TFA 43 (1992-1993) 568-570

BOOK REVIEW

Title: INSURANCE RISK MODELS
Authors: HARRY H. PANJER AND GORDON E. WILLMOT
Publisher: THE SOCIETY OF ACTUARIES, 475 NORTH MARTINGALE ROAD, SUITE 8000, SCHAUMBERG, ILLINOIS 60173-2226, USA
ISBN: 0-938959-25-5

This is a book about Risk Theory, and, in particular, about the calculation or estimation of the aggregate claims in a fixed time period from a portfolio of policies. The chapter headings are as follows:

PART I: STATISTICAL PRELIMINARIES

1. Introduction and Mathematical Background.
2. Probability and Random Variables.
3. Stochastic Processes.
4. Probability Distributions.

PART II: BASIC RISK MODELS

5. Individual Risk Models.
6. Basic Compound Risk Models.

PART 111: ADVANCED RISK MODELS

7. Compound Claim Frequency Models.
8. Mixed Claim Frequency Models.

PART IV: FITTING, ESTIMATING AND APPROXIMATING

9. Fitting Risk Models.
10. Tail Behaviour of the Aggregate Claims Distribution.

PART V: RUIN THEORY

11. Ruin Probability Calculations.

(442 pages in total)

Chapters 1, 2, 4, 5 and 6 are part of the required reading for one of the Society of Actuaries' examinations: Course 152 – Intensive Seminar on Risk Theory. Risk Theory has been included in the British professional actuarial examinations for some years – Faculty Part IVB and Institute Subject 5 – but it still seems to be regarded by some actuaries as of theoretical interest only and concerned only with non-life insurance. Any British actuary subscribing to these views would be well advised to consider two points:

1. While Course 152 is an **elective** course for the Associateship of the Society of Actuaries, the Society's basic Risk Theory course, Course 151, is **compulsory**. In contrast to this, the Society's courses covering the construction and graduation of life tables, Courses 162 and 165, are both **elective**.

2. The Canadian Institute of Actuaries' Committee on Solvency Standards sent all valuation actuaries in Canada in August 1992 a Primer on Dynamic Solvency Testing (for life assurance companies). Amongst other things, this gave details of ten "prescribed" scenarios, concerning future interest rates, expenses, mortality, etc., valuation actuaries were supposed to assume to assess the solvency of their company. One of these scenarios required the calculation of the distribution of claims in one year using precisely the methods discussed in this book.

"The basic theme of the book", according to a statement in the Preface, "is that the distribution of aggregate claims for an insurer can be computed by simple recursive algorithms . . .". The starting point for the book could be said to be the recursive algorithm given in Chapter 6 which makes the calculation of the aggregate claims distribution for an insurance portfolio feasible (with the help of a computer). (This celebrated result, first published in 1981, is known almost universally as "Panjer's Recursion Formula". It is unfortunate that, due to the understandable modesty of one of the authors, it is not given this name in this book!) The book could be regarded as complementing "Loss Distributions" by Hogg and Klugman, Chapters 1 and 2 of which are the remaining part of the reading for the Society of Actuaries' Course 152. The books are similar in style and approach, but whereas Hogg and Klugman concentrate on claim severity distributions, Panjer and Willmot concentrate on claim number and aggregate claim distributions.

Some of the core material in this book, notably in Chapters 4, 5, 6, 8, 9 and 11, is covered by the Monographs "Loss Distributions", "Risk Models" and Ruin Theory" which form part of the reading for the Faculty Part IVB and/or the Institute Subject 5 examinations. However, the treatment in this book is almost always more extensive and at a higher technical level.

There are exercises at the end of nearly all the chapters, although no solutions are given. For a book concerned with recently developed techniques for the calculation of aggregate claims distributions, it is a little surprising that so few of these exercises require the use of a computer.

Another surprising feature, at least to this reviewer, is the authors' rather casual attitude to real data. They state in the preface that: "The theory is developed from the perspective of application to real insurance data". However, there are very few examples in the book involving applications to real data, and on one of the occasions where real data are used (p.301 Table 9.1 data set G) we are not told from which area of insurance the data are taken.

Despite these minor grumbles, this book can be recommended as an extensive and well written guide to important recent developments in actuarial science. The authors say that the book is intended for a broad audience. For the reasons given earlier, it is to be hoped that its audience in Britain goes beyond the few technically minded actuaries involved in non-life insurance.

H. R. W.