DISCUSSION BY ROBERT L. HURLEY

The author exercises singular care to specify precisely the scope and purpose of the paper, "Rating by Layer of Insurance." The study is limited to the losses under the Homeowners policy, specifically, direct physical damage losses incurred on the dwelling building occasioned solely by the fire hazard. The author would not have the reader imagine that the conclusions pertain to the Homeowners policy overall. Nor should the reader, in disregard of the author's purpose, impute the findings to any classification of fire risk beyond the relatively narrow prescription, dwelling building physical damage risks, most probably not subject to abnormal underinsurance.

The mathematical analysis is carefully developed and the pertinent calculations should impose no undue hardships on the reader familiar with graduation methods. While the graphical presentation may initially appear somewhat awesome for one whose responsibilities no longer encompass statistical methodology, the author supplies cues and actual instructions by which all becomes relatively easy.

The paper gives the portion of total dollar losses for each percent of the total policy amount. In effect, the data show the expected distribution of losses by percent deductible. While a familiar technique for writing earthquake insurance, the percentage deductible is thought to be less common than the straight dollar deductible in most property insurance situations.

At this point maybe we should offer a caution. The title of the paper, "Rating by Layer of Insurance," must not be interpreted directly as pure premiums by layers of insurance. Rather we have here the relative distribution of losses by size correlated to the policy amount only on those buildings having suffered a loss. The study, by design, does not treat directly with those policies not having suffered losses during the experience review period.

The absence of the zero loss class, which would introduce the frequency element, can be of somewhat more than speculative interest to a person attempting to develop relative pure premiums by layer of insurance. It is conceivable that analysis of two different batches of insurance losses might tend to have a similar distribution of losses by size but an entirely different distribution of pure premiums, solely because of the relative differences in the zero loss class.

To develop pure premiums by layer of insurance, the author suggests that the savings in loss cost (or if one prefers, the loss elimination ratios) as developed in the study might be applied to the total classification pure premiums to fraction off the cost for the relative layers of insurance. This approach is viewed as not inconsistent with Bertil Almer's paper published in the *Transactions of the XVth International Congress of Actuaries* wherein the probability of a loss within a specific range of values is represented as a joint function of the inherent probability of any loss occurring and a mathematical expression for the expected distribution of losses by size. Similar theory has also been at least touched upon by previous Casualty Actuarial Society authors if not developed with the mathematical subtlety of a Dr. Almer.

The author concludes on the basis of the findings presented in Exhibit A that the savings in loss cost (or, again, the loss elimination ratios) as a percent of the amount of insurance at risk is identical for all policy sizes. This reviewer also suspects that whatever differences may exist by policy amounts, they might not be turned into easily defensible rating differentials for such a narrow range of coverage as Homeowners fire dwelling building property damage insurance.

For example, it was noted that at the 5% value to insurance level the $10,000 policy (Frame) had suffered 44% of its dollar losses. At the same percentage level, the $25,000 policy (Frame) had suffered only 35% of its losses. This 20% differential (i.e. 1 — .35/.44) might conceivably be used by some hypothetical disputant wanting to argue that the value of the identical percentage deductible decreases as the policy size increases.

On the other hand the same entry point in Exhibit A might also be used by an equally keen but no less unreal adversary who would contend just the opposite, that the value of the identical percentage deductible increases right along with increases in the policy size. For we note that at the same 5% insurance to value level, the $20,000 policy has suffered 51% of its total dollar losses, or about a 15% differential, in just the opposite direction. The following abstract of table A may help to point up the respective arguments.

Percent of Total Dollar Losses Suffered With a 5% Deductible

	$10,000 Policy	$20,000 Policy	$25,000 Policy
% total dollar loss	44%	51%	35%
Relativity to $10,000 policy	1.00	1.16	0.80

It is thought possible to find other such points at which an honest uncertainty might not be able to withstand a determined adversary whichever way the latter may choose to argue. The reviewer seriously doubts that these vexatious points escaped the author. Rather it is not unlikely that the author dismissed all such unexplainable inconsistencies as non-significant. There is at least the suspicion in the reviewers conscience that he might easily have done so too.

And yet, in retrospect it seems that there has been on occasion, an undue willingness to belabor either implicitly with verbal argumentation or formally with statistical methodology the Null Hypothesis. This technique developed early in the present century has certainly become, over the intervening years, an indispensable dogma in the statistician's portmanteau of learning.

Almost inescapable is the parallel of the Null Hypothesis with such popular ratiocinations as, "If you can't see it, it isn't there,"— or probably better "if you can't prove it, it probably can't be true." While it may be somewhat rash to question the wisdom of such popular maxims, the value of the Null

Hypothesis can most effectively be realized with a due regard for what have been characterized as "Type 2 errors," wherein real differences appear as non-significant according to the statistical test.

