Actuarial Statistics - An Australasian Perspective

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1. Introduction

The theme of this paper originally encompassed an Australasian perspective of actuarial statistics and its place in the university curriculum. Its scope has, however, since been tacitly broadened. It was felt that one could only consider actuarial statistics in the context of actuarial studies generally, having regard to the major changes currently taking place in the financial world, and the changing role of actuaries in that world.

After a general description of the current situation in the financial world, the subject "Actuarial Statistics" is discussed. Actuarial education, and the extent to which it should take place at university, then comes under the spotlight. Finally, the situation regarding actuarial education in Australasia is considered.

Reference to actuarial examinations in this paper will mean the professional actuarial examinations of the Institute of Actuaries in England. The first six of these subjects deal with statistics, economics and specifically actuarial topics such as life contingencies, and are also taken by actuarial students in Australia and New Zealand. Of the total of ten actuarial examinations, the final four bear directly on actuarial practice, and are run separately in Australia and in the UK.

2. Current changes in the financial world

The financial world is in a state of flux, with sweeping legislative and institutional changes occurring constantly, all taking place against the backdrop of an explosion in computing power. At the same time, distinctions between banks, building societies, brokers and insurance companies etc. are becoming increasingly blurred. Concomitantly there has been an enormous concentration of firms in the service industry, and where there is still a recognisable difference between services provided, they are increasingly being provided by various subsidiaries of the one organisation.

This lowering of barriers in the financial world is mirrored by what has happened to the actuary. Actuarial consultancy has broadened to incorporate management consultancy, and is frequently allied with accounting, legal and personnel management services. The actuary who values the pension fund is now asked to solve other problems of a more or less financial or mathematical nature, while the life actuary is increasingly involved with product development and profit testing in an ever more complex commercial environment.

Together with such comprehensive changes in the business world itself there has arisen the further need to cope with ever more complex legislation, resulting altogether in a large and growing demand for individuals who are not only literate but also numerate, with good communicative skills. The range of mathematical abilities sought varies enormously, with the actuary towards the upper end of the spectrum. It is important to realise that the call for a greater number of actuaries is only part of a wide search within the financial sector for a highly skilled numerate workforce.

3. The subject Actuarial Statistics

Even within the framework of the formal UK actuarial examinations there are several possible interpretations of the title "actuarial statistics". In this paper, for instance, we do not consider Subject 6, which is concerned with the estimation of decremental and durational rates, and includes *inter alia* the study of fertility, demography and population projection. In addition to this subject, there are two statistics papers *per se*, of which we discuss only the second, more advanced paper, called "Actuarial Statistics".

The three substantive areas of the syllabus of this latter paper are risk theory, credibility theory and loss distributions, on which areas we elaborate in turn.

Risk theory: We can separate risk theory into two portions. The first comprises the more basic areas, such as the compound Poisson process. While one can suggest improvements on the approach taken by Bowers et al. (1986) (e.g. introduction of the cumulant generating function and omission of much explicit calculation of convolutions), the approach in the textbook is reasonable, and the topic of paramount importance.

One has stronger reservations about the second half, which broadly considers the ruin of an insurance company over an infinitely long time horizon. While not denying the value of an intuitive idea of the risk process and the probability of ruin, and readily admitting the historical interest of the topic, the excessive algebraic manipulation required to derive even the simplest of formulae is both offputting to students and a formidable barrier to effective examination. Questions tend to be either trivial, or tediously long and algebraically complicated, requiring substantial rote learning.

The problem arises because an advanced topic is being tackled by elementary means. As Gerber (1979) observes, many risk theoretic results are readily derived by more advanced tools, such as martingale theory, which are considered too advanced for actuarial courses. As another example, the intuition underlying the basic concept of the adjustment coefficient can really only be obtained through consideration of defective renewal equations; this topic also ties in neatly with stochastic birth processes, of substantial potential interest to actuaries, but renewal equations are again considered too difficult for inclusion in actuarial education (Gerber, 1979, p.121). Finally, the severe