institute of Actuaries.

Mr. Olifiers was a consulting actuary in Canada and the United States for a few years. During his stay in the United States he published, "Tables for Valuation of Death Benefits Provided by the New York Workmen's Compensation Law of 1914."

Edward Olifiers went to Brazil in 1914 as Chief Actuary of the Sul America Life Insurance Company and later became General Manager of the Previdência do Sul Insurance Company. He developed the Brazilian insurance system for Workmen's Compensation. At the time of his death he was working on the introduction of medical insurance in Brazil as well as writing a book on his many years of experience in the development of the Brazilian insurance structure.

Mr. Olifiers had many professional affiliations. In addition to being a Fellow and charter member of the Casualty Actuarial Society he was also a Fellow of the Society of Actuaries, member of the Instituto Brasileiro de Atuária, member of the ASTIN Section of the International Congress of Actuaries and member of the technical staff of the Instituto de Resseguros do Brasil.

He is survived by his widow, Hulda Doberstein Olifiers and two sons, Christian and Jorge V.

MICHAEL T. WERMEL
1907 — 1962

Dr. Michael T. Wermel, Vice President of Woodward and Fondiller, died at the age of 54 in Queens Hospital, Honolulu, February 6, 1962.

He was a graduate of New York and Columbia Universities, receiving his Doctor of Philosophy degree from the latter institution. He taught at Brooklyn College, Tufts College, University of California, New York University, Loyola University, and the California Institute of Technology. For a period after World War II he was the chief architect under the Occupation authorities in the rebuilding of the German Social Security system. He served as Chief Actuary, Bureau of Employment Security of the U. S. Department of Labor, from 1948 to 1952.

In 1952, Dr. Wermel joined Woodward and Fondiller as Vice President in charge of the Los Angeles office. During the same period he was Director of the Benefits and Insurance Research Center, Industrial Relations Section, and Professor at California Institute of Technology. He left that post two years ago to become Dean of the College of Business Administration at the University of Hawaii. His great contributions to the progress of the new State brought him universal respect and thanks.

A many-sided, unassuming man of brilliance and understanding, his philosophical and technical knowledge of unemployment and disability compensation was unique. His prominence in this area was attested by a plaque from officials of the Federal government for his pioneering work in unemployment compensation. He was a labor relations negotiator, educator, economist and author of note, authority on government actuarial matters, and consultant to Governors, Senators, Secretaries of Labor, industrialists, labor leaders, and employee groups.

Mike Wermel will be remembered by his friends for his personal integrity, his tireless efforts on behalf of others, and for the modesty that gracefully attended his many talents.

EXAMINATION FOR ENROLLMENT AS ASSOCIATE

PART I GENERAL MATHEMATICS

The questions for Part I were prepared and copyrighted by the Educational Testing Service of Princeton, N. J., and cannot be reprinted. Students may obtain a set of similar questions from the Secretary-Treasurer.

PART II SECTION (a)

1. (a) An individual has ten coins, one of which has two heads. Four coins are taken at random and tossed. Of the four coins tossed, three turn up heads and one turns up tails. What is the probability that the two-headed coin was among the four coins that were tossed?

   (b) Four numbers between zero and one are selected at random. What is the probability that the largest of the four numbers selected is between $\frac{1}{2}$ and $\frac{2}{3}$?

2. (a) A speaks the truth two times out of three; B speaks the truth three times out of four. Each agrees in asserting that a three was thrown with a pair of ordinary six-faced dice. Find the probability that a three was indeed thrown.

   (b) A bag contains two red and two white balls. An individual draws out two balls at random, replaces them with two blue balls and once more draws out two balls at random. Find the probability that the latter two balls drawn from the bag are of different colors.

3. (a) Five people are asked to state the month in which they were born. Find the probability that exactly three different months will be named.

(b) A row of (M-1) white blocks and N red blocks are arranged in a line or row in random fashion. If (M-1) is greater than N, what is the probability that no two red blocks are next to each other? Express your answer in terms of factorials.

4. (a) If n integers taken at random are multiplied together, find the chance that the last digit of the product is zero.

(b) A deck of cards is shuffled and dealt one card at a time. What is the probability that the seventh card is the third red card and the first ace? Express your answer in factorials.

PART II SECTION (b)

AREAS OF THE NORMAL CURVE

Z	AREA
1.00	.34134
1.50	.43319
2.00	.47725
2.50	.49379
3.00	.49865

1. (a) Define the following properties of a normal curve:
   i. Mean
   ii. Mode
   iii. Median
   iv. Height of maximum ordinate
   v. Points of inflection
   vi. Standard Deviation
   vii. Mean Absolute Deviation

   (b) What assumptions must be made to fit a normal curve to a given distribution?

2. It has been observed that the probability of any driver being involved in an accident in any given year is 0.10. Assuming that accident involvement follows the Poisson distribution and all drivers have an equal ā priori chance of being involved in an accident, determine the probability of a given driver being involved in at least two accidents in a given year. Leave your answer in symbolic form.

3. The following scores were recorded by three students on tests T_1 and T_2

	Tests	
Student	T_1	T_2
A	69	82
B	73	85
C	66	89

What is the correlation between a student's score on Test T_1 and his score on Test T_2?

4. 1,000 men are selected at random and interviewed. The following table shows by age group both the number interviewed and the number that have had heart trouble:

AGE GROUP	Under 25	25–34	35–44	45–54	55–64	65 and Over
Number interviewed	100	250	300	200	100	50
Number with Heart Trouble	4	14	20	25	12	5

Given the following information regarding χ^2, comment on the hypothesis that equal proportions should be found in each group:

Number of Degrees of Freedom	Significance Level	Value of χ^2
5	5%	11.0
6	5	12.0
5	95	1.2
6	95	1.8

5. The following data shows the trend of average costs for automobile property damage claims from 1956 through 1961. Applying the Method of Least Squares to this data, determine the best fitting line and project the 1962 average cost.

Year	Average Cost
1956	$100
1957	115
1958	125
1959	130
1960	140
1961	150

6. If the intelligence quotient of a sample of 100 students has a mean of 108 and a standard deviation of 12, with what degree of confidence can we assert that this sample mean differs by less than 3 from the average intelligence quotient of all the students from which the sample was taken?

7. (a) Three methods of determining skewness of a set of data are:
   i. The Method of Moments
   ii. Pearson's Method
   iii. Bowley's Method

   Define any two of these three methods algebraically and explain how they would show a skewness to the right.

   (b) A coin is tossed 400 times. What is the approximate probability of more than 250 heads?

PART III SECTION (a)

1. Distinguish between each of the following pairs of terms:
   (a) Select Table and Ultimate Table
   (b) Conservative Insurance Mortality Table and Conservative Annuity Mortality Table
   (c) Curtate Expectation of Life of (x) and Complete Expectation of Life of (x)
   (d) Installment Fractional Premium and True Fractional Premium
   (e) The t^{th} Terminal Reserve and Net Amount at Risk in the t^{th} Policy Year

2. (a) Prove that $A_x + a_x < \ddot{a}_x$

   (b) Prove that $a_{x:\overline{n}|} < a_{\overline{n}|}$

   (c) A life insurance policy issued to (20) provides that the death benefit of $1000 will be paid at the end of ten years from the issue date if death occurs within the first ten years, or at the end of the year of death if death occurs after ten years. Express the net single premium in commutation symbols.

(d) A whole-life annuity immediate to (x) provides for a payment of (1.025) at the end of the first year, $(1.025)^2$ at the end of the second year, $(1.025)^3$ at the end of the third year, etc. Show that the present value of this annuity is e_x if interest is figured at 2.5%.

3. (a) A life insurance policy issued at age 40 provides a death benefit of $2 if death occurs before age 65, and $1 if death occurs thereafter. The net annual premium, P, to be paid for the first 25 years is reduced at age 65 to the net annual premium that would be paid at age 40 for a $1 ordinary whole life policy. Find P. (Express answer in commutation symbols)

(b) A 20-pay 30-year endowment policy with a face amount of $1,000 provides that in the event of death during the 30 years, the net premiums paid will be refunded along with the payment of the face amount of the policy. Express in commutation symbols the net annual premium of such a policy issued to a life age 18.

4. (a) Prove that
$${}_tV_x = 1 - (1 - {}_1V_x)\,(1 - {}_1V_{x+1})\;\ldots\;(1 - {}_1V_{x+t-1})$$

(b) State Fackler's accumulation formula and indicate under what circumstances it is particularly useful.

(c) Express ${}_{15:10}V_{20}$ in commutation symbols.

(d) Find the 4th terminal reserve on a $1,000 policy issued to (30) given that the 3rd terminal reserve is $95.80, the net annual premium is $34.42, $i = 2.5\%$ and $q_{30+4} = .004$.

PART III SECTION (b)

1. (a) Identify the two major instruments used to provide corporations with their long-term permanent capital funds.

   (b) Distinguish between secured and debenture bonds.

   (c) Identify the major classifications of bonds with respect to the payment of principal and interest.

   (d) Identify the various ways in which corporate bonds may be retired.

2. Define "trading on equity" and discuss its advantages and disadvantages.

3. According to Willett, after a system of insurance against any class of risk has been established, an entrepeneur has a choice between three methods of meeting such a risk in an industry that he has decided to enter. Name his three choices and discuss the usual course of action.

4. Describe and fully discuss a "short sale." Your discussion should clearly indicate the essence of a "short sale," conditions under which such a sale is made, cost of such a sale, and to whom dividends are paid.

5. (a) Discuss the causes of change in the value of money.

   (b) Name three characteristics which have been evident in most cases of currency hyperinflation.

6. Describe the manner in which a reciprocal exchange functions.

7. (a) According to Willett, what are the three component parts of the cost to society of insurance?

   (b) Define and give an example of
      i. A positive loss
      ii. A negative loss

8. Briefly discuss the question of the existence of risk and the ways of meeting it. The discussion should include such definitions and comparisons as will bring out the relationships, if any, that exist among the terms risk, probability of loss, insurance and gambling.

PART IV

SECTION (a)

1. Describe briefly the hazard insured by Fire Legal Liability Coverage and name three situations when such coverage is indicated.

2. What losses are specifically set forth as not being due to collision within the meaning of the automobile comprehensive physical damage insuring clause?

3. State the requirements for Workmen's Compensation deposit premiums under the National Council Manual Rules on a policy providing for premium adjustment:
   a. at policy termination
   b. monthly
   c. quarterly
   d. semi-annually

4. Describe the rights and obligations of an insurance company under the terms of the "defense clause" in a standard automobile liability insurance policy.

5. Describe the provisions of the boiler and machinery policy with respect to inspections.

6. Name and briefly discuss three warranties by the insured that are implied in the making of a contract of Ocean Marine Insurance.

7. In addition to direct loss from breakage, the glass insurance contract covers indirect losses of three types. Name any two of the three types of indirect loss covered.

8. Under Mercantile Open Stock Insurance, limits on the amount of loss covered by the insurer are imposed in four principal ways. Explain briefly three of the four ways.

9. Compare and distinguish between deductible insurance and excess-of-loss insurance.

10. What is the coverage under a standard fire policy with respect to explosion.

11. Describe briefly Convertible Collision Automobile Insurance.

12. Discuss briefly the function of an "indemnitor" in the field of corporate suretyship.

13. List four of the General Inclusions, three of the General Exclusions and three of the Standard Exceptions referred to in the Basic Manual of the National Council on Compensation Insurance.

14. Why is Malpractice or Professional Liability Insurance as written for doctors sometimes referred to as "physicians' defense insurance"?

15. In addition to payment of claims up to policy limits, name three other costs the company agrees to pay under automobile liability insurance.

16. With respect to accident and sickness insurance, a distinction may be made between "accidental bodily injury" and "bodily injury effected solely through accidental means." What is the distinction? Illustrate.

17. Write a formula for the indicated amount an insurance company pays under a Fire Insurance policy with a coinsurance clause; if

    L = Amount of loss

    I = Amount of insurance in force

    P = Coinsurance Percentage

    V = Sound property value at time of loss

18. The personal property floater policy may be endorsed at its inception to allow credit for specific insurance. Describe this endorsement and the method of calculating the credit.

19. Liability policies may be written to assume liability imposed by law "caused by an occurrence" instead of "caused by accident" as is the usual practice. Differentiate between "accident" and "occurrence" as used in General Liability insurance.

20. Give three rights of an insurer under a Workmen's Compensation Policy.

SECTION (b)

1. A history of rate level changes for Workmen's Compensation in a given state reveals that effective 4/1/60 there was an increase of 2.5% applicable to new and renewal policies only and effective 7/1/61 there was an increase of 5.0% applicable to new and renewal policies and an increase of 3.0% applicable to the unexpired terms of outstanding policies. If the earned premium reported for calendar year 1961 was $5,200,000, determine the calendar year 1961 earned premium on present level. Assume a uniform distribution of exposure.

2. What were the recommendations of the Inter-Regional Insurance Conference contained in its 1957 statement (as revised in 1960) of "Basic Principles — Rate Level Adjustments"?

3. (a) In revising a New York Fire Insurance class rate you are given the following information:

Class credibility	50.0%
Class loss ratio	60.0%
Provision for expenses, taxes and profits	53.1%

Calculate the indicated rate change for the class.

(b) Using the method outlined in P. Stern's paper on automobile liability ratemaking, develop the proposed territorial percentage rate level change, given:

Pure Premium Underlying Present Rates	29.10
Experience Pure Premium Adjusted to Proposed Rate Level	30.39
Pure Premium Underlying Present Rates Adjusted to Proposed Rate Level	31.17
Credibility	.70

(c) It has been said that accident year experience is superior to policy year experience for obtaining trend indications. Explain why this is so.

(d) State the National Council's formula for minimum premiums. Upon what is the formula based?

4. (a) It has been found that the Workmen's Compensation experience of large risks tends to be better than that of small risks; that is, the loss ratios of small risks tend to be somewhat higher. Name and briefly discuss the two methods used under the National Council's ratemaking procedures to correct this situation.

(b) In Workmen's Compensation ratemaking, in addition to eliminating the experience of certain classifications and limiting certain catastrophe losses, there are three considerations for which losses as reported by the insurance companies must be adjusted before their use in policy year experience. Name and briefly discuss the three adjustments.

5. Compare and contrast the procedures utilized in determining a state-wide indicated over-all rate level change for automobile physical damage and for private passenger automobile bodily injury liability with respect to:

   a. Basis of experience
   b. Experience period
   c. Paid losses and incurred losses
   d. Earned premiums on present rate level
   e. Loss adjustment expenses
   f. Taxes, licenses and fees
   g. Production allowance and profit and contingencies
   h. Expenses other than (e), (f) and (g)
   i. Trend factors
   j. Catastrophes

EXAMINATION FOR ENROLLMENT AS FELLOW

PART I

SECTION (a)

1. (a) What are the legal requirements for making a contract valid and binding?

   (b) Briefly describe when facts concealed in the making of a contract are material.

2. (a) What provision is made in the New York Insurance Law for classification and rating plans?

   (b) Briefly describe the operation of the "Appleton Rule."

3. In the most recent financial statement filed with New York an insurance carrier showed assets of $100,000,000, liabilities of $78,000,000 and surplus of $22,000,000 (including $3,000,000 paid up capital). In three advertisements of this insurer in New York newspapers, the following statements are made:

Financial Condition

(a)	Assets	$100,000,000
	Liabilities	78,000,000

(b) Our Surplus to Policyholders of $20,000,000 Gives You Safety With Our Service.

(c) Every Policy is Guaranteed by the Best Bank of New York.

Do these advertisements comply with the New York Insurance Law? Explain.

4. Briefly describe five principal powers of the Insurance Commissioner for the regulation of insurance by the state.

5. (a) Section 3(a) of the McCarran Act states:

   "Until January 1, 1948, . . . the Sherman Act, . . . the Clayton Act, . . . the Federal Trade Commission Act, . . . , and the Robinson-Patman Anti-discrimination Act shall not apply to the business of insurance or to acts in the conduct thereof."

   Explain the purpose and effect of this section.

   (b) What is meant by "no prior approval" in connection with rate filings? How is this different from the "deemer provision" of the All Industry Committee's Model Bill?

6. Discuss the establishment by the states of guaranty funds to protect policyholders from insolvency of insurance carriers.

7. Give a brief illustration of "Reciprocal Law" as applied in the general area of insurance regulation.

8. If the law of a state imposes a higher than average tax on domestic companies but not on foreign companies, what are the advantages and disadvantages of such a law to companies domiciled within that state?

Section (b)

1. (a) What proposals affecting social insurance were contained in President Kennedy's State of the Union address in January of 1962?

   (b) How do these proposals compare with the recommendations of the Brookings Report?

2. Compare the New York compulsory automobile insurance law with that of Massachusetts as regards:

   (a) Required coverage

   (b) Proof of insurance

   (c) Expense of administration

3. (a) Describe the feature of the Massachusetts Assigned Risk Plan which discourages companies from not renewing undesirable risks.

   (b) Explain, using Massachusetts compulsory automobile insurance as an example, why "The insurance companies always have and always will oppose a flat rate for compulsory insurance."

4. Briefly describe the Saskatchewan Plan (i.e., the Automobile Accident Insurance Act of 1946 and as subsequently amended).

5. (a) Discuss the logic of an assigned risk plan for fire insurance.

   (b) Comment on the alternatives offered by the Fire Insurance Industry to any such proposals.

6. What are the six characteristics of governmental and privately operated unemployment insurance programs in the United States as defined by N. Gaines in P.C.A.S. Volume XLII?

7. (a) Briefly describe the purpose of the New York Disability Benefits Law.

   (b) Who has the responsibility for administration and enforcement of the Law?

   (c) What are its principal exclusions?

8. Under temporary disability insurance laws, what are the benefit requirements for private plans:

   (a) In California?

   (b) In Rhode Island?

   (c) For the railroad?

PART II

Section (a)

1. Under Section 74 of the New York Insurance Law regarding Unearned Premium Reserves, what are the principles set forth covering:

   (a) Deductions from gross premiums in force

   (b) Computation of the liability for unearned premiums

   (c) Marine insurance and perpetual fire insurance

2. Determine the unearned premium reserve as of December 31, 1961 for each of the following:

   (a) Ocean marine cargo written premiums of $1,000,000 monthly, January through September, $2,000,000 in October, $3,000,000 in November and $3,000,000 in December

   (b) $4,500,000 statutory Massachusetts Automobile Liability premiums written during the year

   (c) A deposit premium of $120,000 paid in December, 1961 for a compensation policy with an inception date of January 1, 1962

3. Determine the effect upon the surplus at the end of the first month resulting from writing during the month prepaid annual premiums in the amount of $48,000, assuming the following distribution of gross premiums and assuming that 75% of the General Administration and Inspection, boards and bureaus expenses is incurred at the inception of the contract:

Production cost	25%
General administration	6
Inspection, boards & bureaus	1
Taxes (excluding Federal)	3
Underwriting profit & contingencies	5
Losses (including all loss adjustment expense)	60
	100%

4. (a) Briefly explain how the reserve for state premium taxes and how agents' balances or uncollected premiums over 3 months due distort the true surplus.

