Chapter 8. Joint Life Assurance. Here the advantages of the stochastic model are particularly obvious, and analogies with reliability theory are made (joint life status/series structure, last-survivor status/parallel structure).
Chapter 9. Aggregate Claims of a Collective. Risk theoretic considerations, especially the development and numerical treatment of the distribution function of the aggregate claims.
Chapter 10. Inclusion of Expenses. Incorporation of the third base of calculation.
Chapter 11. Estimation of Probabilities of Death. Classical methods and procedures from mathematical statistics.
Appendix A. Commutation Values
Appendix B. Simple Interest.

The present monograph thus has as many chapters as the first volume of Saxer's standard work. Regarding the contents, the amount of overlap is about sixty per cent. The book is written clearly, precisely and elegantly. As in his pioneering book on risk theory, the author succeeds brilliantly in bridging the gap between intuition and rigour.

Compared with this, there are only a few minor points to be criticized. First of all, the use of stochastic models appears to be a bit half-hearted now and then, especially so with respect to their connections with reliability theory. Symptomatically, in the Foreword a probability space (Ω, A, P) is mentioned in passing, whereas in the text the symbol Pr, which is never defined explicitly, is used whenever probabilities are represented — even 'probabilities' of the type $Pr(t < T < t + dt)$.

Naturally, the practical needs of an actuary over and above the technical and mathematical aspects, e.g. statement of accounts, are not met by the present book. However, practitioners from *life* assurance might be interested by the material presented in Chapter 9 under the topic of reinsurance.

These objections, however, cannot detract from the substantial merits of Gerber's excellent book for which success both with practitioners and theorists can be predicted without any risk whatsoever.

W.-R. HEILMANN

BJØRN SUNDT (1984). *An Introduction to Non-Life Insurance Mathematics.* Veröffentlichungen des Instituts für Versicherungswissenschaft der Universität Mannheim, Vol. 28, Verlag Versicherungswirtschaft, Karlsruhe. 168 pages, DM 24.00.

In his foreword to the book the editor writes: "Textbooks in Non-Life Insurance Mathematics are rare. So it is a pleasure for me that Dr. Sundt was willing to write down his lectures given at Mannheim during the summer of 1983." A practitioner might be deterred by these introductory sentences, since lectures for

students of mathematics in Germany usually are filled with abstract theories and complicated proofs. Dr. Sundt's book, however, is well suited as an introduction for practitioners into methods of modern risk theory. Abstract theories are avoided whenever possible (e.g. credibility estimators are derived without any Hilbert space theory), and complicated proofs are substituted by informal deductions (e.g. Edgeworth expansions are introduced without mentioning Cramér's condition on the underlying characteristic function). Abstract models are motivated and explained using realistic actuarial problems, thus demonstrating that the mathematics presented in the book is in fact applicable. This can best be seen in the chapters on experience rating containing a nice introduction to credibility theory. On the other hand, rigorous proofs are given whenever they are informative, short and easy. So the practitioner will be enabled and encouraged to build his own model when models presented in the book do not fit his actuarial problem.

The main chapters of the book are credibility theory, bonus systems, the risk process, the accumulated claim distribution, claims reserves, and utility theory. These subjects include the most interesting and promising subjects of recent research in risk theory. In the chapter on credibility theory, the simple standard model as well as the Bühlmann–Straub model and the Hachemeister regression model are presented. The bonus malus chapter is concerned with the computation of the premium for each bonus class when the transition rules are fixed. In the chapter on the risk process, the claim number process is modelled by a general non-homogeneous counting process, while for the accumulated claims process, a homogeneous compound Poisson process is used. Ruin probabilities and the adjustment coefficient are introduced, and the optimal reinsurance results of Waters are presented. The chapter on the accumulated claim distribution includes stop loss inequalities, recursive algorithms of Panjer, Edgeworth expansions and normal power approximations, and solvency control problems solved using normal power approximations. In the claims reserves chapter we find the indispensable chain ladder method as well as Taylor's separation method and Straub's burning cost model. The chapter on utility theory is concerned with inequalities between zero utility premiums and between expected utilities with different compensation functions, and the definition of Pareto-optimality.

The whole book is clearly written and easy to understand. Perhaps due to personal taste, I do not believe in normal power approximations, I prefer approximations by compound Poisson distributions. Sundt's statement "...in practical applications the NP-approximation seems to perform very well" can be criticized. Approximations are needed only in those cases in which the exact computation is impossible, e.g. for large portfolios. The performance of an approximation can, however, be checked only if one can compare the exact values and the approximations, or if theoretical error bounds are available. For the normal power approximation, no theoretical error bounds exist (not even for the simple case of identically distributed risks). Theoretical error bounds exist for the approximation with compound Poisson distributions. Nevertheless, normal power approximations are frequently used in practice.

This book by Dr. Sundt can be recommended as an introductory textbook into modern risk theory for students as well as practitioners. Risk theory is a young and rapidly growing discipline with possible applications in life and non-life insurance, and in non actuarial branches. I think that Dr. Sundt's book will pave the way for the future application of new methods in risk theory like hierarchical credibility models or the estimation of accumulated claims distributions.

In his preface Dr. Sundt reports on the way his book was created. The preface is written in a very modest manner. There is not enough space to include the first paragraph of the preface here but in brief it states that the book was created by pure chance. I am pleased that this rare event actually happened, and all readers of the book will be pleased, too.

CHRISTIAN HIPP