Dickson, David C. M.

Insurance risk and ruin. (English) Zbl 1060.91078

International Series on Actuarial Science. Cambridge: Cambridge University Press (ISBN 0-521-84640-4/hbk). xii, 229 p. (2005).

This book provides the reader with an introduction to the classical topics of risk theory like, e.g., collective and individual risk models, especially aggregate claims distributions, ruin theory, or some basics of utility theory, premium calculation and reinsurance. It has been designed for a final-year, but yet introductory course in insurance risk theory, with a special emphasis on recursive methods. The prerequisite knowledge required is probability theory on an intermediate level, including the basic concepts of distribution theory, conditional probabilities and expectations, or generating and moment-generating functions. No measure theory is needed, neither are more advanced tools from stochastic process theory (such as martingales etc).

Chapter 1 reviews the most common (discrete or continuous) distributions in risk theory, discusses some reinsurance applications and provides basic facts about sums of independent random variables. Chapter 2 gives a brief overview on key results in utility theory from an insurance perspective, including a discussion of utility functions and their applications in decision making of insurance. In Chapter 3, premium principles and their desirable properties are introduced, and a number of examples is discussed. Chapter 4 is devoted to a detailed study of collective risk models, including properties of aggregate claims distributions, in particular the compound Poisson model, effects of reinsurance, recursive calculation of compound distributions (Panjer recursion and extensions), applications of recursion formulae, and finally some approximate calculation methods. In a similar vein, the individual risk model is studied in Chapter 5 as an alternative approach to aggregate claims models, providing various calculation methods (de Pril, Kornya, compound Poisson) and ending with a numerical illustration. Chapters 6–8 deal with different aspects of ruin theory and develop some classical and more advanced results, such as ruin probabilities in discrete models, Lundberg's inequality, the adjustment coefficient, survival probabilities, the severity of ruin, surplus prior to ruin, time of ruin, effects of dividends, and others. In a concluding Chapter 9, some optimality questions of reinsurance are discussed from an insurer's point of view. It is not only illustrated how utility theory can be used to determine optimal retention levels, but also what ruin theory can contribute to find optimal types of reinsurance.

Every chapter contains a series of worked examples and concludes with a set of exercises to which outline solutions are given at the end of the book. In addition to this, by a repeated description and application of recursive methods throughout the text, students are encouraged to provide their own numerical solutions to various problems. Moreover, the interested reader will find several notes and references at the end of the chapters for further deepening his or her studies.

In conclusion, Dickson's book is a carefully and well written monograph on insurance risk and ruin, providing the higher-year student with the basic tools and concepts in these areas. Lecturers will find it a useful textbook for a corresponding course to teach in an actuarial program.

Reviewer: Josef Steinebach (Köln)

MSC:

91B30	Risk theory, insurance (MSC2010)	Cited in **2** Reviews
91-01	Introductory exposition (textbooks, tutorial papers, etc.) pertaining to game theory, economics, and finance	Cited in **63** Documents
91B16	Utility theory	
60K05	Renewal theory	

Keywords:

insurance mathematics; risk model; ruin theory; utility theory; premium calculation; reinsurance