(b) Which reserves on page 3 of the Annual Statement would reflect the following liabilities?

(1) Federal income tax withholdings from employees' pay-checks

(2) Retrospective returns based on experience

(3) Amounts withheld from premiums paid to authorized re-insurers to pay future losses

(4) Supplies ordered but undelivered

(5) Commissions, other than contingents

5. Given the following information, determine a reserve as of December 31, 1961 for State premium taxes.

	Total Company	*State "A"*
Direct written premiums 1960	$10,000,000	$454,545
1961	11,000,000	500,000
State premium taxes paid in 1961 but incurred in prior years.	200,000	13,636

The only change in premium tax rate during the year was in State "A" where it increased from 3% in 1960 to 3.5% in 1961.

6. What reasons would you give for and against a proposal to change your company's automobile liability loss reserve method from an individual estimates basis to an average claim costs basis?

7. As regards the reserve for losses incurred but not reported,

   (a) Name the four primary contributing factors involved in the compilation of the reserve.

   (b) Name the two dates of prime importance in the determination of the reserve and explain their importance.

   (c) What are the special requirements under the New York Insurance Law as related to this reserve on the Fidelity and Surety Lines of Insurance?

   (d) Explain why the reserve is generally figured separately for the Massachusetts Compulsory Automobile Liability line of insurance.

8. In 1960, compensation unallocated loss expenses paid by a company amount to $1,000,000 which is spread on the following basis:

Policy Year	*1957*	*1958*		*1959*		*1960*
Accident Year	*1958*	*1958*	*1959*	*1959*	*1960*	*1960*
%	5%	5%	5%	5%	40%	40%

Paid unallocated loss expenses for compensation have been increasing steadily at a rate of $50,000 yearly. Determine a reasonable reserve for compensation unallocated loss expenses as of December 31, 1960.

SECTION (b)

1. In 1946, the New York Insurance Law was amended to give the Superintendent of Insurance the power to prescribe uniform accounting classifications. Explain why it has been said that the aims of the bill were actuarial rather than fiscal.

2. (a) Define the following three types of assets involved in the determination of Annual Statement values:

   Ledger Assets
   Non-Ledger Assets
   Assets not admitted

(b) Briefly cite the principal purposes of the Schedules contained in the Annual Statement blank without making reference to specific schedules.

3. It has been suggested to the N.A.I.C. Committee on Blanks that Part 2c — Recapitulation of Fire Premiums, should be removed entirely from the fire and casualty Annual Statement blank. Do you agree? Why?

4. After a casualty company's Annual Statement has been completed, it is discovered that an incorrect valuation has been used for the market value of a Schedule D stock acquired during the year. This company carries stocks on the ledger at cost. List the changes that must be made in the statement to correct this error. Items and sections may be designated by number or caption.

5. (a) Assign each of the following items of expense to the correct Operating Expense Classification for Part I of the Insurance Expense Exhibit.

1. Depreciation of company owned automobiles
2. Travel expense reimbursement for brokers
3. Advertising required by law
4. Workmen's Compensation insurance premiums
5. Electricity

(b) The Uniform Accounting Instructions made no provision for inspection and payroll audit expenses. What items of expense are included in the Operating Expense Classification "Audit of Assureds' Records"?

6. Briefly describe the contents of Parts I, II, and IV and the purpose of Part III of the Insurance Expense Exhibit.

7. Given the following Direct Premiums and company participations:

Company	*Direct Premium*	*Pool R*
A	$9,000,000	40%
B	6,000,000	30%
C	3,000,000	20%
D	2,000,000	10%

Derive the adjustment for line 18 in Part II of the Insurance Expense Exhibit for —

(a) Each Company A through D operating under pooling arrangement R on an Intra-Group Basis.

(b) Company A and Company B operating under a Quota Share arrangement under which A cedes to B 20% of its direct business and B cedes to A 40% of its direct business and Pool R is not involved.

8. Part IV of the Insurance Expense Exhibit shows Workmen's Compensation direct earned premiums by state. What are the problems connected with making this assignment of premiums to state?

PART III

Section (a)

1. Briefly describe the important changes in the eligibility requirements for Automobile and General Liability experience and schedule rating plans proposed by the National Bureau of Casualty Underwriters during 1961.

2. Identify the differences between Formulas "A" and "C" of the National Automobile Underwriters Association's Fleet Rating Plan for Comprehensive and Fire and Theft Coverage with reference to the following features:

   (a) Base Rates

   (b) Table of Experience Modifications, and

   (c) Catastrophe Loss

3. Determine the experience rating modification in formula form for a New York Burglary risk to be written on a deductible basis (i.e., for $500 per loss) having developed the following full coverage experience:

Year	*Collected Premium*	*Individual Incurred Losses*	*Allocated Claim Adjustment Expense*	*Experience Modification*
1958	$ 9,000	$1000—2000—1000—2000	$ 500	None
1959	15,000	2,000—2,000	1,000	25% debit
1960	8,000	3,000—1,000	500	33% debit

Given $500 deductible discount — 30%; Expected loss ratio — 50%; Retention for Acquisition, Taxes, and Profit — 45%.

Also calculate the premium value for entering the Credibility Table.

4. Briefly describe the unique features of the Boiler and Machinery Premium Adjustment Rating Plan with respect to the following areas:

   (a) Rating values
   (b) Loss limitations
   (c) Inspection expenses
   (d) Eligibility

5. It has often been said that the Automobile Safe Driver Plan is not a "rating plan" but rather a "classification plan." Discuss this observation.

6. (a) The compensation experience rating plan assigns separate credibilities to frequency and severity indications, and has been called a "dual modification system." In terms of primary and excess credibilities and actual and expected losses, write an expression demonstrating how the two parts combine to produce a single risk modification.

   (b) Recently the Workmen's Compensation Experience Rating Plan promulgated by the National Council on Compensation Insurance was revised in some of its basic aspects. Describe the changes made and discuss their intended effect on individual risk ratings in regard to:

      (1) Formula for developing primary loss values
      (2) Credibility
      (3) Eligibility

7. How does Credibility enter into the following individual risk rating plans?

   (a) Retrospective Plan D
   (b) Fire Insurance — Multiple Location Rating Plan
   (c) The National Bureau of Casualty Underwriters' Loss Rating Plan

8. (a) Discuss the effect of each of the following items on the basic premium in Retrospective Rating:

      (1) Maximum premium
      (2) Minimum premium
      (3) Loss Conversion Factor

   (b) How are the expenses in the basic premium determined?

SECTION (b)

1. Cite four major changes from the present automobile assigned risk plans that are incorporated in Uniform Automobile Assigned Risk Plan B. Discuss the effect of each change.

2. What, briefly, is a reinsurance pool and cite both the advantages and disadvantages, if any, of such a plan.

3. Explain what is meant by portfolio reinsurance and cite circumstances in which it might be used.

4. Describe some of the changes introduced in the National Bureau's Special Automobile Policy compared to the traditional Family Automobile Policy.

5. A Company's cost factors with respect to a particular agent are: Commission 20%, Overwriting Commission 5%, General Expense 10%, Taxes 3%, Loss Adjustment 12%. In view of these costs, they agree that, if the pure loss ratio is less than 50%, a contingent commission shall be payable to the agent calculated $C = 0.10\ [0.50\text{-}L]$ where C = the contingent commission and L = the actual loss ratio. They feel that by sharing profits with the agent, there will be a strong incentive to maintain a high standard in the quality of the risks placed with the Company.

   To what extent do you feel that the above formula will accomplish the desired goal? Discuss.

6. In the pricing of an individual risk, two underwriters, identified as "A" and "B," express their positions as follows:

   (A) "This risk should be charged only with the directly allocable expenses, not with such overhead costs as rent, general supervision, and similar items not changing if we take on this single risk."

(B) "Under 'A's' theory of viewing each risk individually where would the money come from to support the general corporate overhead? Clearly each risk should bear its proportionate share of the burden."

Comment on these two approaches.

7. As a Company actuary considering the problem of the type of statistics which may be meaningful for analysis of operations, you are weighing the pros and cons of collecting your own company's General Liability experience by class and territory in the same detail used in Bureau reporting. Do you feel that such figures would be worthwhile and meaningful? Discuss.

8. Each year, a leading commentator on insurance analyzes the loss reserve position of various leading Companies according to the following five tabular presentations:

Table 1. Loss reserve divided by earned premium for (a) Liability (b) Workmen's Compensation (c) Other Casualty (d) Fire and Marine

Table 2. Number of suits outstanding per $100,000 earned Liability Premium

Table 3. Loss reserve divided by written premiums for the identical coverage breakdowns as in Table 1

Table 4. Increase or decrease in Schedule "P," Part V

Table 5. Increase or decrease in Schedule "O"

Discuss the significance of these tests.

PART IV

Section (a)

1. Under the National Council Statistical Plan for Workmen's Compensation, experience on three-year fixed rate policies may be reported in either one of two ways. Describe these ways in detail.

2. Briefly discuss the procedure for reporting all fidelity, surety and forgery losses under the statistical plan promulgated by the Surety Association of America.

3. Compare the respective approaches to coverage identification in the statistical plans for the Homeowners and for the Special Multi-Peril Policy.

4. What is the difference between the definition of allocated claim adjustment expense for automobile liability insurance as set forth in the statistical plans of the National Bureau of Casualty Underwriters and the National Association of Independent Insurers?

5. To which of the well-known publications of insurance statistics would you refer to obtain the following types of information?
   - (a) A description of the management of a particular insurance company
   - (b) Premiums Earned and Losses Incurred by State, by company, by line of business
   - (c) Schedule P for a given important Stock Company
   - (d) Underwriting Results by Sub-Line of general liability insurance for the great majority of all Stock Companies combined
   - (e) Average Effect of Expense Graduation (Workmen's Compensation) by type of company
   - (f) Countrywide Direct Expense Ratios by line for the twenty largest Stock Companies entered in New York State

6. Your growing company produces calendar year average paid claim statistics for general liability each year. Interestingly, in the face of inflation your company's average has remained constant for the past two years.

   Do you believe that such statistics are indicative of an arrested growth in claim costs for your company?

   Discuss.

   What type of information would you consider more indicative?

7. (a) What are the four types of functional units contained in all EDP systems? Briefly describe each type.

   (b) The word *Cobol* has become important in electronic data processing circles. Describe and discuss the concept of Cobol.

8. (a) An electronic computer is directed to prepare each of its operations by an instruction. Identify the two basic parts of an instruction and indicate the function of each part.

   (b) Prior to the preparation of punched card data in summary form reports, the cards are arranged in an orderly fashion. Name two types of punched card equipment that can be utilized in arranging the cards and briefly discuss the method each would use.

SECTION (b)

1. (a) Describe the way in which calendar year experience is used in Workmen's Compensation Ratemaking.

   (b) In making rates for New York Workmen's Compensation Insurance a Wage Factor is used. Discuss the need for this factor and describe its calculation in general terms.

2. Recently there has been much discussion concerning the discounting of medical and other non-tabular reserves in Workmen's Compensation Insurance.

   Discuss the effect of such a move on rates, and state your opinions on the desirability of such a move.

3. (a) In Owners', Landlords' and Tenants' bodily injury liability ratemaking countrywide classification differentials have been introduced. What basic problem does this ratemaking approach attempt to solve?

   (b) In revising the relativities among the factors in the General Liability increased limits tables, there are two possible approaches. The first is to review the experience by limits purchased. The second is to review the experience by increment of limits.

   Discuss these methods and their implications.

4. (a) Discuss recent developments in the rating of private passenger assigned risks. How will these changes affect the current ratemaking practices?

   (b) Arguments have been made for and against the inclusion of assigned risk experience in the making of rates for voluntarily insured Automobile Liability risks.

   Discuss.

5. In an inflationary economy how would you attempt to adjust past experience in order to develop adequate rates in the future for the following lines:

   (a) Private Passenger Property Damage Liability Rates

   (b) Manufacturers' and Contractors' Rates

   (c) Glass Insurance Rates

6. Company A has recently introduced a package policy encompassing several different coverages now available separately. The reduced rates for this policy have been developed by utilizing the manual rates for the separate coverages as a guide. Briefly discuss the problems that you, as actuary of this company, will have in developing future rates for this package policy and for the separate coverages.

7. (a) Distinguish between the meanings of "exposure" as generally used in casualty insurance and as used in fire schedule rating.

   (b) Discuss briefly the mathematical foundations, if any, of the exposure concept.

   (c) Comment on the exposure concept as it may be applicable to the Homeowners policy.

8. The negative binomial distribution has been utilized in recent discussions and evaluations of individual automobile driving records. Briefly set forth the theory and reasoning underlying its utilization (without detailing the mathematical development) and the data which has been used in relating the theory to actual results.

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CASUALTY

ACTUARIAL SOCIETY

ORGANIZED 1914

1963 YEAR BOOK

Corrected to December 1, 1962

FOREWORD

The Casualty Actuarial Society was organized November 7, 1914 as the Casualty Actuarial and Statistical Society of America, with 97 charter members of the grade of Fellow. The present title was adopted on May 14, 1921. The object of the Society shall be the promotion of actuarial and statistical science as applied to the problems of insurance, other than life insurance, by means of personal intercourse, the presentation and discussion of appropriate papers, the collection of a library and such other means as may be found desirable. The organization of the Society was brought about through the suggestion of Dr. I. M. Rubinow, who became the first president. The problems surrounding workmen's compensation were at that time the most urgent, and consequently many of the members played a leading part in the development of the scientific basis upon which workmen's compensation insurance now rests.

The members of the Society have also presented original papers to the *Proceedings* upon the scientific formulation of standards for the computation of both rates and reserves in accident and health insurance, liability, burglary, fire, and the various automobile coverages. The presidential addresses constitute a valuable record of the current problems facing the casualty insurance business. Other papers in the *Proceedings* deal with acquisition costs, pension funds, legal decisions, investments, claims, reinsurance, accounting, statutory requirements, loss reserves, statistics, and the examination of insurance companies. The Report of the Committee on Mortality for Disabled Lives together with commutation tables and life annuities has been printed in Volume XXXII. The Committee on Compensation and Liability Loss and Loss Expense Reserves submitted a report which appears in Volume XXXV. Other publications of the Society and the prices thereof are listed on the inside of the front cover of this *Year Book.*

At the November 1950 meeting of the Society the Constitution and By-Laws were amended to enlarge the scope of the Society to include all lines of insurance other than life insurance. The effect of the amendment was to include fire insurance and allied lines in recognition of multiple line writing power granted by many states to both casualty companies and fire companies.

The membership of the Society consists of actuaries, statisticians, and executives who are connected with the principal casualty companies and organizations in the United States and Canada. The Society has a total membership of 384 consisting of 207 Fellows and 177 Associates. Examinations for these two grades of membership are held during the second or third week of the month of May, in various cities in the United States and Canada.

The Society issues a publication entitled the *Proceedings* which contains original papers presented at the meetings, together with discussions of the papers and reviews of books. The *Year Book* is published annually. *Recommendations for Study* is a pamphlet which outlines the course of study to be followed in connection with the examination for admission. These two booklets may be obtained free upon application to the Secretary-Treasurer, Albert Z. Skelding, 200 E. 42nd Street, New York 17, N. Y.

CASUALTY ACTUARIAL SOCIETY

NOVEMBER 15, 1962

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MEMBERSHIP OF THE SOCIETY, NOVEMBER 15, 1962

FELLOWS

Those Marked (†) were Charter Members at date of organization, November 7, 1914

Admitted	
Nov. 21, 1930	AINLEY, JOHN W., Assistant Actuary, The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
Nov. 14, 1947	ALLEN, EDWARD S., Actuary, The Phoenix of Hartford Insurance Companies, 61 Woodland Street, Hartford 15, Conn.
Nov. 13, 1931	AULT, GILBERT E., Actuary, Church Pension Fund & Church Life Insurance Corporation, 20 Exchange Place, New York 5, N. Y.
Nov. 18, 1955	BAILEY, ROBERT A., Associate Actuary, Insurance Company of North America, 1600 Arch Street, Philadelphia 1, Pa.
Nov. 15, 1962	BALCAREK, RAFEL J., Assistant Actuary, Standard Accident Insurance Company, 640 Temple Avenue, Detroit 32, Mich.
Nov. 20, 1924	BARBER, HARMON T., (Retired), 18 Ridgewood Road, Windsor, Conn.
Nov. 19, 1954	BARKER, GORDON M., c/o Bowles, Andrews & Towne, 1004 Thompson Street, Richmond 21, Va.
Nov. 14, 1947	BARKER, LORING M., Actuary, The Fund Insurance Companies, 3333 California Street, San Francisco, Calif.
Nov. 20, 1942	BART, ROBERT D., Director of Employee Relations and Assistant Treasurer, The West Bend Company, 400 Division Street, West Bend, Wis.
Nov. 18, 1932	BARTER, JOHN L., (Retired), 90 Tunxis Road, West Hartford 7, Conn.
Nov. 13, 1931	BATHO, ELGIN R., Vice President and Actuary, Berkshire Life Insurance Company, 7 North Street, Pittsfield, Mass.
Nov. 14, 1958	BENBROOK, PAUL, Vice President, American General Insurance Company, 700 Rusk Bldg., P.O. Box 2179, Houston 2, Texas.
Nov. 16, 1956	BENNETT, NORMAN J., Actuary, America Fore Loyalty Group, 80 Maiden Lane, New York 38, N. Y.
Nov. 22, 1934	BERKELEY, ERNEST T., Actuary, Employers' Group, 110 Milk Street, Boston 7, Mass.
Nov. 22, 1957	BERQUIST, JAMES R., Associate Actuary, Employers Mutuals of Wausau, 407 Grant Street, Wausau, Wis.
Nov. 19, 1953	BEVAN, JOHN R., Assistant Actuary, Liberty Mutual Insurance Company, 175 Berkeley Street, Boston 17, Mass.
†	BLACK, S. BRUCE, Honorary Chairman, Liberty Mutual Insurance Company, 175 Berkeley Street, Boston 17, Mass.
Apr. 20, 1917	BLANCHARD, RALPH H., Professor Emeritus of Insurance, Graduate School of Business, Columbia University, Plympton, Mass.
Nov. 19, 1959	BLODGET, HUGH R., Assistant Actuary, Aetna Casualty and Surety Company & Standard Fire Insurance Company, 151 Farmington Avenue, Hartford 15, Conn.
Nov. 16, 1956	BONDY, MARTIN, Assistant Vice President and Actuary, Consolidated Mutual Insurance Company, 345 Adams Street, Brooklyn 1, N. Y.
Nov. 22, 1957	BORNHUETTER, RONALD L., Associate Actuary, National Bureau of Casualty Underwriters, 125 Maiden Lane, New York 38, N. Y.
Nov. 16, 1956	BOYAJIAN, JOHN H., Actuary, National Board of Fire Underwriters, 85 John Street, New York 38, N. Y.

