BOOK REVIEWS

P. EMBRECHTS, C. KLÜPPELBERG, T. MIKOSCH (1997): *Modelling Extremal Events* for Insurance and Finance, Springer-Verlag. 645 pp (1.04 kg). ISSN 0172-4568, ISBN 3-540-60931-8.

Quite a number of books on extreme value theory have emerged over the past few years. The present one aims at a broad readership of statisticians at all levels from taught graduate to research and, as the subtitle announces, in particular those working in the actuarial/financial realm. A review for the ASTIN Bulletin is in due place. To actuaries the book itself is an extremal event, and definitely not only due to its King-Kong size; it differs radically from the yard-goods literature on risk theory and teaches lessons that will enforce revised opinions about what the core syllabus of the field should be today.

The bulk of established risk theory deals with the small-claims-scenario in which standard insurance schemes work well in practice; events that appear extremal (rare but devastating) to the individual policyholder, when averaged out over the portfolio of an insurance company, are tamed by the law of large numbers. This book deals with the large-claim-scenario with events that are extremal to insurance companies and banks themselves, like catastrophes and stock market crashes: The law of large numbers is not at work since in practice any portfolio, however collossus, is small compared to the size of the largest claims. And, due to the rarity of such extremal events, there are notorius problems connected with databased statistical inferences about the mechanisms governing them.

In their humble preface the authors include a disclaimer stating that the extreme value theory cannot do magic. This is certainly true; the project of the book is to present models that give precise contents to notions of large claims and to show – within these models – how traditional actuarial/financial reasoning works out and how much, or rather little, can be inferred by classical statistical methodology. We acquire a deeper theoretical understanding of the nature of extremal events, but remain at a loss as to what to do in practice once the extremal event is there. This goes, of course, for actuarial literature as a whole, which to a very little extent problematizes the very concept of insurance and, in particular, how insurance schemes could be designed so as to, rather than go bust when the extremal event occurs, stay operational and indemnify the losses in a fair manner within the capacity of the reserves.

As its basic consituent the book gives a comprehensive presentation of the highly developed probabilistic theory of extreme values and its ramifications; classification of archetype extreme value distributions and

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their domains of attraction, fluctuation theories for sums, maxima, and upper order statistics, with associated variations of laws of large numbers and central limit theorems. Ruin theory for large claims is quickly worked out and provides a striking example of how well established actuarial wisdom crumbles under the weight of the heavy tails. The book carries on with an approach to extremes via point processes employing weak convergence of random measures, proceeds to statistical inference for extremes including data-analytic as well as likelikhood and moment methods, and treats also heavy-tailed time series. A final chapter devoted to special topics supplies a rich collection of applications of the theories to problems in the insurance and finance industries. To make the book selfcontained, mathematical prerequisites are placed in an appendix that makes up for a collection of small textbooks of its own.

This long awaited volume gathers and systematizes a huge material, parts of which were hitherto scattered around in journals not much read by actuaries and, therefore, in practice unaccessible to the profession. Given the nature of the subject, which is highly technical, the book is easy to read (requires some physical efforts though), also in excerpts as a reference manual or connecting theoretical concepts to the real world objects they are supposed to describe, with ample illustrations (100 figures) and discussions of authentic cases and data. An amazing amount of knowledge, also on the practical side, is generously shared with the readers here. Mathematical rigour is never compromised, but is still exercised in measured amounts; proofs are given when they serve an educative purpose, and adequate references are given otherwise. The list of 646 references opens virtually unlimited access to supplementary reading.

I recommend this precious book to all fellow ASTINers.

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