ACCIDENT LIMITATIONS FOR RETROSPECTIVE RATING

FRANK HARWAYNE

DISCUSSION BY ROBERT J. FINGER

This paper presents a method for calculating excess loss premium factors (ELPF's). Applying the ELPF to the standard premium determines the premium required to cover losses in excess of a given per accident limitation.

The ELPF is essentially calculated in two phases. First, claim size distributions are required for three types of claims: deaths, permanent total disabilities and major permanent partial disabilities. The claim size distribution gives the percentage of total losses for that injury type which are in excess of a certain accident limitation. Second, the percentage of losses by injury type in excess of the accident limitation are multiplied by the cost of that injury type as a percentage of total premium. Adding the costs for the three injury types yields the ELPF.

The claim size distributions are calculated in a three-step procedure. First, an empirical excess of loss distribution is calculated by state and injury type. This distribution is the percentage of losses in excess of a given amount per claim. The empirical distribution is calculated as a function of ratios to the mean, or average claim size. Second, a composite countrywide distribution is calculated by weighting the state's experience by the number of claims represented. Finally, the empirical distribution is graduated by a function of the form:

$$y = (1 + ax + bx^2 + cx^3)^{-1}$$

where x is the ratio to the mean.

This discussion will explore the applicability of modelling the above claim size distributions by the log-normal probability distribution.

The paper gives empirical data for several states for limited death cases and for major permanent partial cases. The discussion will limit itself to major permanent partial claims, but suitable techniques are applicable to limited death cases.

Table I shows the empirical average excess loss distribution for major permanent partial claims. Also shown are log-normal distributions for coefficient of variations (CV) equal to 0.5, 0.75 and 1.0[1]. It can be seen that the empirical distribution is similar in shape to a log-normal distribution. In fact, it is not too different from a log-normal with a CV of 0.75. Reasons for the discrepancy can be various, but might prove worth exploring. Among the possibilities: (1) the empirical distribution is based in part on case reserves; these reserves may not be entirely accurate: (2) there may be inaccuracies in the data; (3) the data may be distorted by a few abnormal claims or by the weighting by state; (4) limitations in certain states may distort the data; (5) the data may not be log-normally distributed.

It would seem desirable for many reasons to have a generalized model of claim sizes. The log-normal distribution might be a suitable model. Such a model would facilitate making adjustments for particular states, for particular hazard groups or classes, for particular injury types, or for changing claim settlement practices and influences.

TABLE I

SELECTED EXCESS LOSS DISTRIBUTIONS

Ratio To Mean	Log-Normal CV = .5	Empirical Average*	Log-Normal CV = .75	Log-Normal CV = 1.0
.25	75%	75%	75%	75%
.50	51	52	54	56
.75	32	34	38	41
1.0	19	25	26	32
1.5	6	14	13	17
2.0	2	8	7	13
3.0		4	2	6
4.0		2	1	3
5.0		1		2

*Major permanent partial claims; weighted average for five states.

[1] The coefficient of variation is the ratio of the mean to the standard deviation.