FELLOWS

Admitted	
Nov. 19, 1959	BOYLE, JAMES L., Assistant Actuary, The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
Nov. 16, 1961	BRANNIGAN, JAMES F., Casualty, Fire & Marine Actuarial Dept., The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
†	BREIBY, WILLIAM, Consulting Actuary, Pacific Mutual Bldg., 523 W. 6th Street, Los Angeles, Calif.
Nov. 21, 1952	BRINDISE, RALPH S., Casualty Actuary, Standard Oil Company (Indiana), 910 S. Michigan Avenue, Chicago 80, Ill.
Nov. 18, 1927	BROWN, F. STUART, (Retired), Cedar Lane Road, Orleans, Mass.
Oct. 22, 1915	BROWN, HERBERT D., (Retired), Glenora-on-Lake Seneca, Dundee, N. Y.
Nov. 16, 1961	BUDD, EDWARD H., Assistant Secretary, The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
Apr. 20, 1917	BURHOP, WILLIAM H., Chairman of the Board, Employers' Mutual Liability Insurance Company of Wisconsin, 407 Grant Street, Wausau, Wis.
Nov. 23, 1928	BURLING, WILLIAM H., Secretary, Group Dept., The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
Nov. 19, 1959	BYRNE, HARRY T., Assistant Actuary, Aetna Casualty and Surety Company & Standard Fire Insurance Company, 151 Farmington Avenue, Hartford 15, Conn.
Nov. 19, 1929	CAHILL, JAMES M., Secretary, National Bureau of Casualty Underwriters, 125 Maiden Lane, New York 38, N. Y.
Nov. 18, 1932	CAMERON, FREELAND R., Senior Vice President, American-Equity Insurance Group, 901 N.E. 2nd Avenue, Miami 1, Fla.
Nov. 17, 1938	CARLETON, JOHN W., Vice President, Liberty Mutual Insurance Company, 175 Berkeley Street, Boston 17, Mass.
Nov. 21, 1930	CARLSON, THOMAS O., Manager, Southeastern Branch, National Bureau of Casualty Underwriters, 1627 Peachtree Street, N. E., Atlanta 9, Ga.
Nov. 18, 1949	CLARKE, JOHN W., President, General Reinsurance Life Corporation, 400 Park Avenue, New York 22, N. Y.
Nov. 15, 1918	COATES, BARRETT N., 1007 Cragmont Avenue, Berkeley 8, Calif.
Nov. 17, 1922	COATES, CLARENCE S., Actuary, Lumbermens Mutual Casualty Company, 4750 Sheridan Road, Chicago 40, Ill.
Feb. 19, 1915	COLLINS, HENRY, (Retired), Lochbrae, Windermere, Fla.
Nov. 22, 1934	COOK, EDWIN A., President and General Manager, Interboro Mutual Indemnity Insurance Company, 270 Madison Avenue, New York 16, N. Y.
Nov. 18, 1925	CORCORAN, WILLIAM M., Consulting Actuary, Wolfe, Corcoran & Linder, 116 John Street, New York 38, N. Y.
Nov. 19, 1926	CRANE, HOWARD G., Vice President and Treasurer, General Reinsurance Corporation, 400 Park Avenue, New York 22, N. Y.
Nov. 21, 1952	CRITCHLEY, DOUGLAS, E. B. Savory & Company, London, England.
Nov. 22, 1946	CROUSE, CHARLES W., Consulting Actuary, C. F. Preslan & Company, Inc., 20015 Detroit Road, Cleveland 16, Ohio.
Nov. 18, 1960	CROWLEY, JAMES H., JR., Assistant Secretary, Accounts Dept., Aetna Life Affiliated Companies, 151 Farmington Avenue, Hartford 15, Conn.
Nov. 19, 1953	CURRY, HAROLD E., Vice President, State Farm Mutual Automobile Insurance Company, 112 E. Washington Street, Bloomington, Ill.

FELLOWS

Admitted	
Nov. 18, 1932	DAVIES, E. ALFRED, (Retired), Falls Village, Conn.
Nov. 18, 1927	DAVIS, EVELYN M., Partner, Woodward, Ryan, Sharp & Davis, Consulting Actuaries, 26 Broadway, Room 708, New York 6, N. Y.
May 25, 1956	DAY, ELDEN W., Resident Secretary, Lumbermens Mutual Casualty Company, 110 William Street, New York 38, N. Y.
Nov. 18, 1960	DICKERSON, O. D., Associate Professor, Florida State University, Tallahassee, Fla.
Nov. 16, 1951	DOREMUS, FREDERICK W., Assistant General Manager, Inter-Regional Insurance Conference, 125 Maiden Lane, New York 38, N. Y.
Nov. 17, 1920	DORWEILER, PAUL, (Retired), 51 Wethersfield Avenue, Hartford 14, Conn.
Nov. 22, 1957	DROBISCH, MILES R., Assistant Actuary, California Inspection Rating Bureau, 1453 Mission Street, San Francisco 3, Calif.
Nov. 14, 1958	DROPKIN, LESTER B., Actuary, California Inspection Rating Bureau, 1453 Mission Street, San Francisco 3, Calif.
Nov. 24, 1933	EDWARDS, JOHN, Actuary, Ontario Department of Insurance, 145 Queen Street West, Toronto 1, Ontario.
Nov. 19, 1959	EIDE, K. ARNE, Statistical Bureau, Actuarial Div., Metropolitan Life Insurance Company, 1 Madison Avenue, New York 10, N. Y.
Nov. 15, 1940	ELLIOTT, GEORGE B., General Manager, Pennsylvania Compensation Rating Bureau, 315 Chestnut Street, Philadelphia 6, Pa.
Nov. 17, 1922	ELSTON, JAMES S., (Retired), 1640 Palmer Avenue, Winter Park, Fla.
Nov. 15, 1935	EPPINK, WALTER T., 2nd Vice President, Treasurer and Actuary, Merchants Mutual Insurance Company, 268 Main Street, Buffalo 5, N. Y.
Nov. 14, 1958	ESPIE, ROBERT G., Vice President and Assistant Comptroller, Aetna Life Affiliated Companies, 151 Farmington Avenue, Hartford 15, Conn.
Nov. 18, 1955	FAIRBANKS, ALFRED V., Associate Actuary, Monarch Life Insurance Company, 1250 State Street, Springfield, Mass.
†	FALLOW, EVERETT S., (Retired), 28 Sunset Terrace, West Hartford, Conn.
Nov. 15, 1940	FARLEY, JARVIS, Secretary, Treasurer and Actuary, Massachusetts Indemnity and Life Insurance Company, 654 Beacon Street, Boston 15, Mass.
†	FARRER, HENRY, (Retired), 1352 Overlea Street, Clearwater, Fla.
Nov. 18, 1960	FAUST, J. EDWARD, JR., Consulting Actuary, 4117 Central Avenue, Indianapolis, Ind.
May 25, 1956	FINNEGAN, JOSEPH H., Manager, Actuarial Bureau, National Board of Fire Underwriters, 85 John Street, New York 38, N. Y.
Nov. 16, 1961	FITZGIBBON, WALTER J., JR., Actuarial Assistant, Aetna Casualty and Surety Company & Standard Fire Insurance Company, 151 Farmington Avenue, Hartford 15, Conn.
Nov. 15, 1935	FITZHUGH, GILBERT W., President, Metropolitan Life Insurance Company, One Madison Avenue, New York 10, N. Y.
Nov. 18, 1955	FOSTER, ROBERT B., Associate Actuary, Casualty, Fire & Marine Actuarial Dept., The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
Nov. 18, 1955	FOWLER, THOMAS W., Actuary, North American Reinsurance Corp., 161 E. 42nd Street, New York 17, N. Y.

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Nov. 18, 1927	FREDERICKSON, C. H., Consulting Actuary, 3434 Eglinton Ave. E., Scarboro, Ontario, Canada.
Nov. 22, 1934	FULLER, GARDNER V., (Retired), Conover, Wis.
Nov. 22, 1957	GILLAM, WILLIAM S., Director of Research, National Bureau of Casualty Underwriters, 125 Maiden Lane, New York 38, N. Y.
Nov. 20, 1924	GINSBURGH, HAROLD J., 14 Crestview Road, Belmont 78, Mass.
Nov. 21, 1930	GLENN, JOSEPH B., Consulting Actuary, 6110 Valley Road, Washington 14, D. C.
Nov. 13, 1931	GODDARD, RUSSELL P., Bowles Andrews & Towne, Inc., 156 William Street, New York 38, N. Y.
†	GOODWIN, EDWARD S., (Retired), Investment Counselor, 96 Garvan Street, East Hartford 8, Conn.
Nov. 19, 1926	GRAHAM, CHARLES M., Fire and Casualty Actuary, Florida Insurance Department, State Capitol, Tallahassee, Fla.
†	GRAHAM, WILLIAM J., Consultant, 1070 Park Avenue, New York 18, N. Y
Nov. 19, 1953	GRAVES, CLYDE H., Actuary, Mutual Insurance Rating Bureau & Assistant Manager, Mutual Insurance Advisory Association, 733 Third Avenue, New York 17, N. Y.
†	GREENE, WINFIELD W., President, W. W. Greene, Inc., Reinsurance Intermediaries and Actuarial Consultants, 32 Cliff Street, New York 38, N. Y.
Nov. 19, 1953	HALEY, JAMES B., JR., Coates, Herfurth & England, Consulting Actuaries, Crocker Bldg., San Francisco, Calif.
†	HAMMOND, H. PIERSON, (Retired), 22 Vanderbilt Road, West Hartford 7, Conn.
Nov. 16, 1956	HART, W. VAN BUREN, JR., Actuary, Aetna Insurance Company, 55 Elm Street, Hartford 15, Conn.
Nov. 17, 1950	HARWAYNE, FRANK, Chief Actuary, New York State Insurance Department, 123 William Street, New York 38, N. Y.
Nov. 19, 1926	HAUGH, CHARLES J., Vice President, The Travelers Insurance Company & The Travelers Indemnity Company, 700 Main Street, Hartford 15, Conn.
Nov. 17, 1950	HAZAM, WILLIAM J., Vice President and Actuary, American Mutual Liability Insurance Company, Wakefield, Mass.
Nov. 16, 1951	HEWITT, CHARLES C., JR., Actuary, Allstate Insurance Company, 7447 Skokie Blvd., Skokie, Ill.
Nov. 16, 1961	HOBBS, EDWARD J., Associate Actuary, Insurance Company of North America, 1600 Arch Street, Philadelphia 1, Pa.
Nov. 22, 1934	HOOKER, RUSSELL O., Consulting Actuary, 750 Main Street, Hartford 3, Conn.; & President and Actuary, Insurance City Life Company.
Nov. 17, 1950	HOPE, FRANCIS J., Assistant Secretary, Hartford Accident and Indemnity Company, 690 Asylum Avenue, Hartford 15, Conn.
Nov. 18, 1932	HUEBNER, SOLOMON S., President Emeritus, American College of Life Underwriters, 270 Bryn Mawr Avenue, Bryn Mawr, Pa.
Nov. 14, 1947	HUGHEY, M. STANLEY, Vice President, Lumbermens Mutual Casualty Company, 4750 Sheridan Road, Chicago 40, Ill.
Nov. 19, 1959	HUNT, FREDERIC J., JR., Associate Actuary, Insurance Company of North America, 1600 Arch Street, Philadelphia 1, Pa.
†	HUNTER, ARTHUR, (Retired), 124 Lloyd Road, Montclair, N. J.

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Admitted	
Nov. 18, 1955	HURLEY, ROBERT L., Actuary, Inter-Regional Insurance Conference, 125 Maiden Lane, New York 38, N. Y.
Nov. 19, 1954	JOHE, RICHARD L., Vice President and Actuary, United States Fidelity and Guaranty Company, Calvert & Redwood Streets, Baltimore 3, Md.
Nov. 14, 1941	JOHNSON, ROGER A., Actuary, The Associated Hospital Service of Philadelphia, 112 S. 16th Street, Philadelphia 2, Pa.
Nov. 16, 1939	JONES, HAROLD M., Group Statistician, John Hancock Mutual Life Insurance Company, 200 Berkeley Street, Boston 17, Mass.
Nov. 16, 1956	KALLOP, ROY H., Actuary, National Council on Compensation Insurance, 200 E. 42nd Street, New York 17, N. Y.
Nov. 22, 1957	KATES, PHILLIP B., Executive Vice President, Southern Fire & Casualty Company, P. O. Box 240, Knoxville 1, Tenn.
Nov. 19, 1926	KELTON, WILLIAM H., (Retired), 122 Arundel Avenue, West Hartford 7, Conn.
Nov. 19, 1959	KLAASSEN, ELDON J., Associate Actuary, Continental Casualty Company, 310 S. Michigan Avenue, Chicago 4, Ill.
Nov. 14, 1941	KOLE, MORRIS B., Director of Insurance Fund Planning and Data Processing, The State Insurance Fund, 199 Church Street, New York 7, N. Y.
Nov. 24, 1933	KORMES, MARK, President, Actuarial Associates Incorporated, 285 Madison Avenue, New York 17, N. Y.
Nov. 19, 1953	KUENKLER, ARTHUR S., Executive Vice President, Security-Connecticut Insurance Group, 175 Whitney Avenue, New Haven, Conn.
Nov. 18, 1949	LACROIX, HAROLD F., Second Vice President, The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
May 5, 1961	LATIMER, MURRAY W., Industrial Relations Consultant, 1625 K Street, N.W., Washington 6, D.C.
Nov. 17, 1950	LESLIE, WILLIAM, JR., General Manager, National Bureau of Casualty Underwriters, 125 Maiden Lane, New York 38, N. Y.
Nov. 16, 1961	LINDEN, JOHN R., Actuarial Assistant, Aetna Casualty and Surety Company & Standard Fire Insurance Company, 151 Farmington Avenue, Hartford 15, Conn.
Nov. 20, 1924	LINDER, JOSEPH, Consulting Actuary, Wolfe, Corcoran & Linder, 116 John Street, New York 38, N. Y.
Nov. 16, 1956	LINO, RICHARD, Actuary, National Bureau of Casualty Underwriters, 125 Maiden Lane, New York 38, N. Y.
Nov. 18, 1955	LISCORD, PAUL S., Actuary, The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
Nov. 17, 1950	LIVINGSTON, GILBERT R., Casualty Actuary, Connecticut Insurance Department, State Office Bldg., Hartford 15, Conn.
Nov. 16, 1951	LONGLEY-COOK, LAURENCE H., Vice President and Actuary, Insurance *Company of North America, 1600 Arch Street, Philadelphia 1, Pa.*
Nov. 13, 1936	LYONS, DANIEL J., Senior Vice President, Guardian Life Insurance Company, Park Avenue South at 17th Street, New York 3, N. Y.
Nov. 19, 1954	MACKEEN, HAROLD E., Assistant Actuary; Casualty, Fire & Marine Actuarial Dept., The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
Nov. 14, 1958	MAGRATH, JOSEPH J., Secretary, Federal Insurance Company, 90 John Street, New York 38, N. Y.
Nov. 22, 1957	MAKGILL, STEPHEN, S., Assistant Actuary; Casualty, Fire & Marine Actuarial Dept., The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.

FELLOWS

Admitted	
Nov. 23, 1928	MARSHALL, RALPH M., (Retired), Catts Corner, Worton, Kent County, Md.
Nov. 18, 1927	MASTERSON, NORTON E., Vice President and Actuary, Hardware Mutual Casualty Company & Hardware Dealers Mutual Fire Insurance Company, 200 Strongs Avenue, Stevens Point, Wis.
Nov. 19, 1926	MATTHEWS, ARTHUR N., Second Vice President and Actuary, The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
May 19, 1915	MAYCRINK, EMMA C., 32 Chittenden Avenue, Crestwood, N. Y.
Nov. 14, 1958	MAYERSON, ALLEN L., Associate Professor, Mathematics and Insurance, University of Michigan, Ann Arbor, Mich.
Nov. 15, 1935	McCONNELL, MATTHEW H., Superintendent, Compensation & Liability Dept., General Accident Fire and Life Assurance Corporation, Ltd., Fourth and Walnut Streets, Philadelphia 5, Pa.
Nov. 18, 1960	McGUINNESS, JOHN S., Budget Director, Glens Falls Insurance Company, Glens Falls, N. Y.
Nov. 15, 1962	McNAMARA, DANIEL J., Secretary, National Bureau of Casualty Underwiters, 125 Maiden Lane, New York 38, N. Y.
Nov. 15, 1962	MEENAGHAN, JAMES J., Assistant Actuary, National Bureau of Casualty Underwriters, 125 Maiden Lane, New York 38, N. Y.
Nov. 18, 1955	MENZEL, HENRY W., Actuary, New York Compensation Insurance Rating Board, 200 E. 42nd Street, New York 17, N. Y.
†	MICHELBACHER, GUSTAV F., (Retired), 15201 Quito Road, Saratoga, Calif.
Nov. 17, 1938	MILLER, JOHN H., Vice President and Senior Actuary, Springfield-Monarch Insurance Companies, 1250 State Street, Springfield 1, Mass.
†	MILLIGAN, SAMUEL, Senior Vice President, Metropolitan Life Insurance Company, 1 Madison Avenue, New York 10, N. Y.
Nov. 18, 1937	MILLS, JOHN A., (Retired), Point Placid, Reeds Spring, Mo.
Nov. 22, 1957	MILLS, RICHARD J., Statistical Dept., Lumbermens Mutual Casualty Company, 4750 Sheridan Road, Chicago 40, Ill.
Nov. 15, 1962	MORISON, GEORGE D., Actuarial Assistant, Actuarial Department, Aetna Casualty & Surety Company and Standard Fire Insurance Company, 151 Farmington Avenue, Hartford 15, Conn.
Nov. 16, 1961	MOSELEY, JACK, Assistant Actuary, United States Fidelity and Guaranty Company, Calvert and Redwood Streets, Baltimore 3, Md.
Nov. 17, 1920	MUELLER, LOUIS H., 2845 Lake Street, San Francisco 21, Calif.
Nov. 16, 1956	MUETTERTIES, JOHN H., Associate Actuary, Hardware Mutual Casualty Company & Hardware Dealers Mutual Fire Insurance Company, 200 Strongs Avenue, Stevens Point, Wis.
Nov. 17, 1950	MUNTERICH, GEORGE C., Assistant Secretary, Hartford Fire Insurance Company, Hartford Accident and Indemnity Company & Citizens Insurance Company of New Jersey, 690 Asylum Avenue, Hartford 15, Conn.
May 28, 1920	MURPHY, RAY D., (Retired), 28 Godfrey Road, Upper Montclair, N. J.
Nov. 19, 1954	MURRIN, THOMAS E., Vice President and Actuary, The American Insurance Company, 15 Washington Street, Newark 1, N. J.
Nov. 19, 1959	MYERS, ROBERT J., Chief Actuary, Department of Health, Education and Welfare, Social Security Administration, Washington 25, D. C.

