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Quantitative Operational Risk Models

Catalina Bolancé
Jim Gustafsson

Montserrat Guillén
Jens Perch Nielsen



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About the authors

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Jens Perch Nielsen has been Professor of Actuarial Statistics at Cass Business School in London and CEO of the Denmark based knowledge company Festina Lente. He has a history of combining high academic standards with the immediate practical needs of the insurance industry. Through his company he has managed projects on operational risk, reserving, capital allocation, and risk-adjusted cross-selling methods in non-life-insurance, and he has academic publications in all these areas. In life and pension insurance he has conducted professional work on product development, asset allocation, longevity models and econometric projections and on bread and butter type actuarial day-to-day work. His Ph.D. from UC-Berkeley was in Biostatistics and he is still working on his original topic of general nonparametric smoothing techniques in regression, density and hazard estimation.

Preface

All human activities imply some kind of risk because the possibility of a loss due to accidents or mistakes always exists. Industrial production sometimes requires manipulation of hazardous materials and even the use of sophisticated machinery that is vulnerable to failures. Operational risk is natural in this context and refers to potential costs resulting from errors in normal functioning.

The concept of operational risk has extended from the industrial sector to all other activities, but it is intrinsically difficult to identify. In service provision, some types of disruptions are seldom detected and, moreover, it is very hard to identify what has caused them. So, although operational risk is recognized broadly, little is known about how to handle it.

Insurance is an old method to deal with risk. It is based on the honorable principle of redistributing losses, so that individual exposure can be pooled with others, and the collective faces the expenses and compensates the victim with an economic payment. Nowadays, insurance firms specialize on transferring risks from individual units to portfolios and then to external agents. Insurers also need to keep up to solvency standards as their reputation is essential for a business that is based on the promise to compensate in the event of a loss. The first step toward building an insurance contract is to quantify the risk. But, in fact, there may be errors in the models that are being used for measuring risk, as in many other usual processes that are implemented in insurance activities. Therefore, insurance itself can also be in danger of suffering operational risk.

In the banking sector, as in many other fields, financial transactions are subject to operational errors. So, operational risk is also part of banking supervision.

Given these circumstances, regulators require to measure operational risk as part of the indicators for solvency. This area is quite new and has exploded in the last few years with the existence of the Basel agreements in the banking industry and Solvency II in the insurance sector, which have set the path for international standards of market transparency of financial and insurance service operators.

Measuring operational risk requires the knowledge of the quantitative tools and the comprehension of insurance activities in a very broad sense, both technical and commercial. This book offers a practical perspective that combines statistical analysis and management orientations.

The book provides a guideline to practitioners, going from the basics of what to do with operational risk data to more sophisticated and recent tools that are needed to quantify the capital requirements imposed by operational risk.

This project started when Jens Perch Nielsen was director of research at RSA. A young Swede came into his office in Denmark asking him whether Nielsen would like to supervise his thesis. Two weeks later, Jim Gustafsson was on his way to London to talk to Chief Actuary Dix Roberts and operational risk expert and doctor of philosophy Paul Pritchard. That also led to a close cooperation with Catalina Bolancé and Montserrat Guillén from Spain, experts in how to transform data to improve nonparametric smoothers. Now, a few years and a lot of scientific papers later, Jens, Cati, Jim, and Montse are happy to be able to present this book on operational risk to the academic as well as the practical world.

Dix Roberts and Paul Pritchard have followed the entire process, and they have taken the time to have countless conversations with the authors on “where to go next”, which have been invaluable in their search for methods of real practical value. They have also both coauthored papers on operational risk, and the authors of this book are extremely grateful to them for their contribution.

The authors are also grateful to Tine Buch-Kromann who is also a doctor of philosophy from RSA—an expert in transformation herself—who spent energy and time to help supervise Jim’s master’s thesis. In this way, Jim got the best possible introduction to the transformation approach that has indeed partly been developed by Tine. Tine also coauthored works on operational risk, and she has constantly been an energetic and valuable discussant of our operational risk ideas. They also acknowledge all colleagues from the Riskcenter at the University of Barcelona, who provided many good suggestions and a wonderful atmosphere for doing research with many academic visitors. They thank David Pitt, who read and corrected earlier versions of the first three chapters.

The authors’ ambition with this book is to present the highlights of their work on operational risk, and it is therefore not an attempt to cover the substantial field of operational risk. There are important papers, books, and approaches on operational risk out there that give a comprehensive presentation of this topic. The authors have, instead, chosen to cover what they believe they do best: what they see as their own innovative approach to operational risk based on how to get prior knowledge into the estimation. Prior knowledge of operational risk can come in many packages, one of the most important being prior knowledge from external data, related to, but different from the data under investigation. Other prior knowledge could be on parametric shapes that have shown themselves to be useful in other similar studies, or even nonparametric shapes taken from sources other than the data at hand.

The book includes real-life examples and discusses the results, showing the usefulness of the methods described in the different chapters. It also provides an overview of the main difficulties arising in practice when quantifying

operational risk in an insurance company or in a bank. There are many special features and sources of error that do not occur in other fields as they do in banks and insurance companies.

In operational risk, one usually has to combine internal data and external data (i.e., information arising from the company with information arising from other firms); this topic has not been discussed in other books. The question of underreporting (not knowing the total frequency and severity of all errors that occur in the normal function of the company) is also one of the contents that is included in this book. Underreporting is not extensively mentioned in the existing literature.

The last chapter of this book is a self-contained guided example with programs in R and SAS[©], which can be useful to practitioners in order to implement most of the methods that are presented along the text. Data to reproduce the results in Chapter 7 are available from the authors.

Everything the authors have done in this book has been developed in the spirit that it should be practical, relevant, and based on academic standards. It is now up to the reader to judge whether they have been able to live up to their own ideal.

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