With the recent development and emphasis of benefits for hospital and medical expense, an additional contingency was added to the problem of evaluating the cost of future benefits, namely the cost index of medical care. This has led to the development of the adjustable premium guaranteed renewable policy under which the insurer guarantees the continuance of the policy subject to the timely payment of premiums which can be adjusted in the future on a class basis to recognize changes in the price level as well as other changes in the underlying assumptions.

In accepting the Task Force 4's report the NAIC did it with the stipulation that any company choosing to write an adjustable premium guaranteed renewable health policy should maintain fund accounts of each form of policy so that if the time came when the company wished to raise the rates on existing policies because of adverse experience, there would be a historical basis of a fund account to justify that request. Thus, the obligation a company assumes in issuing an adjustable premium guarantee renewable policy is not only that of attempting to determine an adequate rate and maintaining proper reserves but also of keeping a fund account, so that if the initial assumptions prove to be inadequate or if cost of services requires an increase in rate, the company will have something to point to in justification of its revised rates.

Finally, I would like to comment on the new development of an automobile policy containing certain renewal guarantees and suggest the parallels between that and the health and accident policies with renewal guarantees, which may now be defined as non-cancellable or as adjustable premium guaranteed renewable policies, depending on whether the premium is or is not guaranteed. I think there are many parallels with respect to definition, nomenclature, advertising, and also in the principles and practices of ratemaking and maintenance of reserves.

REPORTS OF THE SEMINARS HELD IN WASHINGTON, D. C. AT THE 1960 ANNUAL MEETING OF THE SOCIETY

AUTOMOBILE MERIT RATING

(Summation by Thomas O. Carlson, Manager, Southeastern Branch, National Bureau of Casualty Underwriters.)

I stand before you as an innocent victim of a mouse-trapping Society Vice President who asked me to conduct a seminar on developments in Automobile Merit Rating, saying that there would be a number of papers to carry the session and I would only have to referee the bout. The word "only" was the mouse-trap. When I saw the first papers, deep-fried in a batter of hypergeometric foundation overlaid with negative binomials and coefficients of variation, I hastily reviewed my dues-paying status in the Society in the same frame of mind as the chap down in my new "Yo'-all" neck of the woods who came into the City Hall one morning to inquire whether his marriage license had not already expired. I suggested, when the Vice President cruelly refused to unspring the trap, that all members should be forewarned that this was to be a discussion taking off from a springboard of theory rather than practice, but he felt that the papers distributed in advance of the meeting

would speak for themselves. Nevertheless one soul, who probably had ample company, remarked at the end of the second session: "Did I land in the wrong pew? Or *was* this the session on merit rating?"

Both sessions with unexpected enthusiasm went overtime in considering and discussing papers by Mr. L. B. Dropkin, Mr. C. C. Hewitt, Jr., and Mr. R. A. Bailey, a review of a previous Bailey-Simon paper by Mr. D. B. Martin, and a review of Mr. Bailey's current paper by Mr. L. Roberts, by Mr. L. J. Simon and jointly by two student guests, Messrs. Muniz and Lange. Mr. Roberts had also written a discussion of the previous Bailey-Simon paper but this discussion was not received in time to be included as part of the seminar.

Mr. Dropkin's paper, in the unassuming guise of an actuarial note, on "Automobile Merit Rating and Inverse Probabilities", further develops his important work on the negative binomial distribution by bringing in the time element and by utilizing inverse probabilities to develop a function to determine the probability of x accidents in s years for a sub-group observed to have c accidents in t years.

Mr. Hewitt's paper, "The Negative Binomial Applied to the Canadian Merit Rating Plan for Individual Automobile Risks", applies the developments in Mr. Dropkin's new paper to the Canadian experience.

Mr. Martin's review was of a paper, "Two Studies in Automobile Insurance Ratemaking", presented at a previous meeting, jointly by Mr. R. A. Bailey and Mr. L. J. Simon. Mr. Martin, in remarks that were refreshingly down-to-earth (1) emphasized the importance of current developments of proper mathematical foundations underlying the ultimately more simple practical rules-of-thumb utilized by the underwriters, (2) remarked that the underwriter not infrequently (illustrated by references to the development and testing of the Canadian plan in which Mr. Martin himself played an important role) is racing ahead of the theoretician but is comforted when the mathematician, often breathlessly, catches up with him and supports him, and (3) agreed with the Chairman that we are no longer dealing with merit rating as such and that this nomenclature should be dropped for a phrase emphasizing that we are talking about classification refinement rather than merit rating.