FELLOWS

Admitted	
Nov. 14, 1958	NILES, CHARLES L., JR., Actuary, General Accident Group, General Bldg,. 414 Walnut Street, Philadelphia 5, Pa.
Nov. 15. 1935	OBERHAUS, THOMAS M., Vice President, Woodward and Fondiller, Inc., 420 Madison Avenue, New York 17, N. Y.
†	ORR, ROBERT K., (Retired), 757 S. Johnson Avenue, Lakeland, Fla.
Nov. 22, 1957	OTTESON, PAUL M., Vice President and Actuary, Federated Mutual Implement and Hardware Insurance Company & Federated Life Insurance Company, 129 East Broadway, Owatonna, Minn.
Nov. 21, 1919	OUTWATER, OLIVE E., (Retired), Harbert, Mich.
Nov. 15, 1962	PARLIN, R. WILLIS, Actuary, Mutual Service Insurance Companies 1919 University Avenue, St. Paul 4. Minn.
Nov. 18, 1960	PENNYCOOK, ROD B., Health Insurance Secretary, The Great West Life Assurance Company, 60 Osborne Street, Winnipeg, Manitoba.
Nov. 22, 1957	PERKINS, WILLIAM J., Assistant Group Actuary, The London Life Insurance Company, London, Ontario, Canada.
Nov. 14, 1941	PETERS, STEFAN, Consultant, Arthur D. Little, Inc., 35 Acorn Park, Cambridge, Mass.
Nov. 21, 1952	PETZ, EARL F., Assistant Secretary, Lumbermens Mutual Casualty Company, 4750 Sheridan Road, Chicago 40, Ill.
Nov. 19, 1959	PHILLIPS, HERBERT J., JR., Assistant Actuary, Employers' Liability Assurance Corporation, Ltd., 110 Milk Street, Boston 7, Mass.
Nov. 24, 1933	PICKETT, SAMUEL C., (Retired), 126 Macktown Road, Windsor, Conn.
Nov. 22, 1957	PINNEY, ALLEN D., Assistant Secretary, The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
Nov. 17, 1922	PINNEY, SYDNEY D., 290 Wolcott Hill Road, Wethersfield 9, Conn.
Nov. 19. 1959	POLLACK, ROBERT, Assistant Actuary, American Mutual Liability Insurance Company, Wakefield, Mass.
Nov. 13. 1931	PRUITT, DUDLEY M., Executive Secretary, Middle Atlantic Region, American Friends Service Committee, 1500 Race Street, Philadelphia 2. Pa.
Nov. 18, 1955	RESONY, ALLIE V., Assistant Secretary, Hartford Accident & Indemnity Company, 690 Asylum Avenue, Hartford 15, Conn.
Nov. 18, 1949	RESONY, JOHN A., Secretary, Group Dept., The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
Nov. 16, 1951	RICE, HOMER D., (Retired), 1731 Morningside Drive, Mount Dora, Fla.
May 24, 1921	RIEGEL, ROBERT, Professor Emeritus of Statistics and Insurance, University of Buffalo, Buffalo 14, N. Y.
Nov. 14, 1958	ROBERTS, LEWIS H., Actuary, Woodward & Fondiller, 420 Madison Avenue, New York 17, N. Y.
Nov. 14, 1947	RODERMUND, MATTHEW, Vice President-Actuary, Munich Reinsurance Company, 410 Park Avenue, New York 22, N. Y.
Nov. 14, 1947	ROSENBERG, NORMAN, Executive Assistant, Farmers Insurance Group, 4680 Wilshire Boulevard, Los Angeles 54, Calif.
Nov. 14, 1947	ROWELL, JOHN H., Actuary, Marsh & McLennan, Inc., 231 S. LaSalle Street, Chicago 4, Ill.
Nov. 17, 1938	RUCHLIS, ELSIE, Actuarial Supervisor, National Bureau of Casualty Underwriters, 125 Maiden Lane, New York 38, N. Y.

FELLOWS

Admitted	
Nov. 14, 1947	SALZMANN, RUTH E., Associate Actuary, Insurance Company of North America, 1600 Arch Street, Philadelphia 1, Pa.
Nov. 19, 1948	SCHLOSS, HAROLD W., Secretary and Actuary, Royal-Globe Insurance Companies, 150 William Street, New York 38, N. Y.
Nov. 18, 1937	SHAPIRO, GEORGE I., 934 E. 9th Street, Brooklyn 30, N. Y.
Nov. 13, 1931	SILVERMAN, DAVID, Consulting Actuary, Wolfe, Corcoran & Linder, 116 John Street, New York 38, N. Y.
Nov. 19, 1954	SIMON, LEROY J., Actuary, Insurance Company of North America, 1600 Arch Street, Philadelphia 1, Pa.
Nov. 18, 1960	SIMONEAU, PAUL W., Assistant Actuary, Aetna Casualty and Surety Company & Standard Fire Insurance Company, 151 Farmington Avenue, Hartford 15, Conn.
Nov. 19, 1929	SKELDING, ALBERT Z., Secretary-Treasurer, Casualty Actuarial Society, 200 E. 42nd Street, New York 17, N. Y.
Nov. 19, 1929	SKILLINGS, E. SHAW, Assistant Vice President and Actuary, Allstate Insurance Company, 7447 Skokie Boulevard, Skokie, Ill.
Nov. 18, 1932	SMICK, J. J., Partner, Smick & Steinhaus, Consulting Actuaries, 135 E. 42nd Street, New York 17, N. Y.
Nov. 14, 1958	SMITH, EDWARD M., Associate Actuary, The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
Nov. 15, 1940	SMITH, SEYMOUR E., Vice President and Actuary, The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
Nov. 15, 1962	STANKUS, L. M., Actuary, Allstate Insurance Company, 7447 Skokie Blvd., Skokie, Ill.
Nov. 24, 1933	ST. JOHN, JOHN B., Consulting Actuary, Box 57, Penllyn, Pa.
Nov. 18, 1927	STONE, EDWARD C., Chairman of the Board, American Employers' Insurance Company, 40 Central Street, Boston 9, Mass.
Nov. 19, 1959	SYKES, ZENAS M., Actuary, Social Security Administration, United States Department of Health, Education and Welfare, Washington 25, D. C.
May 25, 1956	TAPLEY, DAVID A., Senior Vice President and Actuary, Wolverine Insurance Company, Wolverine-Federal Tower, Battle Creek, Mich.
Nov. 14, 1958	TARBELL, LUTHER L., JR., Assistant Actuary; Casualty, Fire & Marine Actuarial Dept., The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
Nov. 16, 1956	THOMAS, JAMES W., Assistant Actuary; Casualty, Fire & Marine Actuarial Dept., The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
†	THOMPSON, JOHN S., Newark Athletic Club, Newark 2, N. J.
Nov. 19, 1953	TRIST, JOHN A. W., Manager, Statistical Department, Insurance Company of North America, 1600 Arch Street, Philadelphia 1, Pa.
Nov. 15, 1962	TRUDEAU, DONALD E., Casualty, Fire & Marine Department, The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
Nov. 14, 1947	UHTHOFF, DUNBAR R., Vice President and Actuary, Employers' Mutual Liability Insurance Company of Wisconsin and Employers' Mutual Fire Insurance Company, 407 Grant Street, Wausau, Wisconsin
Nov. 23, 1928	VALERIUS, NELS M., Associate Actuary, Aetna Casualty and Surety Company & Standard Fire Insurance Company, 151 Farmington Avenue, Hartford 15, Conn.

FELLOWS

Admitted	
Nov. 21, 1919	Van Tuyl, Hiram O., (Retired), 17 Coolidge Avenue, White Plains, N. Y.
Nov. 16, 1951	Vincent, Lewis A., General Manager, National Board of Fire Underwriters, 85 John Street, New York 38, N. Y.
Nov. 17, 1920	Waite, Alan W., 16 Penwood Road, Bloomfield, Conn.
Nov. 15, 1962	Walsh, Albert J., Assistant Actuary, Liberty Mutual Insurance Company, 175 Berkeley Street, Boston 17, Mass.
Nov. 14, 1947	Wieder, John W., Jr., Actuary, Aetna Casualty and Surety Company & Standard Fire Insurance Company, 151 Farmington Avenue, Hartford 15, Conn.
Nov. 18, 1960	Wilcken, Carl L., Assistant Actuary, Canadian Underwriters' Association, 12 Upjohn Road, Don Mills, Ontario, Canada.
Nov. 15, 1935	Williams, Harry V., Vice President, Hartford Accident and Indemnity Company & Hartford Fire Insurance Company, 690 Asylum Avenue, Hartford 15, Conn.
Nov. 22, 1957	Williams, Phillip A., Associate Actuary, The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
Nov. 14, 1941	Williamson, W. Rulon, Research Actuary, 3400 Fairhill Drive, Washington 23, D. C.
Nov. 18, 1960	Willsey, Lynn W., Assistant Secretary, Group Dept., The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
Nov. 16, 1961	Wilson, James C., Vice President & Actuary, Security General Insurance Company and Security Fire and Indemnity Company, 639 W. Fifth Street, Box 3099, Winston-Salem, N. C.
Nov. 13, 1931	Wittick, Herbert E., Vice President and General Manager, Pilot Insurance Company, 1315 Yonge Street, Toronto 7, Ontario, Canada.
Nov. 18, 1949	Wolfrum, Richard J., Actuary, Liberty Mutual Insurance Company, 175 Berkeley Street, Boston 17, Mass.
Nov. 16, 1951	Woodall, John P., Manager, South-Eastern Underwriters Association, 327 Trust Co. of Georgia Bldg., Atlanta 2, Ga.
Nov. 14, 1958	Wright, Byron, Actuary, Department of Banking and Insurance, State of New Jersey, State House Annex, Trenton 25, N. J.
Nov. 19, 1953	Yount, Hubert W., Executive Vice President, Liberty Mutual Insurance Company, 175 Berkeley Street, Boston 17, Mass.

ASSOCIATES

Admitted	
Nov. 15, 1918	ACKERMAN, SAUL B., 405 Lexington Avenue, New York 17, N. Y.
Nov. 16, 1939	AIN, SAMUEL N., Consulting Actuary, 120 Broadway, New York 5, N. Y.
Nov. 16, 1961	ALDRICH, WILLIAM C., Secretary, National Council on Compensation Insurance, 200 E. 42 Street, New York 17, N. Y.
Nov. 22, 1957	ALEXANDER, LEE M., American Mutual Liability Insurance Company, Wakefield, Mass.
Apr. 5, 1928	ALLEN, AUSTIN F., Chairman of the Board, Texas Employers' Insurance Association, P.O. Box 2759, Dallas 21, Texas.
Nov. 15, 1962	AMLIE, WILLIAM P., Statistical Department, Lumbermens Mutual Casualty Company, 4750 Sheridan Road, Chicago 40, Ill.
Nov. 18, 1955	ANDREWS, EDWARD C., Associate Actuary; Casualty, Fire & Marine Actuarial Dept., The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
Nov. 15, 1918	ANKERS, ROBERT E., (Retired), 414 E. Broad Street, Falls Church, Va.
Nov. 21, 1930	ARCHIBALD, A. EDWARD, Vice President, Investors Diversified Services, Inc., Minneapolis 2, Minn.
Nov. 19, 1959	BANNISTER, DAN W., Vice President, Security Insurance Company, 175 Whitney Avenue, New Haven, Conn.
Nov. 24, 1933	BARRON, JAMES C., Comptroller, American Mercury Insurance Company, 2251 Wisconsin Avenue, N.W., Washington 7, D. C.
Nov. 23, 1928	BATEMAN, ARTHUR E., Pine Grove Rest Home, Marlboro, Mass.
Nov. 15, 1940	BATHO, BRUCE, Vice President and Comptroller, Life Insurance Company of Georgia, 573 W. Peachtree Street, N.E., Atlanta 8, Ga.
Nov. 16, 1956	BERG, ROY A., JR., Assistant Actuary, Old Republic Life Insurance Company, 307 N. Michigan Avenue, Chicago 1, Ill.
Nov. 19, 1959	BERKMAN, JOAN M., Assistant Actuary, National Bureau of Casualty Underwriters, 125 Maiden Lane, New York 38, N. Y.
Nov. 14, 1958	BERNAT, LEO A., Consultant, Minnesota Research Associates, 503 15th Avenue, S.E., No. 2, Minneapolis 14, Minn.
Nov. 18, 1925	BITTEL, W. HAROLD, Chief Actuary, Department of Banking and Insurance, State of New Jersey, Trenton 25, N. J.
Nov. 17, 1920	BLACK, NELLAS C., (Retired), 4310 Norwood Road, Baltimore 18, Md.
Nov. 14, 1958	BLUMENFELD, M. EUGENE, Assistant Actuary, Federal Life and Casualty Company, Wolverine-Federal Tower, Battle Creek, Mich.
Nov. 22, 1934	BOMSE, EDWARD L., Manager, Casualty Underwriting Planning Dept., (C & L), Royal-Globe Insurance Group, 150 William Street, New York 38, N. Y.
Nov. 22, 1957	BRAGG, JOHN M., Vice President and Actuary, Life Insurance Company of Georgia, 573 W. Peachtree Street, N.E., Atlanta 8, Ga.
Nov. 15, 1962	BUFFINTON, PHILIP G., Vice President, State Farm Fire and Casualty Company, 112 E. Washington Street, Bloomington, Ill.
Oct. 22, 1915	BUFFLER, LOUIS, (Retired), 196-05C-65 Crescent, 2-C, Fresh Meadows 65, N. Y.
Nov. 20, 1924	BUGBEE, JAMES M., Vice President, Maryland Casualty Company, Box 1228, Baltimore 3, Md.

ASSOCIATES

Admitted	
Mar. 31, 1920	BURT, MARGARET A., Office of George B. Buck, Consulting Actuary, 60 Worth Street, New York 13, N. Y.
Nov. 19, 1959	BUTLER, RICHARD H., Secretary, The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
Nov. 15, 1962	CARSON, DAVID E. A., Actuarial Department, Hartford Insurance Group, 690 Asylum Avenue, Hartford 15, Conn.
Nov. 17, 1922	CAVANAUGH, LEO D., Consultant-Life Insurance Management, 55 E. Washington Street, Chicago 2, Ill.
Nov. 18, 1927	CHEN, S. T., Consulting Actuary, The Wing On Life Assurance Company, Ltd., Wing On Life Bldg., 22 Des Voeux Road, Central, Hong Kong.
Nov. 16, 1961	CHERLIN, GEORGE, Actuary, National Health and Welfare Retirement Association, Inc., 800 Second Avenue, New York 17, N. Y.
Nov. 22, 1957	CHURCH, HARRY M., Coates, Herfurth & England, Consulting Actuaries, 325 North Lake, Pasadena, Calif.
Nov. 18, 1955	COATES, WILLIAM D., Assistant Superintendent, Association Group Div., Continental Casualty Company, 310 S. Michigan Avenue, Chicago 4, Ill.
Nov. 19, 1953	CONTE, JOSEPH P., Vice President and Secretary, Columbian Mutual Life Insurance Company, 305 Main Street, Binghamton, N. Y.
Nov. 19, 1959	COPESTAKES, ARTHUR D., Assistant Vice President, American Mutual Liability Insurance Company, Wakefield, Mass.
Nov. 19, 1959	CRAIG, ROBERT A., Casualty, Fire & Marine Actuarial Dept., The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
Nov. 24, 1933	CRAWFORD, WILLIAM H., Vice President and Treasurer, Industrial Indemnity Company, 155 Sansome Street, San Francisco 4, Calif.
Nov. 19, 1953	CROFTS, GEOFFREY, Actuarial Training Director, Occidental Life Insurance Company of California, Box 2101, Terminal Annex, Los Angeles 54, Calif.
Nov. 15, 1962	CURRY, ALAN C., Assistant Actuary, State Farm Mutual Auto Insurance Company, 112 E. Washington Street, Bloomington, Ill.
Nov. 21, 1952	DANIEL, C. M., Applied Science Representative, International Business Machines Corporation, 2116 Grand, Des Moines 12, Iowa
Nov. 18, 1925	DAVIS, MALVIN E., Senior Vice President and Chief Actuary, Metropolitan Life Insurance Company, 1 Madison Avenue, New York 10, N. Y.
Nov. 18, 1960	DEMELIO, JOSEPH J., Actuary, The Home Insurance Company, 59 Maiden Lane, New York 8, N. Y.
Nov. 16, 1956	DORF, STANLEY A., Associate Actuary, New York State Insurance Department, 123 William Street, New York 38, N. Y.
Nov. 14, 1941	DOWLING, WILLIAM F., President, Nymco Agency, Inc., 150 Fifth Avenue, New York 11, N. Y.
Nov. 14, 1958	DUROSE, STANLEY C., JR., Assistant Deputy Commissioner, Wisconsin Insurance Department, 127 South, State Capitol, Madison 2, Wis.
Nov. 19, 1954	EATON, KARL F., Controller, Guarantee Mutual Life Company, 8721 Indian Hills Drive, Omaha 14, Neb.
June 5, 1925	EGER, FRANK A., (Retired), 1119 Prospect Ridge, Haddon Heights, N. J.
Nov. 16, 1961	EHLERT, DARRELL W., Associate Actuary, Allstate Insurance Company, 7447 Skokie Blvd., Skokie, Ill.
Nov. 15, 1962	EVEN, CHARLES A., JR., Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
Nov. 22, 1957	FELDMAN, MARTIN F., Associate Actuary, New York State Insurance Department, 123 William Street, New York 38, N. Y.
Nov. 15, 1962	FINKEL, DANIEL, Senior Statistician, The State Insurance Fund, 199 Church Street, New York 7, N. Y.

