EDITORIAL AND ANNOUNCEMENTS

GUEST EDITORIAL

Actuarial Models

"A good actuarial model should not be unnecessarily complicated, bearing in mind that the objective is to provide practical results."

The above quotation is taken from a consultation document written by the Institute of Actuaries' Education Committee and published in April 1991. It is described as one of a number of "fundamental axioms of the actuarial thought process or philosophy...". I read the above quotation recently and it raised some questions in my mind about actuarial modelling. It wasn't that I strongly disagreed with the quotation (which of us is in favour of *unnecessarily* complicated models?), I just felt uneasy about its implications as I perceived them. This Guest Editorial seemed to me to be an ideal opportunity for me to put forward some very brief, and very personal, views on actuarial modelling. If you consider my points rather obvious, then I am pleased that you agree with them. If you disagree with my points, then I am pleased that I took the opportunity to make them!

The quotation seems to me to imply that simple models are better than more complicated models. There are good reasons why as simple a model as possible is to be preferred in some circumstances. For example:

a) a simpler model may be easier to explain to a lay person,
b) a simpler model will, in general, have fewer parameters, and so, again in general, these parameters can be estimated with greater confidence from a given set of data, and,
c) with fewer parameters it may be easier to see how the results produced from the model depend on the parameters.

Another argument in favour of simple models is that such models can be very powerful. As actuaries, we do not have to look far for a justification for this statement. The life insurance industry has been built up using a mathematical model which consists of a monotonically decreasing sequence of positive numbers (a life table $\{l_x\}$) and a separate positive number (a fixed rate of interest i). (This is a somewhat selective view of history! It plays down the importance of the technical ability and judgement of the many actuaries and other professionals who have worked in life insurance, but it is convenient for my present purpose.)

What then, if any, are the arguments in favour of more complicated models? I can think of at least two. Suppose there is a situation where a relatively complicated model could be used, but, by making some assumptions, this can be reduced to a much simpler model. We may prefer to use the simpler model for day-to-day work but the more complicated model is still useful since it can be used to quantify the effects of the assumptions used to derive the simpler model. The second argument is that, while a simple model may be very

convenient computationally, it may give very little insight into the process being modelled, whereas a more complicated model may provide this insight. This point is illustrated very well in a paper by Norberg (Transactions of the 23rd International Congress of Actuaries, 1988, vol. 3, pages 215-223) concerning select mortality. We are familiar with a select life table as a few extra columns of figures included with a simple (i.e. ultimate) life table. This model is very simple to use but does not attempt to explain how selection arises. Norberg uses a time-homogeneous Markov chain to model the mortality of insured lives and shows qualitatively how the usual features of selection can arise. In absolute terms Norberg's model may be considered quite simple, but it is far more complicated than the conventional select life table. Despite this, I consider it well worth studying for the insight it provides.

Another feature of the quotation at the start of this Guest Editorial which makes me uneasy is the implication that the objective for any actuarial model is to provide "practical results". This seems to me to be short step from saying that a model specified in terms of parameters which cannot be estimated from data currently available is worthless. (How many of us have heard a statement like this at some time?). If we are in a situation where we require numerical results from a model for immediate application, then we are constrained to consider only those models whose parameters can be estimated from data currently available (or which can be determined with reasonable confidence by some other means). This constraint may even restrict us to using a model which we know is not entirely suitable. But if this is the best we can do, and are we aware of the limitations of the model, the exercise can still be worthwhile.

Although many actuaries will consider that pressure of work means that they are constantly in situations where they require numerical results from a model for immediate application, there are, I think, good reasons for studying models where the relevant data are not currently available. One reason is that we may be looking for *qualitative* rather than *quantitative* results from a model, so that numerical values of parameters, and hence data, may be irrelevant. Norberg's model for select mortality mentioned earlier is a good example of this. Norberg's purpose is to provide some insight into selection and he achieves this without providing numerical estimates for the parameters of this model. In fact, he does not appear to have the data required to parameterise the model.

However, an overriding reason for developing models where the relevant data do not currently exist is that we may be sure that we will be facing new challenges in the future and that these new challenges will require new models. It seems to me to be prudent to have a variety of models waiting in the wings in various stages of development, and overly restrictive to consider only those models where the relevant data currently exist. To restrict ourselves in this way would be tantamount to allowing the data processing manager to dictate terms to the actuary and that is not a situation any of us would welcome!

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