DISCUSSION BY LESTER B. DROPKIN

The current paper by LeRoy Simon, which reports the trials and tribulations, as well as the methods and procedures, by which the National Council's Subcommittee to Review Table M developed the new 1965 Table M is one which is sorely needed and which will avoid the very unfortunate situation which occurred when Table M was modified in 1954 without any concomitant paper appearing in the Proceedings.

This paper is important. It is not to be read casually, commuting to and from work. Anyone who has had, currently has, or will have occasion to become more than just passingly involved with retrospective rating is well advised to set aside a time and a place for a careful reading of the paper. Happily, this need not be a chore – for LeRoy Simon has the faculty of not only being able to be actuarially creative, but also of being able to write well.

Mr. Simon tells us what the scope and nature of the paper is at the very outset. It is to be concerned with only "certain aspects," and the reader is to have "a basic knowledge of Table M and its use." From such suppositions it might be expected that the paper would be rather more difficult to approach than in fact it is. Mr. Simon has wisely, and very nicely, made use of a number of appendices for an expansion upon the more mathematical aspects, thereby allowing the main recitation in the body of the paper to proceed smoothly. This segregation of much of the theory and mathematical details into separate appendices allows the reader, according to his own talents and interests, to pursue more deeply those particular aspects which are of special concern to him. I did feel that at times, however, there was an unfortunate relegation of important material to an appendix. For example, it was rather unexpected to find one of the most fundamental relationships, viz., the definition of the charge in terms of the underlying risk distribution, tucked away as the twelfth equation in Appendix C.

The paper is quite complete in its treatment of the many steps which were involved in the preparation of the new 1965 Table M. In this connection, specific mention should be made of the finely detailed exhibits which accompany the paper. Each important step is illustrated by an appropriate exhibit. The reader, therefore, is able to work along, as it were, with the Committee, and to gain a real feeling for the methods followed. To get the most out of the paper, the reader should not simply read and passively accept. Rather should he actively participate, con-

stantly having pencil in hand, recreating (albeit on a miniature scale) the many details.

One of the first decisions made was to assume that the standard National Council permissible loss ratio applied to all of the data reported. Now while it may be true that this standard permissible loss ratio is most commonly used in terms of numbers of states, it is also true that large and significant portions of the data come from states where a different permissible loss ratio obtains. Since the sorting and grouping of the risks conditions the raw values which form the basis of all subsequent steps, it would have been of interest to know what consideration was given to this point.

Another important early decision was to adjust the data to a more current level. The need for some adjustment cannot be questioned. However, to assume, in effect, that each and every loss increased by a flat amount is open to very serious criticism. In the present context, I doubt whether the Committee had any real choice of an alternative to this simple hypothesis; yet it does point out an area for future investigation. While I fully recognize the difficulties of developing an adequate theory even for static conditions, we will have to concern ourselves increasingly with the complex effects which dynamic changes bring.

Among other actions taken were two which I feel added particularly to the accomplishment. These were: (1) the decision to form the table in such a way that the charges at an entry ratio of unity would be spaced at intervals of .01 between premium groups; and (2) the decision to extend the range of application of the table.

The dominant theme of Mr. Simon's paper is, of course, the search for a formula which would yield columnar charges. The recital of the steps which led to a successful culmination of this endeavor is a monument to the virtue and power of a trial and error, heuristic approach. Monuments, however, are most often erected in memory of what has been and no longer is. It would be most fitting and proper if we could indeed believe that the construction of the next Table M will be achieved by following a quite different route.

A table of charges should be a byproduct, falling out naturally from more fundamental considerations. From a theoretical point of view, the risk distribution of incurred loss amounts is logically prior to the Table M function. It is the analytic expression for the underlying risk distribution that we should be looking for. But even this distribution itself arises out

of the interaction of two still more fundamental distributions, viz., the distribution of claim costs and the distribution of claim occurrences.

Investigations into these areas is precisely the subject matter of the mathematical theory of risk. There can be found the general abstract expressions and the symbolic representations of the pertinent mathematical relationships. What we do not yet have are the particular forms and the parametric values of the functions which appear in the equations of the mathematical theory of risk.

Unfortunately, it often appears that the functions which arise in the mathematical theory of risk are characteristically of a complex and intractable nature. No doubt we shall therefore have to call upon a wide variety of computer techniques, approximation techniques, and, in general, upon the whole bagful of methods which have successfully been used elsewhere in arriving at specific numerical results. This may well mean that the final formulas to be used will not be neat and aesthetically satisfying. We may even be surprised to find that an eighth degree reciprocal polynomial is the practical device which corresponds to a theoretically derived Table M function. But consider the difference between using such a formula simply because it happens to work, and using it as a convenient detail in a wide theoretical construct.

The philosophical speculations of the preceding paragraphs are in no sense meant to be a criticism of Mr. Simon and his colleagues. They were meant to express my belief that we are now at a point which will see the rapid development of many new approaches to actuarial problems, and that these new approaches will reflect a much greater degree of mathematical maturity and sophistication than ever before.

In recounting for us the herculean labors of three years, it is understandable that LeRoy Simon would restrict himself to only those aspects in which he was most directly interested and involved. I hope that this means that we can look forward to seeing additional papers which will treat some of the other questions of interest. Among those which immediately suggest themselves are: the question of using the data of all risks vs. the data of experience or retrospectively rated risks; the question of using a table of charges based on workmen's compensation for other lines; the question of one year vs. three year charges; and the question of the effect of a per claim or per accident limitation.

Finally, I can offer only a most heartfelt second to LeRoy Simon's wish that the necessary studies and work on the next Table M be started immediately. It can be truly said: the time *is* now.