

# Preface

This book is a second edition of the book of the same title by the first author which was published in 2000. The subject of ruin probabilities and related topics has since then undergone a considerable development, not to say boom. This much expanded and revised second edition aims at covering a substantial part of these developments as well as the classical topics.

Risk theory in general and ruin probabilities in particular are traditionally considered as part of insurance mathematics, and has been an active area of research from the days of Lundberg all the way up to today. One reason for writing this book is a feeling that the area has in recent years achieved a considerable mathematical maturity, which has in particular removed one of the standard criticisms of the area, namely that it can only say something about very simple models and questions. Although in insurance practice, usually simpler (and coarser) risk measures like Value-at-Risk are used, it is widely believed that the thinking advocated by ruin theory is still important for modern risk management. For instance, in times of market-consistent valuation principles, the role of the time diversification effect of insurance portfolios, which is one of the core elements of ruin theory, should not be forgotten. In addition, ruin theory has fruitful methodological links and applications to other fields of applied probability, like queueing theory and mathematical finance (pricing of barrier options, credit products etc.). Apart from these remarks, we have deliberately stayed away from discussing the practical relevance of the theory; if the formulations occasionally give a different impression, it is not by intention. Thus, the book is basically mathematical in its flavor.

The present second edition is more than 50% longer than the first and has more than double the number of references. The longer parts of the new material, reflecting subareas that have been particularly active in the last decade, are collected in Chapters XI–XIV, which treat Lévy processes, Gerber-Shiu functions, dependence and stochastic control, respectively. Shorter additions include

more about martingales and generators (II.4), various versions in Chapter VIII of models with level dependence, e.g. tax or stochastic investments, Erlangization (IX.8), statistical techniques for distinguishing between light and heavy tails (X.6), more material on discrete-time risk models (XVI.1) and recent advances in simulation techniques scattered in Chapter XV. In addition, there are amendments and updates at a large number of places.

A book like this can be organized in many ways. One is by model, another by method. The present book is somewhere between these two possibilities. Chapters IV–VIII introduce some of the main models and give a first derivation of some of their properties. Chapters IX–XV then go into more depth with some of the special approaches for analyzing specific models and add a number of results on the models in Chapters IV–VIII. Chapters II and III are essentially methodological in flavor.

Here is a suggestion on how to get started with the book. For a brief orientation, read first Chapter I, continue with II.1–3 to see some of the simplest ruin calculations, the first part of III.5 (to understand the Pollaczek-Khinchine formula in IV.2 more properly), and then, to get acquainted with the classical theory of the Cramér-Lundberg model, IV.1–5, V.4a, VIII.1, IX.1–3 and X.1–2. For a second reading, incorporate II.4, III.1–3, IV.8–9, V.1–2, V.5, VII.1–3, VIII.2, X.3–4, XII.1–2, XIII.1–2 and XV.1–3. The rest is up to your specific interests. Enjoy!

The symbols used for the quantities appearing in the book differ among the disciplines. We chose to use those that are common in the queueing community, partly also to be in line with the first edition. We apologize for the confusion this may cause for readers who are used to other symbols. In a book project like this it is impossible to avoid conflicts of notation in the sense that the same symbol may be used for different quantities. We hope that it will always be clear from the context what the notation refers to. In addition, we have collected a number of conventions, abbreviations and symbols after this Preface.

We have tried to be fairly exhaustive in citing references close to the text, but it is obvious that such a system involves a number of inconsistencies and omissions, for which we apologize to the reader and to the authors of the many papers that ought to have been on the list.

We intend to keep a list of misprints and remarks posted on the web page

<http://www.hec.unil.ch/halbrecher/rp2.html>

and we are grateful to get relevant material sent by email to

[hansjoerg.albrecher@unil.ch](mailto:hansjoerg.albrecher@unil.ch)

Finally, we would like to thank Corina Constantinescu, Hans Gerber, Peter Glynn, Dominik Kortschak, Ronnie Loeffen, Stefan Thonhauser and Hailiang Yang for discussions and proofreading parts of the manuscript, and Dominik Kortschak for help with some figures and general LaTeX issues.

Most of all, we would like to thank our wives May Lise and Renate for their support and patience during the writing of this book.

Aarhus and Lausanne, May 2010

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