BOOK REVIEWS

Hartmut MILBRODT, Manfred HELBIG (1999): *Mathematische Methoden der Personenversicherung*. de Gruyter. IBSN 3-11-014226-0

The book "Mathematische Methoden der Personenversicherung" by Hartmut Milbrodt and Manfred Helbig is a major textbook about life insurance mathematics and has the ambitious aim to cover a large part of the classic and modern life insurance mathematics in German. It is aimed at actuarial students, life insurance professionals and at research fellows.

In order to reach this aim, the monograph has over 600 pages and 13 chapters:

- Versicherungsmathematik: Teil der Versicherungswissenschaft
- Elementare Finanzmathematik: Der Zins als Rechnungsgrundlage
- Ausscheideordnungen in der Lebensversicherung
- Stochastische Prozesse in der Personenversicherung
- Versicherungsleistungen in der Lebensversicherung
- Versicherungsleistungen in der allgemeinen Personenversicherung
- Berechnung erwarteter Barwerte spezieller Versicherungsleistungen mittels Kommuationszahlen
- Prämien
- Das Deckungskapital einer Versicherung eines unter einem einzigen Risiko stehenden Lebens
- Das Deckungskapital in der allgemeinen Personenversicherung
- Überschuss und Überschussanalyse in der Lebensversicherung
- Mathematischer Anhang.

From the above table of contents, it is seen that this book covers a large amount of things an actuary in a life insurance has to know such as commutation functions, smoothing of moralities, bonus schemes and multi-state model for life insurance. From this point of view, the book is necessary for each library. A particular highlight of this book is the treatment of markov models in life insurance in a very general way. The theory is as well illustrated by practical examples. On the other hand, the book is rather long and not as concise as for example "Life insurance mathematics" by Hans Gerber.

One reason for being so long stems from the aim of the authors to present all theorems in the most general framework. Therefore the definitions, propositions and theorems become rather involved and it is possible get lost. The exercises are either very theoretical (mathematical) or bound to earth and so there is something for every type of reader. The solutions are unfortunately missing.

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On the other hand, this book is unique because it tries to present the traditional and the modern life insurance mathematics within one book and therefore I think that is in particular helpful for people who want to know both types of life insurance mathematics.

MICHAEL KOLLER

G.E. WILLMOT AND X. SHELDON LIN (2000): *Lundberg Approximations for Compound Distributions with Insurance Applications*. Springer Lecture Notes in Statistics, 156. ISBN 0 387 95135 0.

Contents:

In its broadest interpretation, one can say that Lundberg approximations yield exponential inequalities and first order asymptotic expansions for compound distributions. Typical applications include ruin estimation in risk theory and approximations for the total claim amount over a given period of time. Similar problems occur in dam theory, queueing theory and reliability. The present text mainly uses techniques from the latter field to augment the classical insurance results. The various chapters typically start with some general results on the relevant topic; these results are then exemplified under specific distributional assumptions. Though the original Lundberg approximations were established for short-tailed distributions (as claim size, say), also the long-tailed case (like the Pareto) is discussed.

The text is well written; proofs and examples are given very much in detail. Consequently, the text can be used to augment a course on risk theory for instance through the discussion of specific examples

PAUL EMBRECHTS

J. Grandell: *Mixed Poisson Processes.* Chapman & Hall, London, 1997, 260 pages, ISBN 0 412 78700 8.

Mixed Poisson distributions and processes can loosely be regarded as Poisson distributions or processes with random intensity parameters. The distributions of these parameters are called *structure distributions*. It is surprising that such a simple construction has a lot of applications and serves as a source for further generalizations. By author's words, "the present book can be looked upon as a detailed survey, and contains no essential new results". One can agree with these modest words only on the understanding that the author gave a deep insight in the topic and related fields, provided many examples and counter-examples, historical remarks, and a comprehensive bibliography resulting in an excellent book.

In order to feel a flavour of the book, let us briefly consider its contents. Chapter 1 informally introduces readers into the subject. It contains relevant references and comments about the history of the problem. The mixed Poisson distribution is accurately defined in Chapter 2. Its various properties (e.g., the infinite divisibility) and relationships with other distributions are examined. Chapter 3 contains a mathematical background: point and Markov processes, martingales. In Chapter 4, the mixed Poisson processs is introduced, its basic properties are established, and relevant examples are given. As the author indicates, this chapter "is, to a great extent, a slightly (this adjective seems not to be adequate – *V.K.*) modernized summary of Lundberg's work" [*On random processes and their application to sickness and accident statistics*, 1940]. Various random processes such as infinitely divisible, Hoffman, Yule, birth, Pólya, and others are considered in the light of their relations to mixed Poisson processes. Chapter 5 is of special theoretical and applied interest. It is devoted to Cox, Gauss-Poisson, and mixed renewal processes regarded as important generalizations of mixed Poisson processes that can be viewed as approximations of a wide class of point processes. The emphasis is placed on constructive definitions of these processes. In particular, the author considers the *thinning* allowing to characterize the Cox and Gauss-Poisson processes. Various characterizations of mixed Poisson processes are given in Chapter 6. They are stated within sets of birth, stationary point, and general point processes. Chapter 7 deals with certain aging properties of the structure distributions. These properties are used in Chapter 8 for bounds, asymptotic formulae, and recursive evaluation of mixed Poisson distributions. The last Chapter 9 is devoted to applications to risk business with the emphasis on ruin probabilities, where contribution of the author is outstanding. Readers can also find there other interesting topics, e.g., associated with subexponential distributions.

This compact book is well-balanced as it combines rigorous mathematical treatments with informal discussions. It brings together many facts published in journals and other issues and contains a comprehensive bibliography on the subject and related topics. Certainly, it will serve as a valuable source of facts and inspiration for actuaries, applied mathematicians, students, and researchers.

Vladimir Kalashnikov