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REVIEWS

General Insurance

by

B. BENJAMIN, Ph.D., F.I.A.

(Pp. viii + 311: Heinemann, London)

This excellent new book brings together lucidly many aspects of a subject which is of some complexity and valuably contributes much additional knowledge. Its contents range from well written chapters concerning the nature of the business, legislation and so on, to chapters which carefully explain highly technical aspects such as solvency and analysis of profit.

The chapter dealing with the investment of funds is intriguing, drawing attention as it does to the interesting practice of allowing for investment return in rate making only as an implicit set off (though not necessarily of any specific amount) against profit margins which are correspondingly reduced in the rate making process. This procedure is indeed thought provoking. Conceptually the total premium for a year in any given risk class should have regard to the expected claims over the policy year for that risk class plus expenses plus a loading. The loading should clearly include appropriate allowance for variance around the expected claim rate and to reduce the loading on account of investment return involves joint consideration of underwriting risk and investment risk. With an approach which is implicit might there be some slight danger of insufficient appreciation being given to the additive nature of these risks, for example, by attempting to reduce the variance loading appropriate for a relatively risky underwriting policy by reason of an excess return obtainable from relatively risky investments over that obtainable from relatively risk free investments? And when it is stated that in managing its business the company must have an investment policy which maximises expected return net of taxation subject to any constraints imposed by the nature of the business of the company, does not the nature of the business impose the constraint of first setting an acceptable degree of investment risk and then taking the return which comes with it?

The chapter which follows is on documentation and data collection. As Professor Benjamin states, the mathematical theory starts from a point at which the appropriate data has been assembled but there is also the vital stage which must be given special and prior consideration, namely that of extracting and preparing the data. The manner of presentation here, by the author, of the methodology involved is extremely good.

It is, of course, adequacy of premium rates which is of vital importance to a company and the chapters on the risk premium, expenses, the office premium and experience rating are very sound. The element, expected claim cost, within the total premium is customarily decomposed into frequency and severity, a breakdown which involves the assumption that the two are independent, not invariably to be accepted entirely without question. However, there emerges the basis on which rates are to be calculated involving consideration being given, in, for example, relative frequency, to the determination of the number of claims to be inserted in the numerator of the ratio and the exposure units in the denominator as well as the importance of differentiation of premium rates according to risk class. In motor insurance a claim may be taken as an incident notified and recorded whether or not it might have resulted in payment, a year might be a policy year or a calendar year, whilst in the denominator the most practical exposure unit might be the vehicle year. Professor Benjamin's important comments on such aspects are particularly valuable.

In motor insurance rate making, a well known procedure in practice, for a given risk class, is to identify the major categories of variation and then to sub-divide such factors into adequate groupings. The method gives a series of pluses and minuses which are applied to the overall average frequency to obtain the expected frequency in an individual case. However a representation of claim frequency in the m factor form of a series of parameters referring to the successive factors included, the fitting being carried out by a least squares approach, intuitively raises questions, for example as to whether multi-collinearity exists. Professor Benjamin's deeply perceptive remarks on aspects such as this, the log normal and Pareto representations of claim amount distributions, credibility theory and so on are apposite.

Perhaps worthy of even further consideration in some branches of insurance might be the general area of discriminant analysis. The broad approach, which brings into the analysis all the separate variables, is to determine the vector of discriminant co-efficients which best separates groups of good and bad risks by maximisation of between group variation to within group variation. The two-dimensional data are transformed into a single dimensional score with which can be incorporated a misclassification cost.

The comprehensive chapter on reinsurance is typical of the book as a whole, first concisely giving the background, then clearly outlining the market, following with crisp technical analyses of the various forms of reinsurance and concluding with sound practical considerations. Reinsurance can, of course, present some problems, for example in connection with the determination of optimum retention limits involving criteria of selection which combine practical costing aspects with the theory of risk. And, again for illustration, consideration of the stop loss premium in connection with a stop loss coverage clearly conjures up problems of integration over the tail of the cumulative distribution function. To condense such a chapter into some 38 pages inclusive, as with most other chapters, of a valuable bibliography is no mean feat.