ASSOCIATES

Admitted	
Nov. 16, 1956	FLACK, PAUL R., Actuarial Assistant, General Accident Fire and Life Assurance Corporation, Ltd., 414 Walnut Street, Philadelphia, Pa.
Nov. 16, 1923	FLEMING, FRANK A., (Retired), c/o Mutual Insurance Rating Bureau, 733 Third Avenue, New York 17, N. Y.
Nov. 21, 1952	FRANKLIN, NATHAN M., Actuary, The Surety Association of America, 60 John Street, New York 38, N. Y.
Nov. 19, 1954	GAINES, NATHANIEL, Office of George B. Buck, Consulting Actuary, 60 Worth Street, New York 13, N. Y.
Nov. 15, 1962	GERONDO, LOUIS P., JR., The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
Nov. 18, 1932	GETMAN, RICHARD A., Assistant Actuary, Life Dept., The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
Nov. 17, 1922	GIBSON, J. P., JR., 2970 Lorain Road, San Marino, Calif.
Nov. 16, 1923	GILDEA, JAMES F., (Retired), 236 Nott Street, Wethersfield, Conn.
Nov. 18, 1960	GILLESPIE, JAMES E., Actuarial Assistant, Continental Casualty Company, 310 S. Michigan Avenue, Chicago, Ill.
Nov. 14, 1947	GINGERY, STANLEY, Vice President & Associate Actuary, The Prudential Insurance Company of America, Prudential Plaza, Newark 1, N. J.
Nov. 19, 1959	GOLD, MELVIN L., Consulting Actuary, 29 Lakeview Drive, West Orange, N. J.
Nov. 16, 1961	GOULD, DONALD E., Senior Statistician, The State Insurance Fund, 199 Church Street, New York 7, N. Y.
Nov. 18, 1927	GREEN, WALTER C., Consulting Actuary, Walter C. Green and Associates, 1405 S. Main Street, Salt Lake City, Utah.
Nov. 16, 1961	GREENE, THOMAS A., Assistant Secretary, American Re-Insurance Company, 99 John Street, New York 38, N. Y.
Nov. 15, 1940	GROSSMAN, ELI A., Vice President, The Great Eastern Life Insurance Company, 10 Dorrance St., Providence 3, R. I.
Nov. 15, 1935	GUERTIN, ALFRED N., Actuary, American Life Convention, 230 N. Michigan Avenue, Chicago 1, Ill.
Nov. 16, 1939	HAGEN, OLAF E., Metropolitan Life Insurance Company, 1 Madison Avenue, New York 10, N. Y.
Nov. 17, 1922	HALL, HARTWELL L., (Retired), 34 Lincoln Avenue, West Hartford 7, Conn.
Nov. 13, 1936	HAM, HUGH P., President and General Manager, The Western Assurance Company, 40 Scott Street, Toronto 1, Ontario, Canada
Nov. 19, 1953	HARACK, JOHN, Actuary, Health Service, Inc., and Medical Indemnity of America, Inc., 200 N. Michigan Avenue, Chicago 1, Ill.
Mar. 24, 1932	HARRIS, SCOTT, Executive Vice President, Joseph Froggatt & Company, Inc., 74 Trinity Place, New York 6, N. Y.
Mar. 25, 1924	HART, WARD VAN B., 49 Robbins Drive, Wethersfield 9, Conn.
Nov. 21, 1919	HAYDON, GEORGE F., Manager Emeritus, Wisconsin Compensation Rating Bureau, 623 N. 2nd Street, Milwaukee 3, Wis.
Nov. 19, 1953	HEAD, GLENN O., Executive Vice President, First Investors Life Insurance Company, 120 Wall Street, New York 5, N. Y.
Nov. 19, 1959	HICKMAN, JAMES C., Assistant Professor, Department of Mathematics, University of Iowa, Iowa City, Iowa
Nov. 15, 1962	HILLHOUSE, JERRY A., Assistant Superintendent, Rating Division, State Farm Mutual Automobile Insurance Company, 112 E. Washington Street, Bloomington, Ill.
Nov. 17, 1927	HIPP, GRADY H., (Retired), 216 Pine Forest Drive, Greenville, S. C.

ASSOCIATES

Admitted	
Nov. 16, 1961	HOROWITZ, MILTON, Principal Actuary, The State Insurance Fund, 199 Church Street, New York 7, N. Y.
Nov. 19, 1929	JACOBS, CARL N., Chairman of the Board, Hardware Mutual Casualty Company, Hardware Dealers Mutual Fire Insurance Company & Sentry Life Insurance Company, 200 Strongs Avenue, Stevens Point, Wis.
Nov. 18, 1921	JENSEN, EDWARD S., Assistant Vice President, Group Dept., Occidental Life Insurance Company of California, 1151 South Broadway, Los Angeles 55, Calif.
Nov. 15, 1962	JENSEN, JAMES P., Actuarial Assistant, Liberty Mutual Insurance Company, 175 Berkeley Street, Boston 17, Mass.
Nov. 21, 1930	JONES, H. LLOYD, (Retired), 9 Midland Gardens, Bronxville, N. Y.
Nov. 21, 1919	JONES, LORING D., (Retired), 64 Raymond Avenue, Rockville Centre, L. I., N. Y.
Nov. 21, 1952	JONES, NATHAN F., Associate Actuary, The Prudential Insurance Company of America, Prudential Plaza, Newark 1, N. J.
Nov. 19, 1959	KROEKER, JOHN, Senior Actuary, Department of Insurance, Ottawa 8, Ontario, Canada.
Nov. 16, 1961	LANGE, JEFFREY T., National Bureau of Casualty Underwriters, 125 Maiden Lane, New York 38, N. Y.
Nov. 19, 1959	LEIGHT, ARTHUR S., Actuarial Associate, Metropolitan Life Insurance Company, 1 Madison Avenue, New York 10, N. Y.
Nov. 14, 1947	LUFKIN, ROBERT W., Office Manager, Craftsman Insurance Company, 851 Boylston Street, Boston 16, Mass.
Nov. 16, 1961	MACGINNITIE, W. JAMES, Actuarial Assistant, Continental Casualty Company, 310 S. Michigan Avenue, Chicago 4, Ill.
Nov. 18, 1925	MALMUTH, JACOB J., Chief—Rating Bureau, New York State Insurance Department, 123 William Street, New York 38, N. Y.
Nov. 16, 1961	MARGOLIS, DONALD R., Actuarial Assistant, Insurance Company of North America, 1600 Arch Street, Philadelphia 1, Pa.
Mar. 24, 1927	MARSH, CHARLES V-R., (Retired), 125-56 Avenue South, St. Petersburg, Fla.
Nov. 16, 1956	MATHWICK, LLOYD F., Assistant Group Underwriting Manager, Employers' Mutual of Wausau, 407 Grant Street, Wausau, Wis.
Nov. 13, 1936	MAYER, WILLIAM H., JR., Manager, Group Contract Bureau, Metropolitan Life Insurance Company, 1 Madison Avenue, New York 10, N. Y.
Nov. 16, 1961	McCLURE, RICHARD D., Assistant Vice President, American Mutual Liability Insurance Company, Wakefield, Mass.
May 26, 1955	McDONALD, MILTON G., Fire and Casualty Actuary, Department of Banking and Insurance, 100 Nashua Street, Boston 14, Mass.
Nov. 16, 1961	McINTOSH, KENNETH L., Manager, Louisiana Rating & Fire Prevention Bureau, P. O. Box 60730, New Orleans 60, La.
Nov. 16, 1961	McLEAN, GEORGE E., Actuary, Massachusetts Hospital Service, Inc., 133 Federal Street, Boston 6, Mass.
Nov. 19, 1959	McNAMARA, DANIEL J., Secretary, National Bureau of Casualty Underwriters, 125 Maiden Lane, New York 38, N. Y.
Nov. 13, 1931	MILLER, HENRY C., Comptroller, California State Compensation Insurance Fund, 525 Golden Gate Avenue, San Francisco 1, Calif.
Nov. 18, 1960	MILLER, NICHOLAS F., JR., Aetna Casualty and Surety Company, 151 Farmington Avenue, Hartford 15, Conn.

ASSOCIATES

Admitted	
Nov. 18, 1937	MINOR, EDUARD H., Associate Actuary, Metropolitan Life Insurance Company, 1 Madison Avenue, New York 10, N. Y.
Nov. 18, 1960	MOHNBLATT, ARNOLD S., Actuarial Assistant, Consolidated Mutual Insurance Company, 345 Adams Street, Brooklyn 1, N. Y.
Nov. 17, 1922	MONTGOMERY, JOHN C., (Retired), 165 Westervelt Avenue, Tenafly, N. J.
May 25, 1923	MOORE, JOSEPH P., 115 St. Catherine Road, Outremont, Quebec, Canada
Nov. 16, 1961	MOSS, ROBERT G., Actuary, Marsh & McLennan, Inc., 506 Olive Street, St. Louis 1, Mo.
Nov. 22, 1957	MUIR, JOSEPH M., General Manager, Mutual Insurance Advisory Association & Mutual Insurance Rating Bureau, 733 Third Avenue, New York 17, N. Y.
Nov. 16, 1961	NELSON, ROLAND E., Associate Actuary, State Farm Life and Accident Assurance Company, 112 E. Washington Street, Bloomington, Ill.
Nov. 15, 1935	NELSON, S. TYLER, Casualty Division Manager, American Agricultural Mutual Insurance Company, Room 2300 Merchandise Mart, Chicago 54, Ill.
Oct. 27, 1916	NEWELL, WILLIAM, (Retired), 1225 Park Avenue, New York 28, N. Y.
Nov. 18, 1925	NICHOLSON, EARL H., Actuary and Deputy Insurance Commissioner, Nevada Insurance Department, Carson City, Nevada
Nov. 16, 1961	OIEN, ROBERT G., Data Processing Applications Manager, Mutual Service Insurance Company, 1919 University Avenue, St. Paul 4, Minn.
May 23, 1919	OTTO, WALTER E., Chairman of the Board, Michigan Mutual Liability Company, 28 W. Adams Avenue, Detroit 26, Mich.
Nov. 19, 1926	OVERHOLSER, DONALD M., Office of George B. Buck, Consulting Actuary, 60 Worth Street, New York 13, N. Y.
Nov. 16, 1961	PEEL, JERALD P., Actuary, Security Mutual Casualty Company, 309 West Jackson Blvd., Chicago 6, Ill.
Nov. 20, 1924	PENNOCK, RICHARD M., (Retired), 12 E. Lodges Lane, Bala-Cynwyd, Pa.
Nov. 14, 1947	PERRY, ROBERT C., Executive Vice President, State Farm Life Insurance Company, 112 E. Washington Street, Bloomington, Ill.
Nov. 19, 1929	PHILLIPS, JOHN H., (Retired), 915 Steuben Street, Wausau, Wis.
Nov. 17, 1920	PIKE, MORRIS, (Retired), 531 East 20th Street, New York, N. Y.
Nov. 23, 1928	PIPER, KENNETH B., Vice President, Provident Life and Accident Insurance Company, Fountain Square, Chattanooga 2, Tenn.
Nov. 17, 1922	POORMAN, WILLIAM F., President, Central Life Assurance Company, Box 1555, Des Moines, Iowa.
Nov. 15, 1962	PORTERMAIN, NEILL W., Actuarial Assistant, Mutual Service Insurance Company, 1919 University Avenue, St. Paul 4, Minn.
Nov. 13, 1936	POTOFSKY, SYLVIA, Senior Actuary, The State Insurance Fund, 199 Church Street, New York 7, N. Y.
Nov. 15, 1918	RAYWID, JOSEPH, Vice President, Woodward and Fondiller, Inc., 420 Madison Avenue, New York 17, N. Y.
Nov. 18, 1960	RICCARDO, JOSEPH F., JR., Actuarial Dept., Aetna Casualty and Surety Company & Standard Fire Insurance Company, 151 Farmington Avenue, Hartford 15, Conn.
Nov. 18, 1960	RICHARDS, HARRY R., Chief Supervisor, The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
Nov. 19, 1932	RICHARDSON, HARRY F., (Retired), Seven Oaks, Bozman, Md.

ASSOCIATES

Admitted	
Nov. 19, 1953	Richmond, Owen D., Controller, Business Men's Assurance Company, 215 Pershing Road, Kansas City 41, Mo.
Nov. 16, 1961	Riddlesworth, William A., Actuarial Division, Aetna Casualty and Surety Company, & Standard Fire Insurance Company, 151 Farmington Avenue, Hartford 15, Conn.
Nov. 18, 1960	Ripandelli, John S., Consulting Actuary, Lewis State Bank Bldg., No. 13, Tallahassee, Fla.
Nov. 18, 1932	Roberts, James, A., Group Statistician, The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
Nov. 15, 1962	Rood, Henry F., Senior Vice President, Lincoln National Life Insurance Company, 1301-27 South Harrison Street, Fort Wayne, Indiana.
Nov. 18, 1960	Roth, Richard J., Vice President, The Travelers Research Center, Inc., 650 Main Street, Hartford 3, Conn.
Nov. 19, 1959	Royer, Alan F., Actuary, Insurance Dept., Commonwealth of Pennsylvania, North Office Bldg., State Capitol, Harrisburg, Pa.
Nov. 18, 1927	Sarason, Harry M., Managing Actuary, Woodward and Fondiller, Inc., 3625 W. 6th Street, Los Angeles 5, Calif.
Nov. 14, 1958	Sarnoff, Paul E. Associate Actuarial Director, Prudential Insurance Company of America, Prudential Plaza, Newark 1, N. J.
Nov. 16, 1923	Sawyer, Arthur, (Retired), 13751 St. Andrews Drive, Leisure World, Apt. 1-I, Seal Beach, Calif.
Nov. 14, 1947	Scammon, Lawrence W., Manager, Massachusetts Automobile Rating & Accident Prevention Bureau, Massachusetts Workmen's Compensation Rating & Inspection Bureau, & Massachusetts Motor Vehicle Assigned Risk Plan, 89 Broad Street, Boston, Mass.
Nov. 16, 1961	Scheibel, Jerome A., Actuary, Wisconsin Insurance Department, State Capitol, Madison 2, Wis.
Nov. 14, 1958	Schlenz, John W., Senior Vice President and Actuary, Federal Life and Casualty Company, Wolverine-Federal Tower, Battle Creek, Mich.
Nov. 22, 1957	Schneiker, Henry C., Assistant Actuary, The Home Insurance Company, 59 Maiden Lane, New York 38, N. Y.
Nov. 19, 1954	Schulman, Justin, Mathematician, Computer Sciences, Engineers Hill, Plainview, L. I., N. Y.
Nov. 14. 1947	Schwartz, Max J., Principal Actuary, New York State Insurance Department, 324 State Street, Albany 10, N. Y.
Nov. 20, 1930	Sevilla, Exequiel S., President, Manager and Actuary, National Life Insurance Company of the Philippines, Regina Bldg., P.O. Box 2056, Manila, Philippines.
Nov. 22, 1957	Shaver, C. Otis, Actuary, Nationwide Mutual Fire Insurance Company, 246 N. High Street, Columbus 16, Ohio.
Nov. 20, 1924	Sheppard, Norris E., Professor of Mathematics, University of Toronto, Toronto 5, Canada.
Nov. 15, 1962	Smith, Edward R., Actuarial Department, Hartford Insurance Group, 690 Asylum Avenue, Hartford 15, Conn.
Nov. 19, 1926	Somerville, William F., (Retired), 1258 St. Louis Avenue, Excelsior Springs, Mo.
Nov. 18, 1925	Sommer, Armand, Vice President, Continental Casualty Company, Transportation Insurance Company & United States Life Insurance Company, 310 S. Michigan Avenue, Chicago 4, Ill.
Nov. 15, 1918	Spencer, Harold S., (Retired), 8 Chelsea Lane, West Hartford, Conn.
Nov. 19, 1959	Steinhaus, Henry W., Partner, Smick and Steinhaus, Consulting Actuaries, 135 E. 42nd Street, New York 17, N. Y.
Nov. 20, 1924	Stellwagen, Herbert P., Executive Vice President, Insurance Company of North America, 1600 Arch Street, Philadelphia 1, Pa.
Nov. 16, 1956	Stern, Philipp K., Actuary, Mutual Insurance Rating Bureau, 733 Third Avenue, New York 17, N. Y.

