DISCUSSION BY CHARLES R. RINEHART

First, let me commend Mr. Simon on a thought provoking paper in an area which has received very little attention in our *Proceedings*.

When first asked to review this paper, I was something less than enthusiastic. I had initially expected the paper to present a methodology for pricing catastrophe reinsurance treaties and, in this context, it did not seem particularly remarkable that Mr. Simon was able to calculate the probability of a claim in a particular year given the premium, a fixed severity and an assumption regarding the frequency distribution for a particular reinsurance treaty. It was only after rereading the paper that I was able to appreciate the benefits of a technique for testing the logical consistency of the assumptions underlying the pricing of catastrophe treaties.

This is, actually, similar to the technique used by the Bayesians to test the internal consistency of the underlying assumptions in a decision process. The key to any such approach is in surfacing the critical assumptions implied by any decision strategy. For the catastrophe reinsurance treaties described in the paper, the premium is the equivalent of the decision strategy while the principal factor implied by the premium is the potential for a claim in a particular year. Mr. Simon has provided a technique whereby the claim probability implied by a particular treaty premium can be computed. Ostensibly, such probabilities can be compared for similar treaties, or variations on the same treaty, to determine if the probability assumptions underlying the quoted premiums are logically consistent.

This does not imply that logical consistency is a necessity or even always desirable. In addition to the basic claim considerations, other factors such as competitive pressures or a reinsurer's relationship with a particular company will undoubtedly have a bearing on the ultimate treaty premium. The advantage to this technique, however, is that it will point out when the underlying assumptions are inconsistent and thereby necessitate that the individual pricing the treaties, at least, rationalize the deviation.

In addition to the test for logical consistency, this procedure further lends itself to a general test for reasonableness of the claims probability implied by a particular premium. As an illustration: in Mr. Simon's Example A, the gross premium of $1,000,000 implied that the probability of hitting the cover within a one year period was approximately 10%. If this were a wind treaty, say in excess of a $5,000,000 retention for a moderate

sized company, the 10% probability would appear reasonable. However, if this were the top layer of an earthquake treaty, with the underlying layers and company retentions amounting to, say, $50,000,000, the probability would not be reasonable and the treaty premium possibly too high. While this is an extreme case, the reinsurance expert should be capable of far more refined analyses. Certainly, he is continually using his own experience to review his current prices, but, because the dynamics of the market place are continually changing his frame of reference, it should be beneficial to occasionally review the underlying assumptions implied by his prices to insure their continued reasonableness.

Finally, it should be noted, that the technique of testing for logical consistency has many other applications in addition to reinsurance. While there has never been sufficient data to test the myriad of individual rating factors used in the fire schedules, it might be very enlightening to test the internal consistency of the effects of each of the rating factors on the ultimately developed fire rate. The many rating factors present in a No Fault Class Plan would similarly avail themselves to tests for relative consistency. In the latter case, there are some data available and, to the extent reliable, they could be incorporated into the analysis, further enhancing the results.

In this review, I have not attempted to address any of the assumptions utilized by Mr. Simon in the actual application of his technique. Two areas which probably require further analysis are:

1. Is the Poisson distribution the appropriate mathematical model for the occurrence of claims?
2. Is the assumption that all losses are total losses realistic?

Regardless of how these questions might be resolved, Mr. Simon has provided a valuable contribution in the overall concept of testing the logical consistency of the assumptions underlying a ratemaking process.