BOOK REVIEWS

David C.M. Dickson (2005) *Insurance Risk and Ruin*. Cambridge University Press (CUP). ISBN 0-521-846404.

This book is the first one in the International Series on Actuarial Science published by CUP in conjunction with the Institute of Actuaries and the Faculty of Actuaries. It is a textbook mainly devoted to the two major areas of actuarial risk theory: aggregate claims distributions and ruin theory. It is tailor-made for a first course on risk theory for advanced actuarial university students. The nine chapters are:

1. Probability distributions and insurance applications
2. Utility theory
3. Principle of premium calculation
4. The collective risk model
5. The individual risk model
6. Introduction to ruin theory
7. Classical ruin theory
8. Advanced ruin theory
9. Reinsurance

All chapters end with some exercises whose solutions are outlined at the end of the book.

Chapter 1 provides a brief review of probability distributions, and introduces probability generating functions that are used extensively in the following chapters. It also presents basic insurance applications, especially reinsurance.

The two following chapters are short introductions to utility theory and to principles of premium calculation. The bare essentials are nicely presented.

The collective risk model is treated in chapter 4. As usual, the convolution formula is developed, and the Panjer recursion formula derived. But this chapter also introduces extensions to this recursive formula and discretisation methods. A few words are said about the stability and the danger of numerical underflow/overflow of these recursive formulas.

The individual risk model gets a modern presentation in chapter 5: De Pril's and Kornya's recursive formulas are derived, as well as the classical compound Poisson approximation. The chapter wraps up by illustrating and comparing the different methods.

Chapters 6 and 7 introduce basic and classical ruin theory: at first in discrete time, and then in continuous time (classical model). Fundamental results are derived mainly by renewal arguments, and Laplace transforms. A very short but sufficient primer on Laplace transforms is presented before using the tool to obtain important results and solving examples. How to compute ruin probabilities numerically in continuous time or in discrete time is discussed, as well as De Vylder's approximation method.

Several problems of advanced ruin theory are covered in chapter 8: introduction of a barrier, severity of ruin, surplus prior ruin, dividends, etc.

The last chapter is about the effect of reinsurance (proportional and XL) on the insurer's utility and on its ruin probabilities.

This book is well written. It is also well organized. In all chapters, there are many examples. As a textbook it might need to be supplemented with a few more exercises. For practitioners, it may be an interesting reference, and a way to have a good overview of some recent developments in ruin theory.

François DUFRESNE

P. Cizek, W. Härdle, R. Weron (Eds.), 2005, *Statistical Tools for Finance and Insurance*, Springer

The book which is presented in paperback and electronic (pdf and html) edition has been designed for researchers and practitioners with a good knowledge of stochastic processes and gives an overview of recent theoretical work and applied developments in quantitative finance (first part) and insurance (second part).

A look at the table of contents and the impressive lists of recent literature after each chapter reveal a very rich and active research area.

More then 30 contributors were part of the project in a joint initiative from the authors from the Center of Economic Research (CentER), the Centre of Applied Statistics and Economics (C.A.S.E.) and Hugo Steinhaus Centre for Stochastic Models (HSC). It goes without saying that this joint effort is a guarantee for the reader seeking valuable information on the state of the art in his/her discipline.

The Financial part starts with a very useful part on stable distributions. Many financial techniques rely traditionally on the Gaussian distribution but it has been argued that stable distributions often give a better fit to data with heavier tails than the normal distribution. The authors state that "they are valuable models for data sets covering extreme events, like market crashes or natural catastrophes". Different estimation procedures like Maximum Likelihood, and quantile estimation are compared and applied to financial data. Examples include Dow Jones index data (DJIA), Boeing Stock returns and exchange rates.

The growing interest on the evaluation of extreme risk is a motivation for the part on extreme value and copula multivariate models. The concept of tail dependence as a simple measure of dependence for large loss events is introduced and imbedded within the theory of copulas.

CAT bounds received much attention since the mid 1990's. The cat event process is modelled with a compound doubly stochastic Poisson process and applied to 10 year catastrophe data.

The reader who wants to know how to overcome the limitations of the Black-Scholes formula will find a number of alternatives in this book such as implied trinomial trees and stochastic volatility models.

The novel technique of support vector machines (SVM) is applied to predict the probability of default which has received much attention in anticipation to the new Basel II regulations. This approach should be placed next to the more traditional models to predict the probability of bankruptcy, like logistic regression and neural networks.

The second 'Insurance' part of the book starts with some very useful chapters on fitting and parameter estimation of loss distributions and the modeling and simulation of the claim arrival process. The more application oriented reader will find the methodological tools applied to real datasets as e.g. property claim services data and Danish fire losses.

For the insurer however it is also important to draw conclusions on the behaviour of the portfolio after an extended period of time and since exact calculations can only be done in very few cases, a nice overview of more than ten different approximations in infinite and five approximations in finite time with numerical illustrations is presented. Some of these methods are extended in the following two chapters where diffusion approximations for the ruin probability are presented and a distinction is made between good and bad periods with fractional Brownian motion processes and claims assumed to be dependent of time.

The insurer who wants to find an introduction to the recent developments on premium calculation is invited to read the last chapters where also the broader context of business decisions including risk transfer through reinsurance is considered.

This book is an important contribution for statistical researchers who want to pursue their work in the area of financial and actuarial mathematics. But also the mathematical statistician less familiar with the risk and insurance business will be fascinated by the wealth of possible new theoretical developments.

Eventually this book will certainly also be attractive for the practitioner who will find new useful algorithmic tools.

All the examples are implemented in Xplore and Xplore quantlets written in Java. These can be downloaded from the Web and used within the Web browser on any Windows, Mac or Linux platform.

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