ASSOCIATES

Admitted	
Nov. 19, 1959	STEVENS, WALDO A., Actuary, Massachusetts Automobile Rating and Accident Prevention Bureau & Massachusetts Workmen's Compensation Rating and Inspection Bureau, 89 Broad Street, Boston, Mass.
Nov. 16, 1923	STOKE, KENDRICK, Actuary, Michigan Mutual Liability Company, 28 W. Adams Avenue, Detroit 26, Mich.
Nov. 19, 1959	STRUG, EMIL J., Assistant Actuary, Massachusetts Hospital Service, Inc., 133 Federal Street, Boston 6, Mass.
Nov. 21, 1930	SULLIVAN, WALTER F., Actuary, California State Compensation Insurance Fund, 525 Golden Gate Avenue, San Francisco 1, Calif.
Nov. 15, 1962	SWITZER, VERNON J., Superintendent, Rating Division, State Farm Mutual Automobile Insurance Company, 112 E. Washington Street, Bloomington, Ill.
Nov. 21, 1919	TRENCH, FREDERICK H., Treasurer, Utica Mutual Insurance Company, P.O. Box 530, Utica 1, N. Y.
Nov. 20, 1924	UHL, M. ELIZABETH, National Bureau of Casualty Underwriters, 60 John Street, New York 38, N. Y.
Nov. 14, 1958	VAN CLEAVE, MARVIN E., Chief, Rate Div., Wisconsin Insurance Department, 113 South, State Capitol, Madison 2, Wis.
Nov. 15, 1962	VERHAGE, PAUL A., Actuarial Analyst, Hardware Mutual Casualty & Hardware Dealers Mutual Fire Insurance Company, 200 Strongs Avenue, Stevens Point, Wis.
Nov. 19, 1959	WEBER, DONALD C., Assistant Professor of Mathematics, Wisconsin State College and Institute of Technology, Platteville, Wis.
Nov. 18, 1932	WEINSTEIN, MAX S., Actuary, New York State Employees' Retirement System, 90 S. Swan Street, Albany 1, N. Y.
Nov. 18, 1925	WELLMAN, ALEX C., Senior Vice President, Protective Life Insurance Company, Birmingham, Ala.
Nov. 21, 1930	WELLS, WALTER I., Second Vice President, State Mutual Life Assurance Company of America, 440 Lincoln Street, Worcester, Mass.
Nov. 18, 1927	WHITBREAD, F. G., Assistant Vice President, Lincoln National Life Insurance Company, 1301-27 S. Harrison Street, Fort Wayne, Ind.
Nov. 19, 1948	WHITE, AUBREY, Vice President and Chief Actuary, Ostheimer and Company, Inc., 1510 Chestnut St., Philadelphia 2, Pa.
Nov. 19, 1954	WILLIAMS, DEWEY G., Assistant Secretary, Texas Employers Insurance Association, P. O. Box 2759, Dallas 21, Texas.
Nov. 16, 1939	WITTLAKE, J. CLARKE, Vice President, Business Men's Assurance Company, B.M.A. Bldg., Kansas City 10, Mo.
Oct. 22, 1915	WOOD, DONALD M., Partner, Childs & Wood, 175 W. Jackson Boulevard, Chicago 4, Ill.
Nov. 18, 1937	WOOD, DONALD M., JR., Partner, Childs & Wood, 175 W. Jackson Boulevard, Chicago 4, Ill.
Nov. 18, 1927	WOOD, MILTON J., Vice President and Actuary, Life, Accident & Group Actuarial Dept., The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
Nov. 17, 1950	WOODDY, JOHN C., Actuary, North American Reassurance Company, 161 E. 42nd Street, New York 17, N. Y.
Nov. 22, 1934	WOODWARD, BARBARA H., Assistant Secretary and Regional General Counsel, The Reuben H. Donnelley Corporation, 466 Lexington Avenue, New York 17, N. Y.
Nov. 16, 1956	WOODWORTH, JAMES H., Assistant Secretary, Hartford Accident & Indemnity Company, 690 Asylum Avenue, Hartford 15, Conn.
Nov. 18, 1925	WOOLERY, JAMES M., Vice President-Actuary, Occidental Life Insurance Company of North Carolina, Cameron Village, Raleigh, N. C.
May 5, 1961	YOUNG, ROBERT G., Assistant Vice President, Michigan Mutual Liability Company, 28 West Adams, Detroit 26, Mich.

STUDENTS

This list includes those, not yet Associates of the CAS, who have received credit within the last 3 years for one or more parts of the Associateship examinations. Unless indicated by the symbol "F", the indicated parts credited are for the Associateship examinations.

ABBEY, WILLIAM P., U. S. Fidelity & Guaranty Co., Baltimore 3, Md. (I, IIa, IIIa)

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BELL, ALLAN A., Aetna Casualty & Surety Co., Hartford 15, Conn. (I, II, III)

BELL, HERBERT, Peerless Ins., Co., New York 38, N. Y. (IIa, III, IF)

BLAHA, JAMES M., JR., Continental Casualty Co., Chicago 4, Ill. (I, IIa)

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BOCHICHIO, LOUIS R., 414 S. 4th Street, Brooklyn 11, N. Y. (IIa)

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BRADFORD, JOHN A., Continental Casualty Co., Chicago 4, Ill. (I, IIa, III)

BREWER, RICHARD T., National Bureau of Casualty Underwriters, New York 38, N. Y. (III)

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HARTMAN, DAVID G., 930 Wesley Ave., Evanston, Ill. (I)

HARTMANN, KENNETH R., Continental Cas. Co., Chicago 4, Ill. (I)

HERMAN, F. LEE, State Farm Mutual Automobile Ins. Co., Bloomington, Ill. (II, III, IV)

HIGGINS, JACK T., Employers Casualty Co., Dallas, Texas (I)

HINDES, WALTER E., The Fund Insurance Cos., San Francisco, Calif. (I)

HOLT, WILLIAM T., Travelers Insurance Co., Hartford 15, Conn. (I)

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LOWE, ROBERT F., Fireman's Fund Ins. Co., San Francisco 20, Calif. (I, IIb)

MCBIRNEY, BRUCE H., 629 S. Spring St., Los Angeles 14, Calif. (IIa, IV, IF)

MCCLINTOCK, JOHN S., Travelers Ins. Co., Hartford 15, Conn. (I, IIa, III)

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MAIDANICK, CHARLES I., 5234 S. Dorchester Ave., Chicago 15, Ill. (I, II, IIIa)

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MATTHEWS, JOHN L., The Employers' Group of Ins. Cos., Boston 7, Mass. (I)

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MORRISON, D. IAN, U. S. Fidelity & Guaranty Co., Baltimore 3, Md. (I, II, III, IIF)

MULVIHILL, FRANCIS X., Continental Cas. Co., Chicago 4, Ill. (I, IIa)

MUNIZ, ROBERT M., National Bureau of Casualty Underwriters, New York 38, N. Y. (I, II, III)

MURRAY, EDWARD R., 5927 Ridge Ave., Berkeley, Ill. (I, II)

NAFFZIGER, JOSEPH V., State Farm Mutual Automobile Ins. Co., Bloomington. Ill. (I, IIIb, IV)

NAGEL, J. RICHARD, Maryland Casualty Co., Baltimore 3, Md. (IIb, III, IV)

NELSON, DALE A., State Farm Mutual Automobile Ins. Co., Bloomington, Ill. (I, II)

NELSON, HOMER, Great American of Dallas, Dallas 1, Texas (I, II, IIIb)

NELSON, JOHN K., State Farm Mutual Automobile Ins. Co., Bloomington, Ill. (I)

NEWMAN, STEVE H., Smick & Steinhaus, New York 17, N. Y. (I)

NIELDS, NORMAN B., Insurance Co. of North America, Philadelphia 1, Pa. (I)

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PERREAULT, STEPHEN L., Trinity College, Hartford, Conn. (I)

PETERSIEL, ALFRED S., Mutual Insurance Advisory Assn., New York, N. Y. (I, IIb)

PIERSOL, DONALD E., Travelers Insurance Co., Hartford 15, Conn. (IIb, III, IV, IF)

PILLSBURY, DONALD D., National Bureau of Casualty Underwriters, New York 38, N. Y. (IIIa)

PRICE, EDITH E., Kemper Insurance, Chicago, Ill. (I)

PRIGER, RAYMOND, 1 Daley Place, Lynbrook, Long Island (IIIb)

PUSTAVER, JOHN A., JR., Kemper Insurance, Chicago, Ill. (I)

QUINLAN, JOHN A., Hartford Accident & Indemnity Co., Hartford 15, Conn. (I, IIa)

RAID, GARY A., State Farm Insurance Cos., Bloomington, Ill. (I, IIb)

RATNASWAMY, RAJARATNAM, Mutual Service Ins. Cos., St. Paul 4, Minn. (II, III, IV)

REILLY, FRANCIS V., 2073 E. 9th St., Brooklyn 1, N. Y. (I, IIa, III, IV)

RICHARDSON, JAMES F., 106 College Avenue, New Brunswick, New Jersey (I, II)

RICHARDSON, WALTER S., Liberty Mutual Ins. Co., Boston 17, Mass. (IIa, III, IV, IF)

RICHMOND, GERALD, American Mutual Liab. Ins. Co., Wakefield, Mass. (I, II)

ROGERS, DANIEL J., Continental Casualty Co., Chicago 4, Ill. (I, II, III, IF)

ROMIG, GEORGE M., Marsh & McLennan, Inc., Pittsburgh, Pa. (I)

ROSE, JAMES C., U. S. Fidelity & Guaranty Co., Baltimore 3, Maryland (I, IIa, IIIa)

ROSEL, RICHARD G., Mutual Service Casualty Ins. Co., St. Paul 4, Minn. (IIIb, IV)

ROTHENBERG, LEON, American Mutual Liab. Ins. Co., Wakefield, Mass. (I)

RUBIN, ROBERT H., Continental Casualty Co., Chicago 4, Ill. (I, II, III)

RYAN, KEVIN M., Aetna Casualty & Surety Co., Hartford 15, Conn. (I, II, III)

SCHEEL, PAUL J., U. S. Fidelity & Guaranty Co., Baltimore 3, Md. (I, II, IIIa, IV)

SCHEID, JAMES E., Hartford Accident & Indemnity Co., Hartford 15, Conn. (I, II, IIIa)

SCHULER, ROBERT, Hospital Service Assn. of Western Pennsylvania, Pittsburgh, Pa. (I, IIa)

SCOTT, JAMES E., JR., Great American Reserve Ins. Co., Dallas, Texas (I)

SELIG, JOHN G., Nationwide Life, Columbus 16, Ohio (I, II, III)

SENA, JAMES A., 2770 Sarita Place, Cincinnati 8, Ohio, (I, IIa)

SINGER, PAUL E., Continental Casualty Co., Chicago 4, Ill. (I, II, III)

SMITH, CHARLES P., 825 W. 187th St., New York 33. N. Y. (I, II, IIIa)

STALEY, HARLOW B., Farm Bureau Mutual Ins. Co., Des Moines 8, Iowa (I, IIIb)

STAPLEY, KENYON R., Allstate Ins. Co., Skokie, Ill. (III)

STREETT, THOMAS B., JR., U. S. Fidelity & Guaranty Co., Baltimore 3, Md. (IIIa)

STURGEON, PURSER K., Lumbermens Mutual Cas. Co., Chicago 40, Ill. (I)

TAFT, ROBERT L., 11 Montague Terrace, Brooklyn, N. Y. (I, IIa)

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THOLEN, JOHN P., 130-53 220th St., Springfield Gardens 13, N. Y. (IIa, IIIa)

THOMPSON, PHILIP, Federated Mutual Implement & Hardware Ins. Co., Owatonna, Minn. (II, III, IV)

TOREN, CHESTER J., Zurich Ins. Co., Chicago 6, Ill. (I, II, III)

TORGRIMSON, DARVIN A., Employers Mutuals of Wausau, Wausau, Wis. (IIb)

TREES, JOHN S., Allstate Ins. Co., Skokie, Ill. (I, II)

TUCKER, THOMAS F., Continental Casualty Co., Chicago 4, Ill. (II, III, IV, FI, FIII, FIV)

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WEBB, BERNARD L., Insurance Advisory Committee, Richard 21, Va. (II, III, IV, FI)

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WILDE, EARL J., JR., Hospital Service Assn. of New Orleans, New Orleans 13, La. (IIa)

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WOODRUM, LUTHER J., Continental Casualty Co., Chicago 4, Ill. (I)

YOUNG, RICHARD H., Consolidated Mutual Ins. Co., Brooklyn 1, N. Y. (IIa)

ZORY, PETER B., 80-09 Cowles Court, Middle Village, N. Y. (II, IIIa, IV)

OFFICERS OF THE SOCIETY

Since Date of Organization

Elected	*President*	*Vice-Presidents*	
1914-1915	*Isaac M. Rubinow	*Albert H. Mowbray	*Benedict D. Flynn
1916-1917	*James D. Craig	*Joseph H. Woodward	*Harwood E. Ryan
1918	*Joseph H. Woodward	*Benedict D. Flynn	*George D. Moore
1919	*Benedict D. Flynn	*George D. Moore	*William Leslie
1920	*Albert H. Mowbray	*William Leslie	*Leon S. Senior
1921	*Albert H. Mowbray	*Leon S. Senior	*Harwood E. Ryan
1922	*Harwood E. Ryan	Gustav F. Michelbacher	*Edmund E. Cammack
1923	*William Leslie	Gustav F. Michelbacher	*Edmund E. Cammack
1924-1925	Gustav F. Michelbacher	*Sanford B. Perkins	Ralph H. Blanchard
1926-1927	*Sanford B. Perkins	*George D. Moore	*Thomas F. Tarbell
1928-1929	*George D. Moore	Sydney D. Pinney	Paul Dorweiler
1930-1931	*Thomas F. Tarbell	*Roy A. Wheeler	Winfield W. Greene
1932-1933	Paul Dorweiler	*William F. Roeber	*Leon S. Senior
1934-1935	Winfield W. Greene	Ralph H. Blanchard	Charles J. Haugh
1936-1937	*Leon S. Senior	Sydney D. Pinney	*Francis S. Perryman
1938-1939	*Francis S. Perryman	Harmon T. Barber	*William J. Constable
1940	Sydney D. Pinney	Harold J. Ginsburgh	James M. Cahill
1941	Ralph H. Blanchard	Harold J. Ginsburgh	James M. Cahill
1942	Ralph H. Blanchard	Albert Z. Skelding	Charles J. Haugh
1943-1944	Harold J. Ginsburgh	Albert Z. Skelding	Charles J. Haugh
1945-1946	Charles J. Haugh	James M. Cahill	Harry V. Williams
1947-1948	James M. Cahill	Harmon T. Barber	Russell P. Goddard
1949-1950	Harmon T. Barber	Thomas O. Carlson	Norton E. Masterson
1951-1952	Thomas O. Carlson	Joseph Linder	Seymour E. Smith
1953-1954	Seymour E. Smith	Dudley M. Pruitt	John A. Mills
1955-1956	Norton E. Masterson	*Clarence A. Kulp	Arthur N. Matthews
1957-1958	Dudley M. Pruitt	John W. Carleton	William Leslie, Jr.
1959-1960	William Leslie, Jr.	Ernest T. Berkeley	Laurence H. Longley-Cook
1961-1962	Laurence H. Longley-Cook	Thomas E. Murrin	Richard J. Wolfrum

Secretary-Treasurer

1914-1917 . . . *C. E. Scattergood
1918-1953 . . . . *R. Fondiller
1954-1962 . . . . A. Z. Skelding

Editor†

1914 . . . . W. W. Greene
1915-1917 . . . . *R. Fondiller
1918 . . . . W. W. Greene
1919-1921 . . . . G. F. Michelbacher
1922-1923 . . . . O. E. Outwater
1924-1932 . . . . . *R. J. McManus
1933-1943 . . . . *C. W. Hobbs
1944-1954 . . . . . . E. C. Maycrink
1955-1958 . . . . E. S. Allen
1959-1960 . . . . R. P. Goddard
1961-1962 . . . . H. W. Schloss

General Chairman
Examination Committee

1949-1951 . . . . R. A. Johnson
1952-1956 . . . . J. W. Wieder, Jr.
1957-1961 . . . . W. J. Hazam
1962 . . . . N. J. Bennett

Librarian†

1914 . . . . W. W. Greene
1915 . . . . *R. Fondiller
1916-1921 . . . . L. I. Dublin
1922-1924 . . . . *E. R. Hardy
1925-1936 . . . . W. Breiby
1937-1947 . . . . T. O. Carlson
1948-1950 . . . . *S. M. Ross
1951-1957 . . . . . G. R. Livingston
1958-1962 . . . . R. Lino

*Deceased. †The offices of Editor and Librarian were not separated until 1916.

FELLOWS WHO HAVE DIED

The (†) denotes charter members at date of organization, November 7, 1914.

Admitted		*Died*
Nov. 19, 1948	Arthur L. Bailey	Aug. 12, 1954
May 23, 1924	William B. Bailey	Jan. 10, 1952
†	Roland Benjamin	July 2, 1949
May 24, 1921	Edward J. Bond	Nov. 12, 1941
May 19, 1915	Thomas Bradshaw	Nov. 10, 1939
June 5, 1925	William Brosmith	Aug. 22, 1937
†	George B. Buck, Sr.	Apr. 12, 1961
†	William A. Budlong	June 4, 1934
Nov. 18, 1932	Charles H. Burhans	June 15, 1942
Feb. 19, 1915	F. Highlands Burns	Mar. 30, 1935
†	Edmund E. Cammack	Dec. 17, 1958
†	Raymond V. Carpenter	Mar. 11, 1947
Feb. 19, 1915	Gorden Case	Feb. 4, 1920
Oct. 27, 1916	Edmund S. Cogswell	Apr. 25, 1957
Nov. 23, 1928	Walter P. Comstock	May 11, 1951
Nov. 22, 1934	William J. Constable	Apr. 19, 1959
†	Charles T. Conway	July 23, 1921
†	John A. Copeland	June 12, 1953
†	Walter G. Cowles	May 30, 1942
†	James D. Craig	May 27, 1940
†	James McIntosh Craig	Jan. 20, 1922
May 26, 1916	Frederick S. Crum	Sept. 2, 1921
†	Alfred Burnett Dawson	June 21, 1931
†	Miles Menander Dawson	Mar. 27, 1942
†	Elmer H. Dearth	Mar. 26, 1947
†	Eckford C. DeKay	July 31, 1951
May 19, 1915	Samuel Deutschberger	Jan. 18, 1929
†	Ezekiel Hinton Downey	July 9, 1922
May 19, 1915	Earl O. Dunlap	July 5, 1944
†	David Parks Fackler	Oct. 30, 1924
†	Edward B. Fackler	Jan. 8, 1952
Feb. 19, 1915	Claude W. Fellows	July 15, 1938
†	Benedict D. Flynn	Aug. 22, 1944
Feb. 19, 1915	Richard Fondiller	Apr. 29, 1962
†	Charles S. Forbes	Oct. 2, 1943
May 26, 1916	Lee K. Frankel	July 25, 1931
†	Charles H. Franklin	May 1951
Feb. 25, 1916	Joseph Froggatt	Sept. 28, 1940
†	Harry Furze	Dec. 26, 1945
Feb. 19, 1915	Fred S. Garrison	Nov. 14, 1949
†	Theodore E. Gaty	Aug. 22, 1925
May 19, 1915	James W. Glover	July 15, 1941
Oct. 22, 1915	George Graham	Apr. 15, 1937
Oct. 22, 1915	Thompson B. Graham	July 24, 1946

