

EXTRA PREMIUMS BASED ON THE NET AMOUNT AT RISK

PRESTON C. BASSETT

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JAMES E. HOSKINS:

The usual method of determining extra premiums based on constant extra mortality is to start with the extra mortality rate, expressed as dollars per thousand, make a mental deduction for the fact that the average amount at risk is less than the face amount on most plans, and make a mental addition for commissions, premium taxes, any special expenses, and losses on withdrawal where a level extra premium is charged for a decreasing cost. These special expenses may include allowance for a lower average size, a higher "not taken" rate, lower persistency, and for special consideration in connection with the original underwriting and subsequent requests for reduction or removal of the extra premium.

It is well known that such extra premiums, if payable for the full premium period of the policy, should theoretically vary with plan and age. This had been shown numerically by the present commentator in the *Transactions* for 1922. It is possible that the practical reason for charging invariant extra premiums is that of convenience rather than the reason of inadequate statistics, given by Mr. Bassett. Even if the rate of extra mortality in a given class is established on adequate evidence and is approximately independent of age, it might still be felt that the resulting gross extra premiums differ so little between ages, and between plans except as to some extreme plans which form only a small percentage of production, that the convenience of a constant extra premium is justified. This treatment is analogous to the practically universal practice of treating the extra charge for fractional premium payment as an invariant percentage of the annual premium even though theoretically the percentage should vary with plan and age.

Some companies make a single refinement in the case of extra premiums for assumed constant extra mortality, namely, a reduction on endowments of twenty years or less, usually of about 30%.

At the other extreme from this rough method of computation is the possibility of computing the total gross premium for the substandard policy in the same manner as the corresponding standard premium, and then taking the difference between substandard and standard premiums. Such computations at a few representative points may produce a pattern which can be expressed in some simpler form.

Mr. Bassett has suggested an intermediate method more accurate than the first and perhaps shorter than the second. Theoretically it requires a substandard mortality table like the second method. Mr. Bassett, however, has discovered an approximation which permits the use of the standard table and which is sufficiently accurate where the extra mortality is constant.

His method involves other approximations. It assumes that the amount at risk is the same on the substandard policy as on the corresponding standard policy and that both are represented by the excess of the face amount over the cash value. Strictly, the amount at risk is based on a retrospective asset share with the policy's contribution to surplus deducted. This type of asset share is discussed in my paper "Asset Shares and Their Relation to Non-Forfeiture Values," *TASA XL*, 379. It may be or may not be close to the cash value and will usually differ between standard and substandard policies. The amounts of extra expense which Mr. Bassett introduces may, of course, be computed with any desired degree of accuracy. The greater the accuracy, however, the less simplicity the method achieves.

Mr. Bassett's proposal that the extra premium be at least equal to the rate of extra mortality plus the initial extra expenses, with appropriate reduction in the period of the extra premium, is the most novel part of the paper. This method of reducing the extra premium period, instead of reducing the extra premium on short endowments and collecting for the full period, has been used by some companies and even extended to classes where decreasing extra mortality is expected. In the latter case the method has the advantage, as compared with a series of reducing extra premiums, that the writing of the policy is simplified and no change in records is needed except for a single change when the extra premium ceases. Even though the extra premium may eventually exceed the cost of the current extra risk, the remaining premium period is then shorter than that of the extra premium on a new policy, so that any incentive to switch policies at that time is removed.

The method permits the quotation of the same extra premium rate on all but the most extreme plans. If the calculation of the premium period is made without the assumption of voluntary terminations, as Mr. Bassett makes it, then any terminations which occur are a source of relative gain to the company, since the natural reserve released is higher than that on standard policies. The same effect can be obtained on extra premiums payable for the full premium period by an adequate loading to allow for termination.

Mr. Bassett refers to the method as a correct procedure. The method has some advantages which I have just enumerated but cannot be called more nearly correct than a scheme of extra premiums payable for the full premium period and computed on the best available assumptions, including termination rates.

Both the use of the amount at risk in extra premium calculation and the limitation of the extra premium period so as to make the extra premiums nearly independent of the plan can be applied to such other types of extra mortality as produce substandard reserves close to standard. One such case is that where the extra mortality approximates a multiple of the reciprocal of the standard expectancy (which is the formula by which the CSO Table exceeds Jones' Basic Table). The calculation would be somewhat longer, since the value of  $k$  in Mr. Bassett's formulas would no longer be constant.

(AUTHOR'S REVIEW OF DISCUSSION)

PRESTON C. BASSETT:

Since Mr. Hoskins was substantially in agreement with the thoughts I expressed in my paper there is little place for a reply. However, I do want to thank him for the comments and additions he has made.

At this time I would also like to thank my friends at the Prudential Insurance Company who helped me with this paper, particularly Mr. Frank David.