I, of course, am omitting technical details of papers and reviews here, since they will be published in full dress in the *Proceedings*.

Mr. Bailey's paper, with the provocative title "Any Room Left for Skimming the Cream?", took as its objective the establishment of some means of measuring the relative effectiveness of various schemes of classification and the various elements in these schemes, an extremely important and timely project. He chose as his measuring-stick the coefficient of variation, which is the standard deviation divided by the mean. Having first estimated the coefficient of the inherent risk hazard of all private passenger car risks as approximately 1.00, on the basis of studies previously reported in these *Proceedings* and at the 16th International Congress of Actuaries, he then took a representative distribution, one company's exposures in one state, and computed the coefficients of variation of the various elements and combinations of elements involved in the class-and-territory system to compare with the predetermined unity norm.

A critique of this paper not previously seen by the author, offered by two students, Mr. Muniz and Mr. Lange, present by invitation, questioned the validity of the calculation of the norm as 1.00, giving reasons for supporting a value perhaps as low as .75. They further pointed out that since the distribution of rates, or of hazard as represented in tabulated experience or through interpretation of such in rates, is discrete while the distribution of inherent hazard is continuous, and since the variance of a discrete approximation to a continuous function is less than that of the function itself, some of the low coefficients obtained by Mr. Bailey were to be expected for mathematical reasons and consequently lack the significance he attached to them.

Mr. Lange additionally referred to a measure suggested by M. Delaporte at the 16th International Congress based on dispersion about the mode rather than the mean.

Mr. Roberts emphasized that such a measure as Mr. Bailey is seeking should be applied to experience rather than to rates, expressed caution generally in using the coefficient of variation, and indicated certain avenues for further exploration of the problem, in particular use of a measure stemming from the variance rather than from the standard deviation. He also suggested that a single measure might not be found which would properly evaluate a classification system, and that some combination of measures might turn out to do a more adequate job.

Mr. Simon commented to the effect that to be meaningful the coefficient of variation must be calculated on rates that reflect the actual experience or on the experience indications themselves, and further stressed the limitations of Mr. Bailey's study, restricted of necessity to a limited population, pointing out that application to a complete population is desirable to arrive at final conclusions. He further brought out that the coefficient is valuable for comparing two rate structures.

The Chairman presented a table which illustrated concretely a point made by Mr. Simon on the restrictions on upper bounds of the coefficient of variation regardless of actual propriety of rate relativities in the light of experience developments; the table at the same time emphasized the symmetry of the variance contrasting sharply with the asymmetry of the coefficient of variation in cases involving a mere reversal of the proportions represented by two classes in a two-class system, and also showed that volume has no effect on the coefficient, the same results coming from indications based on 10 cars as from 10,000,000 cars. A very brief excerpt from this table is shown below because, alone among the reviews, the Chairman's remarks will not be separately published.

If a and b are the proportions of Classes A and B, so that $a + b = 1.00$, and x and y are the Class hazards, with x/y represented by the parametric constant k,

$$\text{C.V.} = \frac{(1\text{-}k)\ \sqrt{ab}}{a + bk}$$

showing that only the ratio (not the actual values) of x to y affects the C.V., and that the C.V. is asymmetrical with respect to a and b while the standard deviation (which is $(x\text{-}y)\ \sqrt{ab}$) is symmetrical with respect to a and b.