Yet, it should not be difficult to accept the author's representation that the relative loss costs are solely a function of the percentage of loss to amount at risk, and are relatively independent of the policy value. In other words, we might expect the same savings in loss cost on, say, a 1% deductible whether the fire property damage coverage was written for $10,000, $15,000, or $20,000 insurance on the dwelling building.

Actually, the 1% deductible means only the difference between the first $100 on a $10,000 policy and the first $150 of loss on a $15,000 policy. This may not be enough of a difference to fuss about mathematically. It should not likely outrage even the most scrupulous integrity to assume that for all practical purposes one need not differentiate between these two situations, as far as Homeowners dwelling fire property damage losses are concerned.

However, it could be dangerous to assume that this argument holds for fire coverage generally. The author certainly makes no such mistake in logic, and there is no reason why we should be trapped into such a non-sequitur. There are statistics to indicate that the fire loss cost (excl. dwellings) on a per cent deductible basis is not a constant overall magnitude of insurable value. However, it is thought the potential fallacy is most easily shown by examining where such a theory would lead if followed to its logical conclusion, again, in the case of fire, non-dwelling coverage.

Let the 1% deductible again be our base. On a $2,500 mercantile contents fire policy (and there are many such) the 1% deductible means that the company would escape paying anything on any loss under $25 (as well as the first $25 on any larger loss). However, it is difficult to imagine that there are many fire losses in a retail store which would cost less than $25.

On the other hand, the 1% deductible of a $50 million dollar office building represents $500,000. Even in this era of adverse fire loss ratios, such an occurrence is thought sufficiently unusual that an underwriter would not easily forget the full particulars of any event on which his company was called upon to make a payment in excess of $500,000. Thus, logic would seem to demand what experience would corroborate, that the loss cost on a percentage deductible basis cannot likely be a constant over the full range of fire insurance value.

Possibly these two positions may initially appear contradictory. Homeowners fire property damage building losses can, with seeming impunity, be handled as a constant on a percentage deductible basis, but other fire classifications cannot.

Actually, the dilemma is more apparent than real. It is most probable that comparable influences are working in both situations. However, the operating range of insurable values is sufficiently narrow on dwelling properties that the variation in loss cost per segment of insurable value tends to be imperceptible

in terms of which arithmetical differences are indentifiable by established statistical tests. On the other hand the value spectrum for other than dwelling properties is sufficiently wide that it may be quite unsatisfactory to treat the loss cost per segment of insurable value as if it were a constant.

The author (unjustifiably in the reviewer's opinion) seems to slight her paper as solely an introduction into an area of prime concern for the property-casualty insurance industry. It is much more than that. At the same time there is a need to continue the research into the expected distribution of losses by size, particularly in conjunction with the probability of loss occurrences by hazard, by classification of risk, and by area. Certainly such findings should be of value for establishing credibility criteria, although there may be actuaries who would prefer not to consider these standards as exclusively an exercise in mathematical statistics.

Miss Salzmann is to be commended for her valuable and thought-provoking research. It should be an incentive for other actuaries to contribute to the problem of determining the expected distribution of losses by size and its possible nexus with the industry's rating needs.

DISCUSSION BY ROBERT POLLACK

One of the truly important phenomena of our business in recent years has been the desire and ability of the industry to experiment successfully with new methods of providing coverage. Basically, we have been insuring most of the major property and casualty hazards for many years. However, the scope of coverage of these hazards has been changing markedly and, I am certain, will be subject to more change in the future.

Miss Salzmann's paper suggests a method for dealing with this changing pattern. By arranging losses in an accumulated loss cost distribution, she has offered a means of coping with coverages other than complete first to last dollar protection for lines of insurance in which "an increase or decrease in the insured amount for any one risk does not necessitate a proportionate change in the premium charge." The need for this type of study is obvious, and yet practically no research had been made in this area heretofore.

The method used is not completely new. In the casualty field, Table M is based on a similar approach in that the insurance charges and savings derive from arranging the spectrum of risk loss ratios. The Society of Actuaries has been working for years on similar studies, notably in the field of health insurance. In these latter studies, continuation tables have been developed which can be used in measuring the non-proportional effects of changing the maximum duration of benefits, the waiting period before benefits are payable, etc.

Miss Salzmann has chosen INA'S 1960 homeowners fire losses as the experience base for this study. The fact that this represents a relatively small block of exposures opens the question of credibility of the numerical results shown in the exhibits and charts. As an example, the data in Exhibit C-1 show that losses in excess of 10% of insured value represented 5% of the to-