IMPLICATIONS OF SAMPLING THEORY FOR PACKAGE POLICY RATEMAKING

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DISCUSSION BY CLYDE H. GRAVES

The making of rates for package policies has required the attention of actuaries in rating bureaus and of company actuaries for a number of years. A knowledge of current procedures for the rating of the automobile package policy, the special multi-peril policy and homeowners policies can be obtained by studying the rate filings made in the various states by the National Bureau of Casualty Underwriters, the Mutual Insurance Rating Bureau, and the Multi-Line Insurance Rating Bureau. Individual companies have also developed and rated multi-line package policies.

The *Proceedings* of the Casualty Actuarial Society is sadly lacking, however, in papers explaining the making of package policy rates. A few papers have dealt with theoretical considerations in the rating of such policies, namely, "Multiple Peril Rating Problems—Some Statistical Considerations" by Robert L. Hurley* and "Commercial Package Policies—Rating and Statistics" by Robert A. Bailey, Edward J. Hobbs, Frederick J. Hunt, Jr., and Ruth E. Salzmann.** Lange's paper "Implications of Sampling Theory for Package Policy Ratemaking," which was presented at the November 1966 meeting of the Casualty Actuarial Society, is a welcome addition to the thinking on this subject.

Half of Mr. Lange's paper is a brief review of certain aspects of sampling theory dealing with the techniques of stratification and ratio estimation. Mr. Lange applies these techniques to the problem of rating multi-line policy forms. As he stated in the introduction to his paper;

> "The essence of the method is that package policy experience will be subdivided by coverage for ratemaking, and will be used in combination with non-package experience in determining rate levels and rate relationships. Differentials will be computed for each coverage between package and non-package data to reflect the differences between these two classes of risks."

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* *Proceedings Casualty Actuarial Society*, Volume XLVI, p. 196
** *Proceedings Casualty Actuarial Society*, Volume L, p. 87

As Mr. Lange pointed out, when a package policy is first introduced, its rates are generally constructed from the non-package rates for component coverages with appropriate discounts. Later experience may develop to the point that the rates for the package policy may be determined on its own experience. This is the history of homeowners ratemaking. As Mr. Lange and others have observed, however, this has led to a problem in the rating of the residual fire dwelling business.

Mr. Lange is suggesting in his paper that the use of ratio estimation could be applied in the rating of both the package policy and the non-package policies by utilizing the experience developed under both forms. It would be interesting to test Mr. Lange's suggestion for rating package policy by using regular dwelling fire and extended coverage experience together with homeowners experience. Would the use of the combined experience result in better rates in the sense that the pure premiums so determined would be better estimates of the expected loss costs, or would the procedure result in inadequate rates for dwelling fire and extended coverage and excessive rates for homeowners?

In recent filings made in Virginia, both the National Bureau and Mutual Bureau proposed changes in the automobile package policy rates which were calculated by the following formula:

(1) The sum of the revised family automobile policy rates for bodily injury at \$10,000/\$20,000 limits, and property damage at \$5,000 limits, and \$1,000 medical payments was determined.

(2) This sum was reduced by applying a 15% discount, and then further reduced by one half to determine a semi-annual rate.

(3) An increased limit factor of 1.05 was then applied to determine a \$35,000 single limit premium.

(4) Uninsured motorists coverage was included at a \$2 flat charge.

It should be noted that this formula does not make use of the special automobile package policy at all but determines the rates entirely on family automobile policy experience. It should be pointed out, however, that the percentage of private passenger automobile liability business written under the special automobile package policy form in Virginia is only about 11% of the total. The loss and loss adjustment ratio for the special automobile package policy in Virginia for accident year 1965, based on the experience of all companies reporting to the National Bureau and Mutual Bureau was .658 compared to a loss and loss adjustment ratio of .670 for the family automobile policy.

The Actuarial Committee of the Mutual Insurance Rating Bureau has recommended to the Automobile Rating Committee that the experience utilized in determining Mutual Bureau private passenger automobile liability rates be based on the combined experience of all companies reporting to the Mutual Bureau and National Bureau on both the family automobile policy form and the package automobile policy form for bodily injury and property damage liability coverages. The medical payment component of the two policy forms will be separately determined. It is quite possible that the suggestion made by Mr. Lange for the use of ratio estimation will be helpful. It will require further study and tests, but certainly the experience developed under the package policy forms should no longer be ignored in the making of package policy rates. This situation also exists in rating the special multi-peril policy forms. There is some hope that with the development of the Commercial Risk Statistical Plan by the National Insurance Actuarial and Statistical Association data will be available to test Mr. Lange's suggestions in the rating of commercial package policies.

DISCUSSION BY DALE NELSON

This paper is another in a series of studies on the application of contemporary mathematical developments to the problems of the actuarial sciences both in terms of providing the theoretical justification for, and introducing new techniques into, actuarial practices. Specifically, this paper is concerned with the application of two techniques of sampling theory—stratification and ratio estimation—to (package) ratemaking. My remarks will be confined to a critique of the statistical theory involved, and I will leave the practical aspects of the implied ratemaking process for others to discuss. It might be observed in passing, though, that Mr. Lange has presented some persuasive arguments in favor of sampling theory in package ratemaking: the ability to incorporate more accurate trend, credibility, and loss development factors as well as to analyze the design of package policies, among others.

The two basic ideas discussed in this paper are in fact, if not in name, well-known to all of us. For example, ratio estimation is used, among other places, in the derivation of loss development factors. Similarly, the classification of risks by territory and class grouping is nothing other than stratification. However, it should be pointed out that this form of stratification has a different purpose from that in statistical sampling. In ratemaking (the non-packaged variety), we are directly interested in the characteristics (e.g. pure premiums) for the various strata and only mildly interested—