Mr. Bailey stated he felt the characteristic of asymmetry in the C.V. is reasonable because of the difference between x/y and y/x. The Chairman reserved opinion on this point. The table extract follows:

Differentials		$a = .1$ $b = .9$	$a = .3$ $b = .7$	$a = .5$ $b = .5$	$a = .7$ $b = .3$	$a = .9$ $b = .1$
90%-100%	S.D.	3.0	4.583	5.0	4.583	3.0
	C.V.	.030	.047	.053	.049	.033
70%-100%	S.D.	9.0	13.747	15.0	13.747	9.0
	C.V.	.093	.151	.176	.174	.123
50%-100%	S.D.	15.0	22.913	25.0	22.913	15.0
	C.V.	.158	.270	.333	.353	.273
30%-100%	S.D.	21.0	32.078	35.0	32.078	21.0
	C.V.	.226	.406	.537	.629	.568

Mr. Martin commented that too close an approach to the unity (or other) norm for the inherent risk hazard of all cars by the coefficient of variation of a particular classification distribution would mean that we had reached the point of too great a refinement, i.e., too close an approach to recognition of the inherent hazard of every individual risk, too close to that ultimate refinement in squeezing out the cream expressed by your Chairman as the a-rating of every individual car.

Dr. Dickerson also indicated certain areas of investigation, particularly a more careful and complete analysis of the coefficient of variation itself, by application of the analysis of variance.

I gathered the impression that there was general agreement that the coefficient of variation, while serving as a guide in making comparisons of two systems, is far from a complete indicator and should be used with extreme caution, and that the search for a more adequate measure or measures constituted a promising field of mathematical investigation by the young crop of technicians in the Society.

Mr. Hewitt arose to comment on the large areas of investigation still awaiting the mathematician in our Society's bailiwick, by way of illustration pointing out that while the Poisson distribution applied to accidents assumes a constant inherent hazard from risk to risk, and the negative binomial distribution goes a step further by assuming a Pearson Type III distribution as representing variation in the inherent hazard from risk to risk, there is a further refinement to be explored in the variation of this hazard within the individual risk according to time and circumstances.

And at that point, with your Chairman standing on a platform of quivering variances, trying to support only standard deviations to the exclusion of mere modes, dodging the lethal impacts of gammas, betas and other coefficients, dizzy from multitudinous variations and their pseudo-measures, slipped and skidded precariously down a high-contact Pearson Type III curve, to land in the sharply-cusped coils of a highly irregular fifth degree moment from which he was able to extricate himself only by hanging onto a negative binomial developed by expansion of a characteristic function externalized in purely

imaginary quantities; and that extraordinary mathematical abstraction commonly labeled "t" but known to mere *hoi polloi* as time came to the rescue of all participants and non-participants and the session was adjourned, with the Chairman expressing silent thanks that he has already received credit for passing the mathematical sections of the examinations for admission to the Society.

GUARANTEED RENEWABLE AUTOMOBILE INSURANCE

(Summation by Leo M. Stankus, Actuary, Allstate Insurance Company)

The subject was introduced by presenting the details of two plans—the Allstate Plan and the National Bureau Plan proposed for New York. Both plans guarantee that, except for certain specified reasons, the Liability coverages will not be canceled during the guarantee period. For Allstate, the guarantee period is five years for new business. Under the Bureau Plan, the guarantee period is for one year; however, the policyholder is also guaranteed that he may renew his policy unless a notice of intent not to renew has been mailed to him at least 45 days prior to the renewal date.

For new business, both plans incorporate a "qualification period" during which the underwriter can check the inspection report and Motor Vehicle Department records in order to determine that accurate information has been given on the application. Also, under both plans the Company retains the right to cancel the Liability coverages for certain specified reasons—mainly "public policy reasons" which involve conduct on the part of the policyholder which is detrimental to the public interest.

A good deal of the discussion was devoted to the underwriting problems that are involved in providing this type of a guarantee. When this program had been introduced by Allstate, it was made applicable to all policies which had been in force for at least 90 days on the effective date of the plan, and to all recently issued policies as they complete their 90-day "qualification period." However, for administrative reasons the guarantee periods for in-force policies varied from one to five years, depending upon how long they had been insured with the Company.

The question as to the actuarial aspects of establishing the cost of Liability insurance issued on a guaranteed-renewable basis revealed that the consensus was that such insurance should be issued with some form of "merit rating" plan. All of the Allstate plans have been issued in conjunction with a merit rating plan, and it is understood that the Bureau program in New York also contemplates merit rating.

The possibility of extending a guarantee to coverages other than the Liability coverages was also discussed. It was explained that the guarantee was first offered with respect to the Liability coverages because of the far greater need for this form of protection—both on the part of the policyholder and for the protection of the general public.