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REVIEWS

Practical Risk Theory for Actuaries. By C. D. DAYKIN, T. PENTIKÄINEN and M. PESONEN (Chapman and Hall, 1994) £35.00

This book is divided into two sections. In the first, the authors describe some results from classical risk theory; the second is devoted largely to asset/liability modelling in general insurance using stochastic simulation.

In the first section, the first chapter introduces the insurance process for short-term business, and also introduces some results and notation from basic probability and statistics. In the second and third chapters, distributions for claim numbers and claim amounts are discussed; almost all claim number distributions in the book are assumed to be mixed Poisson, with the Poisson and negative binomial being special cases. The fourth chapter covers methods of calculating or approximating the compound distribution function for aggregate claims. In chapter five a preliminary discussion of simulation methods is presented — this subject is considered in much more detail in the second section of the book. Some applications of classical risk theory are demonstrated in the final chapter of the first section.

The presentation of the theory is not gentle, and in places is distinctly obscure; in this the book follows its predecessor, *Risk Theory*, by Beard, Pentikäinen & Pesonen (Chapman and Hall, 1984). I would not recommend these chapters to anyone wanting to learn about classical risk theory from scratch, although they should be accessible to competent statisticians with a good initial knowledge of compound distributions.

Investment models are discussed in the first two chapters of the second section, with the Wilkie model (with some modifications) described in detail. In the following six chapters the development of an asset/liability model for stochastic simulation of a general insurance company is described, and some applications of such a model are discussed. In the final two chapters the use of stochastic simulation techniques in the management of life insurance and pensions business is discussed very briefly.

Since the description of a model of insurance cash flows requires quite a detailed discussion of the factors influencing those cash flows, the second part of the book provides very interesting insight into the practice of general insurance. It assumes some prior knowledge of both the argot and the nature of short-term insurance, but nothing beyond, say, the syllabus of the joint Institute and Faculty General Insurance examination. In fact, I think that this part of the book would be extremely valuable to students preparing for Subject G.

The impression given by this book is that the authors' real interest lies in Section 2, in which there is very little reference back to the theory developed in Section 1 — after all, if you are going to simulate separately the claim numbers and claim amounts, then results about approximating the aggregate claims distribution are not particularly helpful. While the second section is interesting, it seems quite disconnected from the statistical theory in Section 1, and you could ask why it was necessary to develop all that theory. In fact, the theory has many more applications than the authors imply, but the discussion of applications that do not involve simulation is very limited.

Risk theory is a broad term, usually taken to mean the application of statistics and probability to insurance. Given this, I found the occasional passing over of standard statistical methods surprising. Sometimes this is done without justification, for example in ¶3.3, when a censored Pareto distribution is fitted to data by 'trial and error by computer' — why not by maximum likelihood? And how good (statistically speaking) is the fit? In other places rejection of standard statistical methodology appears to be specifically encouraged. For example, in ¶8.5 the authors suggest that a combination of 'visual evaluation' and 'judgement' will give better results for estimating parameters for a time series model of investment returns than 'blind

calculation using text-book formulae' — which may be true, but perhaps the sensible application of text-book methodology would provide an even better approach. Too many actuaries already mistakenly believe that standard statistical methods cannot be applied or adapted to insurance-related problems.

This is a very wide ranging book, touching briefly on insurance applications of game theory, utility theory, tariff theory and modern portfolio theory, as well as probability and statistics. However, some of the major areas of classical risk theory are hardly covered at all, with the most notable absence being any serious coverage of the theory of credibility, which is assigned only 3 (rather confused) pages in this book, with no discussion of how and when it might be used. The authors state that experience rating (which incorporates credibility theory) is 'beyond the scope of this book'. This seems surprising — as an important branch of risk theory that is widely used in practice, there ought to be a significant place for credibility theory in a book on 'practical risk theory'.

The subtitle of the predecessor, *Risk Theory*, by Beard, Pentikäinen & Pesonen, was *The Stochastic Basis of Insurance*. This book could reasonably be subtitled 'The stochastic simulation of insurance'. Overall, this book is best read for Chapters 5 and 7–14, as a very interesting description of the modelling of the assets and liabilities of a general insurer.

M. R. HARDY

Expert Systems in Business and Finance: Issues and Applications. Edited by PAUL R. WILKINS and LANCE B. ELIOT (John Wiley and Sons Inc., 1993)

This book is a collection of 18 chapters contributed by a total of 28 authors. The editors state that the book is intended to present issues and identify opportunities "that are or should be of interest to those who are evaluating, researching, developing or have a particular interest in applied artificial intelligence, especially expert systems". The book fails to fulfill its aim for several reasons: it lacks a clear thematic organisation; many of the articles are unfocussed and difficult to follow; and basic principles are poorly presented.

The editors claim to have identified four major themes around which they have organised the book. Two of these themes are somewhat coherent, but two are simply rag-bags of topics that have little in common.

The first section consists of five chapters on 'Issues in the design and integration of expert systems'. Four of these chapters concentrate on issues in the integration of expert systems with conventional information-processing systems; the fifth (actually Chapter 3) looks at the design of the user interface component of computerised financial advisors, and has little in common with the other four chapters. I was disappointed in all these chapters. None of the authors discussed what features of expert systems might make it difficult to integrate them with conventional systems, and there was little awareness that many of the problems discussed actually arise when trying to integrate any set of different software packages or systems, whether or not any of them are expert systems. Nowhere is there a clear definition of what is meant by 'expert system', which appears to be taken as synonymous with rule-based system, thus ignoring other possible architectures such as case-based reasoning or blackboard systems.

There are three chapters in the second section, which is entitled 'Issues in the modeling of human judgment for expert systems'. Two of these chapters lack a clear focus: after reading them I had no clear idea of what points the authors were trying to convey. The third chapter, by Mallory Selfridge and Stanley F. Biggs, was the first chapter in the book that I found worthwhile. It gives a clear description of the types of knowledge used by auditors when making going-concern judgements, and would be useful reading for anyone designing or building a system to be used in the making of similarly high level financial judgements.

The book's third section, on 'Issues in validation, auditability and security of expert systems', contains a mixed bag of six chapters. The first is a useful survey of work in verifying and validating expert systems by Daniel E. O'Leary. It suffers slightly because of its lack of