Book Review

Dettweiler, Egbery, 2004, *Risk Processes*, EAGLE-Lecture, Leipzig: edition am Gutenbergplatz Leipzig, 207 pages, Eur 19.50, ISBN 3-937219-08-0/pbk

Most books on risk theory start with the simplest classical model and then proceed to more complicated risk models with different interclaim distributions. Claims at different time points are assumed to be independent in most of the models. Thus, the risk process is generated by an independently marked point process. This book takes a different point of view and treats the risk process as a general marked point process with possibly dependent marks. The term ''risk process'' used in the book only refers to the time and amount of claims. Thus it is somewhat different from the more popular understanding that a risk process is a surplus process.

The book contains five chapters and an appendix. They are:

1. Stochastic Processes
2. Claim Number Processes
3. Risk Processes
4. Analysis of Risk Processes
5. The Ruin Problem

Appendix

Chapter 1 defines some commonly used terminology and gives an introduction to the theory of martingales. Chapter 2 studies the claim number process and proves the one-to-one correspondence between a claim number process and the associated intensity process. In Chapter 3, a risk process is treated as a family of claim number processes. The study of the risk process is again via the intensity process. Three concrete examples are given in Chapters 2 and 3: the classical risk process, the Markovian risk process, and the risk process composed of mixing simpler risk processes. The first three chapters comprise of more than half of the book.

Chapter 4 studies the thinning and aggregation of risk processes and develops some mathematical tools. Chapter 5 studies the ruin model built from risk processes and premium inflows. By using results from Chapter 4, Lundberg bounds for ruin probabilities in the three models are derived.

The book is mathematically rigorous and self-contained. No other books on risk theory treat risk process as a general marked point process in such great detail. While it is uncommon to study the classical ruin model and renewal risk model through the intensity process, this approach is natural for more complicated models, such as the inhomogeneous Poisson ruin model, regime-switching ruin model and periodic ruin model. It also illustrates why an independently marked point process is not a very reasonable model for insurance risk.

While the proofs in the book are very well written, it may be abstract for readers with only a basic background in probability. For individuals without solid knowledge in measure-theoretic probability theory, the major tools in the book (kernel, conditional expectation and martingale) can be hard to understand. Also, since the structure imposed on the risk process is minimal, it is not easy to derive interesting results for the ruin problem from the results in Chapters 2 and 3. Indeed, most of these two chapters are about proving uniqueness-and-existence results for the intensity process, leaving not much room for further development. Only the relatively short Chapter 5 addresses the ruin problem, which is of great interest in theoretical actuarial science. Readers interested in treating a risk model as a marked point process with applications to the ruin problem may find Chapter 12 of Rolski Schmidli, and Teugels (1999) more informative.

Reference

Rolski, Tomasz, Hanspeter Schmidli, Volker Schmidt, and Jozef Teugels. 1999. *Stochastic Processes for Insurance and Finance*. Chichester: John Wiley.

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