Similarly the chapter on technical reserves, which gives detailed attention to the various statutory sub-divisions of the liabilities, run off tables as frequently used in the calculation of provisions for outstanding claims, chain ladder, separation, and average cost per claim methods, followed by some well expressed comments on I.B.N.R. claims is commendably succinct.

This further addition by Professor Benjamin to his very long list of other outstanding publications places the insurance industry in general and the actuarial profession in particular even more in his debt.

L. W. G. T.

Life Contingencies

by

A. NEILL, M.A., M.S., F.F.A., F.I.A., F.C.I.I.

This book covers the syllabus for the examinations in life contingencies of both the Faculty and the Institute of Actuaries. Much of the material is similar to that contained in the familiar textbook of Hooker and Longley-Cook. The new textbook, however, has a large number of examples and a more extensive collection of actuarial tables, although it might have been helpful for some purposes to have used more than one rate of interest (4%). The actuarial tables are naturally more up to date than those of Hooker and Longley-Cook.

The author demonstrates his wide knowledge of life assurance business by making many comments on practical aspects (for example, on surrender values in section 5.1) and these remarks should be of value to the life office student wishing to relate examination work to office practice. Theoretical aspects are not always fully covered, and although it may be argued that this is a practical textbook, one would like to see references to more rigorous proofs for those interested. For example, the " proof " of Woolhouse's formula in section 3.1, which follows that given by Hooker and Longley-Cook, is entirely symbolic, although the results are proved in several mathematical texts.

The sections on stationary populations (6.3, 6.4) are more extensive than the corresponding sections of Hooker and Longley-Cook, and contain diagrams; this should help to reduce the difficulties experienced by many students on this topic. The derivation of the formula (5.10.3.) on extra risks is also clearer than in the earlier textbook. In example 10.11, on pension funds, the reversionary annuity factors should allow for different mortality among " age " and " ill-health " pensioners. The use of the symbol $\bar{s}$ in policy values (pp. 117-118) could lead to confusion and should perhaps be avoided. Appendix II, on notation, is rather too brief for a standard textbook.

The numerous examples, some of them of the standard of the professional examinations, will be of great value to students, including those taking actuarial courses at a university. One matter for regret, however, is the indifferent level of English expression; another is that no attempt has been made to relate the subject to modern work in statistics.

W. F. S.

Scottish Population History

edited by

M. FLINN

(Cambridge University Press, 1978)

Seven years' work by a team of researchers with an army of volunteer helpers who " devilled " for them at New Register House have produced a remarkable study of the demography of Scotland between 1600 and the 1930s. The book is a summary of the work, a triumph of arrangement and balance proceeding at a measured pace of about 100 pages per century, without bias towards any period. The sources used are described and criticised, particularly the uneven evidence (in time and place) of parish registers and the " private " censuses made from time to time. An economic indicator based on grain prices for the period up to the middle of the nineteenth century is given, together with a regional mortality index based upon relative burial frequency for the same period.

The social history of post-mediaeval Scotland is surveyed as an explanation or check upon the conclusions to be drawn from the statistics. Thus seventeenth-century Scotland suffered recurrent mortality crises from famine and plague, whereas later on an improved economy, trading communications and the acts of benevolent individuals and organisations lessened the impact of both natural and man-made disasters. Substantial migration to Ulster was succeeded by emigration to Canada and immigration in turn from Ireland. The effects of severe weather and of individual diseases are traced, and there are interesting studies of the prevalence of illegitimacy, of the reasons for high fertility in the Western Lowlands and the evidence for family limitation in the Highlands in the nineteenth century. The cholera and typhus epidemics, and the consequences of the Scots potato famine are studied; the steep decline in mortality between 1860 and 1880 may have been due to the slackening pace of urbanisation.

It has been fashionable to deride the more esoteric research topics funded by the Social Science Research Council: here is evidence of money very well spent in bringing together a vast amount of invaluable demographic material, and making it available for further researchers.

D.F.R