FELLOWS WHO HAVE DIED—*Continued*

Admitted		Died
May 25, 1923	William A. Granville	Feb. 4, 1943
†	William H. Gould	Oct. 28, 1936
†	Robert Cowen Lees Hamilton	Nov. 15, 1941
Oct. 27, 1916	Edward R. Hardy	June 29, 1951
Oct. 22, 1915	Leonard W. Hatch	Nov. 23, 1958
Nov. 21, 1919	Robert Henderson	Feb. 16, 1942
†	Robert J. Hillas	May 17, 1940
Nov. 15, 1918	Frank Webster Hinsdale	Mar. 18, 1932
May 23, 1924	Clarence W. Hobbs	July 21, 1944
Nov. 19, 1926	Charles E. Hodges	Jan. 22, 1937
Oct. 22, 1915	Lemuel G. Hodgkins	Dec. 26, 1951
†	Frederick L. Hoffman	Feb. 23, 1946
Oct. 22, 1915	Charles H. Holland	Dec. 28, 1951
Nov. 21, 1919	Carl Hookstadt	Mar. 10, 1924
†	Charles Hughes	Aug. 27, 1948
Nov. 19, 1929	Robert S. Hull	Nov. 30, 1947
†	Burritt A. Hunt	Sept. 3, 1943
Nov. 28, 1921	William Anderson Hutcheson	Nov. 19, 1942
Feb. 25, 1916	Charles William Jackson	Sept. 21, 1959
Nov. 19, 1929	Henry Hollister Jackson	May 27, 1955
May 19, 1915	William C. Johnson	Oct. 7, 1943
Nov. 23, 1928	F. Robertson Jones	Dec. 26, 1941
Nov. 18, 1921	Thomas P. Kearney	Feb. 11, 1928
Nov. 19, 1926	Gregory Cook Kelly	Sept. 11, 1948
Oct. 22, 1915	Virgil Morrison Kime	Oct. 15, 1918
†	Edwin W. Kopf	Aug. 3, 1933
Nov. 23, 1928	Clarence Arthur Kulp	Aug. 20, 1957
Feb. 17, 1915	John M. Laird	June 20, 1942
Nov. 13, 1931	Stewart M. LaMont	Aug. 22, 1960
Feb. 19, 1915	Abb Landis	Dec. 9, 1937
Nov. 24, 1933	John Robert Lange	Apr. 12, 1957
Nov. 17, 1922	Arnette Roy Lawrence	Dec. 1, 1942
†	James R. Leal, Sr.	Dec. 26, 1957
†	William Leslie	Dec. 12, 1962
Nov. 18, 1921	James Fulton Little	Aug. 11, 1938
Nov. 23, 1928	Edward C. Lunt	Jan. 13, 1941
Feb. 19, 1915	Harry Lubin	Dec. 20, 1920
†	William N. Magoun	Dec. 11, 1954
Nov. 16, 1923	D. Ralph McClurg	Apr. 27, 1947
May 23, 1919	Alfred McDougald	July 28, 1944
Oct. 31, 1917	Robert J. McManus	Aug. 15, 1960
Feb. 15, 1915	Franklin B. Mead	Nov. 29, 1933
Apr. 20, 1917	Marcus Meltzer	Mar. 27, 1931
†	David W. Miller	Jan. 18, 1936
†	James F. Mitchell	Feb. 9, 1941

FELLOWS WHO HAVE DIED—*Continued*

Admitted		Died
†	Henry Moir	June 8, 1937
Nov. 18, 1921	Victor Montgomery	May 2, 1960
Feb. 19, 1915	William J. Montgomery	Aug. 20, 1915
Nov. 19, 1926	William L. Mooney	Oct. 21, 1948
†	George D. Moore	Mar. 11, 1959
May 19, 1915	Edward Bontecou Morris	Dec. 19, 1929
†	Albert H. Mowbray	Jan. 7, 1949
†	Frank Mullaney	Jan. 22, 1953
†	Lewis A. Nicholas	Apr. 21, 1940
†	Edward Olifiers	May 13, 1962
†	Stanley L. Otis	Oct. 12, 1937
Nov. 13, 1926	Bertrand A. Page	July 30, 1941
Nov. 18, 1921	Sanford B. Perkins	Sept. 16, 1945
Nov. 15, 1918	William Thomas Perry	Oct. 25, 1940
Nov. 21, 1930	Francis S. Perryman	Nov. 30, 1959
†	Edward B. Phelps	July 24, 1915
Nov. 19, 1926	Jesse S. Phillips	Nov. 6, 1954
†	Charles Grant Reiter	July 30, 1937
†	Charles H. Remington	Mar. 21, 1938
May 23, 1919	Frederick Richardson	July 22, 1955
Nov. 19, 1926	Otto C. Richter	Feb. 17, 1962
Nov. **16, 1923**	**William F. Roeber**	Mar. 21, 1960
Nov. 17, 1943	Samuel M. Ross	July 24, 1951
†	Isaac M. Rubinow	Sept. 1, 1936
†	Harwood Eldridge Ryan	Nov. 2, 1930
†	Arthur F. Saxton	Feb. 26, 1927
†	Emil Scheitlin	May 2, 1946
†	Leon S. Senior	Feb. 3, 1940
Nov. 24, 1933	Robert V. Sinnott	Dec. 15, 1952
Apr. 20, 1917	Charles Gordon Smith	June 22, 1938
Feb. 19, 1915	John T. Stone	May 9, 1920
Feb. 25, 1916	Wendell Melville Strong	Mar. 30, 1942
Oct. 22, 1915	William R. Strong	Jan. 10, 1946
†	Robert J. Sullivan	July 19, 1934
Nov. 17, 1920	Thomas F. Tarbell	July 2, 1958
Nov. 22, 1934	Walter H. Thompson	May 25, 1935
Nov. 18, 1921	Guido Toja	Feb. 28, 1933
†	John L. Train	June 12, 1958
Nov. 17, 1922	Antonio Thomas Traversi	Apr. 20, 1961
Nov. 19, 1948	Paul A. Turner	Jan. 30, 1961
Nov. 15, 1935	Harry V. Waite	Aug. 14, 1951
Nov. 18, 1925	Lloyd A. H. Warren	Sept. 30, 1949
May 23, 1919	Archibald A. Welch	May 8, 1945
Nov. 19, 1926	Roy A. Wheeler	Aug. 26, 1932
†	Albert W. Whitney	July 27, 1943
†	Lee J. Wolfe	Apr. 28, 1949
†	S. Herbert Wolfe	Dec. 31, 1927
May 24, 1921	Arthur B. Wood	June 14, 1952
†	Joseph H. Woodward	May 15, 1928
†	William Young	Oct. 23, 1927

ASSOCIATES WHO HAVE DIED

Admitted		Died
May 23, 1924	Milton Acker	Aug. 16, 1956
Oct. 22, 1915	Don A. Baxter	Feb. 10, 1920
Nov. 15, 1940	John M. Blackhall	Nov. 14, 1957
Nov. 15, 1918	Helmuth G. Brunnquell	June 3, 1958
May 25, 1923	Harilaus E. Economidy	Apr. 13, 1948
Nov. 20, 1924	John Froberg	Oct. 11, 1949
Nov. 19, 1929	Maurice L. Furnivall	June 16, 1962
Nov. 22, 1934	John J. Gately	Nov. 3, 1943
Nov. 14, 1947	Harold J. George	Apr. 1, 1952
Nov. 19, 1929	Harold R. Gordon	July 8, 1948
Nov. 18, 1921	Robert E. Haggard	July 26, 1958
Nov. 20, 1924	Leslie LeVant Hall	Mar. 8, 1931
Oct. 31, 1917	Edward T. Jackson	May 8, 1939
Nov. 17, 1922	Rosswel A. McIver	Apr. 1, 1959
Nov. 21, 1919	Rolland V. Mothersill	July 25, 1949
Nov. 19, 1929	Fritz Muller	Apr. 27, 1945
Nov. 23, 1928	Karl Newhall	Oct. 24, 1944
Nov. 15, 1918	John L. Sibley	Mar. 10, 1957
Nov. 18, 1921	Arthur G. Smith	May 2, 1956
Nov. 18, 1927	Alexander A. Speers	June 25, 1941
Mar. 23, 1921	Arthur E. Thompson	Jan. 17, 1944
Nov. 21, 1919	Walter G. Voogt	May 8, 1945
May 23, 1919	Charles S. Warren	May 1, 1952
Nov. 18, 1925	James H. Washburn	Aug. 19, 1946
Nov. 17, 1920	James J. Watson	Feb. 23, 1937
Nov. 18, 1921	Eugene R. Welch	Jan. 17, 1945
Nov. 16, 1951	Michael T. Wermel	Feb. 6, 1962
Mar. 21, 1929	Charles A. Wheeler	July 2, 1956
Nov. 15, 1918	Albert Edward Wilkinson	June 11, 1930
Oct. 22, 1915	Charles E. Woodman	Dec. 16, 1955

SCHEDULE OF MEMBERSHIP, NOVEMBER 15, 1962

	Fellows	Associates	Total
Membership, November 17, 1961	203	176	379
Additions:			
By Election	...	...	...
By Reinstatement	...	...	...
By Examination	8	14	22
	211	190	401
Deductions:			
By Death	4	2	6
By Withdrawal	...	3	3
By Transfer from Associate to Fellow	...	8	8
	207	177	384

CONSTITUTION

(As Amended November 16, 1962)

Article I.—*Name.*

This organization shall be called the Casualty Actuarial Society.

Article II.—*Object.*

The object of the Society shall be the promotion of actuarial and statistical science as applied to the problems of insurance, other than life insurance, by means of personal intercourse, the presentation and discussion of appropriate papers, the collection of a library and such other means as may be found desirable.

The Society shall take no partisan attitude, by resolution or otherwise, upon any question relating to insurance.

Article III.—*Membership.*

The membership of the Society shall be composed of two classes, Fellows and Associates. Fellows only shall be eligible to office or have the right to vote.

The Fellows of the Society shall be the present Fellows and those who may be duly admitted to Fellowship as hereinafter provided. The Associates shall be the present Associates and those who may be duly admitted to Associateship as hereinafter provided.

Any person may, upon nomination to the Council by two Fellows of the Society and approval by the Council of such nomination with not more than two negative votes, become enrolled as an Associate of the Society, provided that he shall pass such examination as the Council may prescribe.

Any person who shall have qualified for Associateship may become a Fellow on passing such final examination as the Council may prescribe. Otherwise, no one shall be admitted as a member unless recommended by a duly called meeting of the Council with not more than two negative votes in a secret ballot, followed by at least a three-fourths secret ballot of the Fellows present and voting at a meeting of the Society.

Article IV.—*Officers and Council.*

The officers of the Society shall be a President, two Vice-Presidents, a Secretary-Treasurer, an Editor, a Librarian, and a General Chairman of the Examination Committee. The Council shall be composed of the active officers, nine other Fellows and, during the four years following the expiration of their terms of office, the ex-Presidents and ex-Vice-Presidents. The Council shall fill vacancies occasioned by death or resignation of any officer or other member of the Council, such appointees to serve until the next annual meeting of the Society.

Article V.—*Election of Officers and Council.*

The President, Vice-Presidents, and the Secretary-Treasurer shall be elected by a majority ballot at the annual meeting for the term of one year and three members of the Council shall, in a similar manner, be annually elected to serve for three years. The President and Vice-Presidents shall not be eligible for the same office for more than two consecutive years nor shall any retiring member of the Council be eligible for re-election at the same meeting.

The Editor, the Librarian and the General Chairman of the Examination Committee shall be elected annually by the Council at the Council meeting preceding the annual meeting of the Society. They shall be subject to confirmation by majority ballot of the Society at the annual meeting.

The terms of the officers shall begin at the close of the meeting at which they are elected except that the retiring Editor shall retain the powers and duties of office so long as may be necessary to complete the then current issue of *Proceedings*.

ARTICLE VI.—*Duties of Officers and Council.*

The duties of the officers shall be such as usually appertain to their respective offices or may be specified in the by-laws. The duties of the Council shall be to pass upon candidates for membership, to decide upon papers offered for reading at the meetings, to supervise the examination of candidates and prescribe fees therefor, to call meetings, and in general, through the appointment of committees and otherwise, to manage the affairs of the Society.

ARTICLE VII.—*Meetings.*

There shall be an annual meeting of the Society on such date in the month of November as may be fixed by the Council in each year, but other meetings may be called by the Council from time to time and shall be called by the President at any time upon the written request of ten Fellows. At least two weeks notice of all meetings shall be given by the Secretary.

ARTICLE VIII.—*Quorum.*

Seven members of the Council shall constitute a quorum. Twenty Fellows of the Society shall constitute a quorum.

ARTICLE IX.—*Expulsion or Suspension of Members.*

Except for non-payment of dues, no member of the Society shall be expelled or suspended save upon action by the Council with not more than three negative votes followed by a three-fourths ballot of the Fellows present and voting at a meeting of the Society.

ARTICLE X.—*Amendments.*

This constitution may be amended by an affirmative vote of two-thirds of the Fellows present at any meeting held at least one month after notice of such proposed amendment shall have been sent to each Fellow by the Secretary.

BY-LAWS

(As Amended November 19, 1954)

Article I.— *Order of Business.*

At a meeting of the Society the following order of business shall be observed unless the Society votes otherwise for the time being:

1. Calling of the roll.
2. Address or remarks by the President.
3. Minutes of the last meeting.
4. Report by the Council on business transacted by it since the last meeting of the Society.
5. New Membership.
6. Reports of officers and committees.
7. Election of officers and Council (at annual meetings only).
8. Unfinished business.
9. New business.
10. Reading of papers.
11. Discussion of papers.

Article II.—*Council Meetings.*

Meetings of the Council shall be called whenever the President or three members of the Council so request, but not without sending notice to each member of the Council seven or more days before the time appointed. Such notice shall state the objects intended to be brought before the meeting, and should other matter be passed upon, any member of the Council shall have the right to re-open the question at the next meeting.

Article III.—*Duties of Officers.*

The President, or, in his absence, one of the Vice-Presidents, shall preside at meetings of the Society and of the Council. At the Society meetings the presiding officer shall vote only in case of a tie, but at the Council meetings he may vote in all cases.

The Secretary-Treasurer shall keep a full and accurate record of the proceedings at the meetings of the Society and of the Council, send out calls for the said meetings, and, with the approval of the President and Council, carry on the correspondence of the Society. Subject to the direction of the Council, he shall have immediate charge of the office and archives of the Society.

The Secretary-Treasurer shall also send out calls for annual dues and acknowledge receipt of same; pay all bills approved by the President for expenditures authorized by the Council of the Society; keep a detailed account of all receipts and expenditures, and present an abstract of the same at the annual meetings, after it has been audited by a committee appointed by the President.

The Editor shall, under the general supervision of the Council, have charge of all matters connected with editing and printing the Society's publications. The *Proceedings* shall contain only the proceedings of the meetings, original papers or reviews written by members, discussions on said papers and other matter expressly authorized by the Council.

The Librarian shall, under the general supervision of the Council, have charge of the books, pamphlets, manuscripts and other literary or scientific material collected by the Society.

The General Chairman of the Examination Committee, shall, under the general supervision of the Council, have charge of the examination system and of the examinations held by the Society for the admission to the grades of Associate and of Fellow.

ARTICLE IV.—*Dues.*

The Council shall fix the annual dues for Fellows and Associates. Effective November 19, 1954, the payment of dues will be waived in the case of any Fellow or Associate who attains the age of 70 years or who, having been a member for at least 20 years, attains the age of 65 years and notifies the Secretary-Treasurer in writing that he has retired from active work. Fellows and Associates who have become totally disabled while members may upon approval of the Council be exempted from the payment of dues during the period of disability.

It shall be the duty of the Secretary-Treasurer to notify by mail any Fellow or Associate whose dues may be six months in arrears, and to accompany such notice by a copy of this article. If such Fellow or Associate shall fail to pay his dues within three months from the date of mailing such notice, his name shall be stricken from the rolls, and he shall thereupon cease to be a Fellow or Associate of the Society. He may, however, be reinstated by vote of the Council upon payment of arrears in dues, which shall in no event exceed two years.

ARTICLE V.—*Designation by Initials.*

Fellows of the Society are authorized to append to their names the initials F.C.A.S.; and Associates are authorized to append to their names the initials A.C.A.S.

ARTICLE VI.—*Amendments.*

These by-laws may be amended by an affirmative vote of two-thirds of the Fellows present at any meeting held at least one month after notice of the proposed amendment shall have been sent to each Fellow by the Secretary.

GUIDES TO PROFESSIONAL CONDUCT

In order to assist the Council of the Society in resolving questions that might be raised as to the professional conduct of members, and more importantly to guide members of the Society when they encounter questions of professional conduct, the following "Guides to Professional Conduct" have been prepared by order of the Council. The actuary has professional responsibilities to society at large, to his client or employer, and to his professional associates. As is true of codes of ethics generally, these guides deal with precepts and principles only. They are not precise rules and are subject to interpretations in relation to the variety of circumstances that occur in practice.

Any member wishing advice on the application of these guides to a particular set of facts is urged to present his case to the Council of the Society. The Council has the power to consider and take action with respect to questions that may be raised as to the professional conduct of members. Any disciplinary action by the Council must be in accord with Article IX of the Constitution.

The Council assumes that every member of the Society earnestly desires to serve his client or employer properly, to protect the public, and to maintain the prestige of the Society and its members. Accordingly, the Council sets forth the following principles by which, in its opinion, every member should be guided in his practice of the actuarial profession.

1. The member will promote a wider understanding of the significance of membership in the Society and will maintain the high standards of the Society by avoiding even the appearance of any questionable practice.
2. The member will conduct his professional competition on a high plane. He will avoid unjustifiable or improper criticism of others and will recognize that there is substantial room for honest differences of opinion on many matters.
3. The member will act in professional matters for each client or employer with scrupulous attention to the trust and confidence that the relationship implies and will have due regard for the confidential nature of his work.
4. The member will bear in mind that the actuary acts as an expert when he gives professional advice, and he will give such advice only when he is qualified to do so.
5. The member will not provide actuarial service for, or associate professionally with, any person or organization if he has reason to believe that the results of such service or association are likely to be used in a manner inimical to the public interest or the interests of the actuarial profession or to evade the law.
6. The member will submit unqualifiedly an actuarial calculation, certificate, or report only if he knows it to be based on sufficiently reliable data and on actuarial assumptions and methods that, in his judgment, are consistent with the sound principles expounded in the course of study of the Society, or in recognized texts, sources or precedents relevant to the subject at hand.

7. The member will recommend for the use of his client or employer, premium rates, rating plans, dividends or other related actuarial functions only if, in his opinion, they are based on adequate and appropriate assumptions and methods.

8. The member will not make or sponsor any actuarial calculation, certificate, statement, report, or comparison, or give any testimony or interview on such matters, which he has reason to believe is false, materially incomplete, or misleading.

9. Where appropriate for the objective use of a certificate or report, or in any event on the request of his employer or client, the member will include a statement of the principal actuarial assumptions and the general methods adopted for his computations.

10. The member will recognize his ethical responsibilities to the person or organization whose actions may be influenced by his professional opinions or findings. When it is not feasible for the member to render his opinions or findings direct to such person or organization, he will act in such manner as to leave no doubt that the member is the source of the opinions or findings and to indicate clearly the personal availability of the member to provide supplemental advice and explanation.

11. The member will not serve more than one client or employer where a conflict of his professional interest may be involved unless there be a full disclosure to all parties concerned, and such parties request and acquiesce in the engagement of his services.

12. The member will sign actuarial recommendations, certificates, and reports if he be acting as an employe, only over a title conferred by his employer if any title is used. Nevertheless, in any capacity, the member may append to his signature the designation: "Fellow of the Casualty Actuarial Society" or "FCAS," or "Associate of the Casualty Actuarial Society" or "ACAS," as the case may be. The member will not use as a signature title the designation "Member of the Casualty Actuarial Society". The member will use a designation dependent upon elective or appointive qualification within the Society such as "President," or "Member of the Council," only when he is acting in such capacity on behalf of the Society.

13. The member will recognize his personal responsibilities under these guides whether he acts as an individual or through a partnership or his employer.

November 20, 1959.

GUIDES FOR THE SUBMISSION OF PAPERS

Method of Review. All papers and reviews of papers are reviewed by the Committee on Review of Papers, which is appointed by the President. The Committee consists of three members, plus, ex officio, the Editor of the *Proceedings.* Unanimous vote of the regular Committee is necessary for acceptance of a paper or a review, except that if there is only one vote for rejection, the paper or review will be reviewed by the Editor and accepted if he approves.

Scope and Standards.—1. Broad lattitude will be allowed in the choice of a subject, provided it is a subject of interest to property and casualty actuaries. However, it must be clearly suitable for inclusion in the *Proceedings.*

2. The paper must contain original ideas or new material of reasonable value, unless it has a definite educational value for other reasons.

3. When a paper includes material that the Committee finds it is not qualified to review, the Committee will seek advice or opinion from other members of the Society or from recognized experts outside of the Society.

4. Disagreement by the Committee with opinions of the author or reviewer of a paper will not be a bar to acceptance of an otherwise suitable paper or review. Where, however, the Committee believes a paper or review to be fallacious in logic or misleading in matters of fact the Committee may reject it. Reviews of papers are expected to be free of criticism of a personal nature. Opportunity will be given to the authors of papers to respond to reviews. Authors' replies will also be reviewed by the Committee and will be treated in the same manner as reviews.

5. The paper or review should show care in preparation. A reasonable minimum standard will be required as to form, clarity, and literary quality. When a paper or review, otherwise acceptable, does not meet these standards, the Committee may return it to the author or reviewer and invite resubmission after editing or rewriting. The Committee may also make suggestions to the author as to possible improvements in an accepted paper.

6. Papers and reviews should be kept within the general limits of length indicated by past acceptances, ordinarily about twenty printed pages for papers and two or three pages for reviews.

Procedures and Regulations.—1. Papers may be submited only by Fellows or Associates of the Casualty Actuarial Society, except that papers may be submitted by non-members of the Society upon invitation of the President. A member may collaborate in joint authorship with a non-member who possesses particular qualifications in respect to the subject of a paper.

2. Papers and reviews of papers should be submitted in quadruplicate to the Secretary-Treasurer of the Society. The Secretary-Treasurer is authorized to return to the author or reviewer copies of a paper or a review that in his opinion are not legible.

3. The name of the author should not appear on the copies of the paper submitted to the Secretary-Treasurer but should be included in the covering letter. However, names of the reviewers should be identified on the copy of the review.

4. In submitting a paper, the author must answer the following questions on a separate sheet:

(a) Name of paper.

(b) Has the paper been published elsewhere, in whole or in part, in identical or similar form?

(c) Is the paper being simultaneously submitted elsewhere, or will it be so submitted before decision by the Committtee on Review of Papers?

(d) In the case of co-authorship with a non-member, to what extent has the Society member contributed?

(e) If the paper contains factual data from some organization, has the organization given the author permission to publish it?

5. Papers and reviews should be typed double-spaced on letter-size stationery, on one side of each sheet. Tables and footnotes may be single-spaced. Pages should be numbered. Footnotes should be numbered consecutively throughout the paper.

6. Major captions should be centered and typed in capitals; subcaptions should appear in the left-hand margin in italics (single underscore). In technical papers paragraphs may be numbered to simplify reference; in nontechnical papers paragraphs should not be numbered.

7. So far as possible, tables should be arranged so that they can be printed on a single page of the *Proceedings* wihout undue reduction in size of type. Column headings must be clear and concise.

8. All mathematical formulas and symbols should be handwritten in ink rather than typewritten. They must be legible especially as to subscripts and superscripts. There must be no possibility of confusion between, for instance, dx and d_x; $\times$ (the sign for multiplication) and x; a and α (alpha). The exclamation point (!) should be used to indicate factorials in binomial expansions. Where necessary, instructions to the printer may be inserted in pencil on the manuscript. The Committee strongly recommends that authors of mathematical papers refer to the Style Manual of the American Institute of Physics for precise information on preparation of a manuscript. A copy of the Style Manual may be borrowed from the Editor of the *Proceedings* or it may be purchased from the Editor for one dollar. When life contingency symbols are applicable the International Actuarial Notation should be used. This code is described in the *Proceedings*, Vol. XXVI, page 123.

9. References to books and periodicals and to proceedings of professional societies, should be sufficiently complete to permit obtaining a copy of the source without additional research.

10. If the manuscript has been prepared carefully in accordance with the foregoing suggestions, there should be only a few minor corrections necessary. The paper as originally submitted should not be considered simply as a draft to which extensive alterations can be made.

11. Authors will be notified of the acceptance or rejection of their papers by the Secretary-Treasurer. If a paper is rejected, original and copies will be returned. The Committee does not promise a decision on a paper submitted fewer than forty-five days prior to the meeting for which the paper has been prepared. Reviews of a paper are to be submited to the author and the Secretary-Treasurer thirty days in advance of the meeting at which the paper is to be reviewed. A review of a paper will be considered to have been accepted by the Committee unless the reviewer is otherwise notified.

12. Authors of accepted papers are requested to notify the Secretary-Treasurer whether or not they can supply additional copies for use at meetings or for further distribution prior to publication. (Photographic reproduction is less expensive than printing and insures accuracy.)

13. After acceptance of a paper and before its reproduction, the author should have the following statement typed at the bottom of the first page: "Presented at the (date) meeting of the Casualty Actuarial Society at (city and state). Reproduction in whole or in part without acknowledgment to the Casualty Actuarial Society is specifically prohibited."

14. Except on recommendation of the Committee, no accepted paper will be read in its entirety at a meeting of the Society. The author will be expected to prepare for oral presentation a two or three minute abstract, stating the purposes of his paper and its conclusions.

15. The Editor of the *Proceedings*, in consultation with the author or reviewer, may edit the paper or review prior to publication.

December 12, 1962.

WOODWARD - FONDILLER PRIZE

This award made in commemoration of Joseph H. Woodward and Richard Fondiller is intended to stimulate original thinking and research and will be made to the best eligible paper each year submitted by an Associate or Fellow who has attained his designation within the last five years. To be eligible the paper must show evidence of ability for original research and the solution of advanced insurance problems. If no paper is considered eligible in a given year, the award shall not be made. Papers previously submitted to the Society or elsewhere, shall not be eligible.

The amount of the prize will be $200 and the papers will be judged by the Society's Committee on Review of Papers whose decision will be final.

The announcement of the award will be made at the November meeting each year, based on papers submitted to the Society at the previous November and May meetings.

RULES REGARDING EXAMINATIONS FOR ADMISSION TO THE CASUALTY ACTUARIAL SOCIETY

1. Dates of Examinations.

Examinations for all parts will be held in May each year in such cities as will be convenient. In addition, Associateship Part I will also be held in November each year. The exact dates will be set by the Secretary-Treasurer.

2. Filing of Application.

Application for admission to examinations should be made on the Society's blank form, which may be obtained from the Secretary-Treasurer.

If a candidate has previously made application to write the Society's examinations, his application for the current examinations must be received by the Secretary-Treasurer before March 1 for the Spring examinations, or before September 15 for the Fall Associateship Part I examination. No applications received after these dates will be considered, except as provided in the following paragraph.

If a candidate is making application to write the Society's examinations for the first time, his application should be received by the Secretary-Treasurer if at all possible by March 1 for the Spring examination, or by September 15 for the Fall Associateship Part I examination. In any case, no application from a new candidate will be considered unless received by April 1 for the Spring examinations or by October 1 for the Fall examination.

3. Associateship and Fellowship Examinations.

There are four parts of the examinations which the candidate must pass in order to become an Associate of the Casualty Actuarial Society. These consist of six actual examinations:

Part I		3 hours
Part II	Section (a)	1½ hours
Part II	Section (b)	1½ hours
Part III	Section (a)	1½ hours
Part III	Section (b)	1½ hours
Part IV	Sections (a) and (b)	3 hours

Part I of the Associateship examinations is a General Mathematics examination jointly sponsored with the Society of Actuaries, who designate this examination as Part 2. Credit for passing this examination will be given by both Societies regardless of the Society through which the candidate registers. One list showing the successful candidates (without identification as to the Society through which they register) will be published.

A candidate may write any one or more of the six examinations and will receive credit for those passed.

There are four examinations which a candidate must also pass to become a Fellow of the Casualty Actuarial Society. Each Fellowship Part consists of two sections, but is a single 3 hour examination. A candidate may present himself for one or more of the Fellowship examinations either if he has previously passed the Associateship examinations or if he concurrently presents himself for and submits papers for all unpassed Associateship examinations. Subject to the foregoing requirements, a candidate will be given credit for any examination which he may pass.

4. Fees.

The examination fee for the Associateship examination is $3.00 for a section, $6.00 for one complete part; subject to a minimum of $6.00 for each year in which the candidate presents himself. The examination fee for the Fellowship examination is $10.00 for each part. Examination fees are payable to the order of the Society and must be received by the Secretary-Treasurer before March 1 of the current year for the Spring examination, or before September 15 for the Fall Associateship Part I examination, except that the examination fees for a new applicant will be accepted if received by the Secretary-Treasurer before April 1 for the Spring examinations, or before October 1 for the Fall Associateship Part I examination.

5. Prize Awards

The Casualty Actuarial Society and the Society of Actuaries jointly will award one $200 and four $100 prizes to the five successful undergraduates ranking highest in the General Mathematics Examination (C.A.S. Part I; S.A. Part 2). These prize awards will be granted twice each year, i.e., for both the Spring and Fall examinations.

6. Credit for Examination Parts under Former Syllabus.

A candidate who has passed, or been credited with, one or more of the Associateship or Fellowship examinations under the 1960 Syllabus will receive credit for the corresponding examinations of the 1963 Syllabus. Partial examinations will be given to those candidates requiring them in accordance with such credits.

7. Waiver of Examinations for Associateship.

Waiver of the folowing Associateship examinations will be allowed for a candidate who has passed or been credited with the corresponding examinations of the Society of Actuaries:

Casualty Actuarial Society	*Society of Actuaries*
Part I	Part 2
Part II(a) and II(b)	Part 3
Part III(a)	Part 4B

Candidates who take the Advanced Mathematics Test of the Graduate Record Examinations may apply for credit for the General Mathematics Examination, (Associateship Part I). Credit will be granted if the candidate's score on the Graduate Record Advanced Mathematics Test is equivalent, as determined by the Casualty Actuarial Society, to the passing score on the Society's General Mathematics Examination. To be eligible for such credit the candidate must take the Graduate Record Advanced Mathematics Test while a full time undergraduate or graduate student at a college or university, or if he ceases his full-time schooling in May or June he may take the Graduate Record Advanced Mathematics Test in the following July. An application to the Casualty Actuarial Society for credit may be completed either in advance of taking the Graduate Record Advanced Mathematics Test or within two years after taking it. The necessary application form may be secured from the Secretary-Treasurer of the Casualty Actuarial Society.

The council may waive, subject to such other requirements as it may prescribe, any examinations of the Casualty Actuarial Society which it deems equivalent to examinations required by another recognized actuarial organization which have been passed by an applicant while not a resident of the United States or Canada, or during his first year of temporary or permanent residence in the United States or Canada.

LIBRARY

All candidates registered for the examinations of the Casualty Actuarial Society and all members of the Casualty Actuarial Society have access to all the library facilities of the Insurance Society of New York and of the Casualty Actuarial Society. These two libraries, with combined operations, are located at 150 William Street, New York 38, New York.

Registered candidates may have access to the library by receiving from the Society's Secretary-Treasurer the necessary credentials. Books and manuals may be withdrawn from the library for a period of one month without charge. The Insurance Society is responsible for postage and insurance charges for sending books to out of town borrowers, and borrowers are responsible for the safe return of the books.

Address requests for books to:

LIBRARIAN
Insurance Society of New York
150 William Street
New York 38, New York

SYLLABUS OF EXAMINATIONS

(Effective with 1960 Examinations)

ASSOCIATESHIP

Part	*Section*	*Subject*
I		General Mathematics.
II	(a)	Probability.
	(b)	Statistics.
III	(a)	Elementary Life Insurance Mathematics.
	(b)	General Principles of Insurance; Insurance Economics and Investments.
IV	(a)	Insurance Coverages and Policy Forms.
	(b)	General Principles of Rate-Making.

FELLOWSHIP

I	(a)	Insurance Law; Supervision, Regulation and Taxation.
	(b)	Statutory Insurances.
II	(a)	Premium, Loss and Expense Reserves.
	(b)	Insurance Accounting and Expense Analysis.
III	(a)	Individual Risk Rating.
	(b)	Problems in Underwriting and Administration.
IV	(a)	Insurance Statistics and Machine Methods.
	(b)	Advanced Problems in Rate-Making.

INTERNATIONAL CONGRESSES OF ACTUARIES

The first International Congress of Actuaries was held in 1895 in Brussels. Since that time numerous congresses have been held, and many actuaries from the United States and Canada have been benefited by attendance at the congresses and by the printed Proceedings, in which numerous valuable articles have appeared.

Continuity in the arrangement for periodic congresses and for the intervening support and management of the central office located in Brussels is achieved by the maintenance of a Permanent Committee of international membership. According to the revised regulations adopted by the New York Congress in 1957, the objects of the Permanent Committee are:

1. To promote or conduct work and research of interest in the science or practice of the Actuary. For this purpose sections formed by a number of members for study of special problems may be recognized. Each section will have its own regulations, previously approved by the Council; it will elect its Committee, except for the member appointed by the Council on the Committee.
2. To publish periodically a Bulletin: (a) bringing together technical, legislative, statistical, and juridical information relating to actuarial science; (b) reviewing publications and works which appear in various countries, bearing upon actuarial matters.
3. To co-operate with the Organizing Committees in preparing the work of International Congresses, and in the publication of their Proceedings.

The XVIth International Congress was held in Brussels in 1960. The next Congress will be held in London and Edinburgh in 1964. The formal opening session will take place in London on Tuesday, May 26, and there will be business meetings on each of the following three days. May 30 and 31 are open dates for travel to Edinburgh, where discussions will start on June 1 with a formal closing session on June 3.

ASTIN SECTION

ASTIN (Actuarial Studies in Non-Life Insurance) is the first section of the Permanent Committee to be formed under the modification of the rules approved at the XVth International Congress in New York and is for the study of the application of modern statistical and mathematical methods in the field of non-life insurance. It has grown from the desire expressed by many members of the XIVth Congress held in Madrid to provide for an effective interchange of ideas on an international basis.

It has as its object the promotion of actuarial research in general insurance and will establish contact between actuaries, groups of actuaries, and other suitably qualified persons interested in this field.

This section will, from time to time, publish papers on topics related to its objects and will also publish a bulletin containing notes of general interest to members. Conferences will be held about every three years.

With these purposes in mind the Permanent Committee wishes to enlist members as broadly as possible. Membership in the Permanent Committee and in the ASTIN section is open to members of the Casualty Actuarial Society. The annual dues for membership are 100 Belgian francs for the Permanent Committee and an additional 200 Belgian francs for the ASTIN Section. It is necessary at presnt for members to pay $2.50 for the Permanent Committee and an additional $5.00 for the ASTIN section in order that dues may be met and to provide a small margin for the expenses of collection and transmission of funds as well as to meet small miscellaneous expenses.

The series of colloquia of ASTIN was continued in 1962 with meetings in Juan-les-Pins, arranged by the Institut des Actuaires Francais, May 23 to 26.

The full text of all papers presented at the 1962 colloquium will be published and distributed to ASTIN members in the ASTIN Bulletin. The general categories of papers and discussion sessions were: (1) Claim reserves in automobile insurance; (2) Theory of fire insurance and its practical applications; and (3) Problems relating to exceptional claims.

The 1963 colloquium will be held at Trieste, Italy, September 19-21, 1963, sponsored by Istituto Italiano degli Attuari.

ASTIN has made significant growth in recent years with membership in 28 countries. Total membership in 1962 was 451 of which 115 were from Canada and the United States. The growth and influence of ASTIN as an international group has paralleled that of the Casualty Actuarial Society in the United States and Canada, and for the same economic reasons. The increased standard of living and economic activity in Western Europe and North America have increased the need for and influence of actuaries in casualty, fire, and accident insurance on both sides of the Atlantic.

Inquiries regarding membership in the Permanent Committee and in the ASTIN Section should be directed to Albert Z. Skelding, Secretary-Treasurer, Casualty Actuarial Society, 200 East 42nd Street, New York 17, New York.

The officers of ASTIN are:

Chairman & Secretary......Robert Eric Beard (England)
Vice Chairman & Editor....Hans Ammeter (Switzerland)
Treasurer ....N. E. Masterson (U.S.A.)

The Committee of ASTIN is made up of the foregoing officers and Paul Johanson, Denmark; Cornelis Campagne, Netherlands; Marcel Henry, France; Giuseppe Ottaviani, Italy; and Carl Philipson, Sweden.

L. H. Longley-Cook is the United States member of the Editorial Committee.

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FUTURE MEETINGS OF THE CASUALTY ACTUARIAL SOCIETY

1963 Spring Meeting — May 20, 21, 22
Concord Hotel
Lake Kiamesha, New York

1963 Annual Meeting — October 30, 31, November 1
Traymore Hotel
Atlantic City, New Jersey

1964 Spring Meeting — May 18, 19, 20
Wentworth-By-The-Sea
Portsmouth, New Hampshire

1964 Annual Meeting — November 18, 19, 20
Plaza Hotel
New York, New York

1963 EXAMINATIONS

May 15, 16, and 17