

R. E. BEARD, T. PENTIKÄINEN and E. PESONEN (1984). *Risk Theory* (3rd edition). Chapman & Hall Ltd., London. xvii + 408 pages, £11.95 paperback/£24.50 hardbound.

[A review on the first edition by H. Bühlmann appeared in AB 6, 178–179.]

Those readers who are familiar with the first two editions of this pioneering book on risk theory will be surprised to see that the new edition is a complete revision of the earlier editions. This renewed third edition gives an introduction to risk theory with main emphasis on the practical aspects of theoretical results. Therefore this book bridges the gap between practical problems and pure risk theory.

The first chapter provides us with some thoughts on general modelling and more specifically on insurance models. Also the notations which will be used in the subsequent sections are introduced.

In the second chapter the authors examine the Poisson process. Classical properties as well as approximations are considered. In addition they discuss the economical influences on the claim number. They distinguish four kinds of fluctuations: trends, long-period cycles, short-period oscillations and pure random fluctuations. The structural distribution is introduced to incorporate short-period oscillations. The classical characteristics of mixed Poisson distributions are subsequently examined.

In Chapter 3 the compound Poisson process is extensively studied. The distribution of the claim size, those of the aggregate claims as well as basic characteristics of the distribution are largely taken into consideration.

Possible estimation techniques for the aggregate claim size distribution are given. Some problems arising from large claims are given. Analytical results are discussed as well as different types of claim distributions. The effect of a reinsurance treaty on total claim size is examined. The by now classical approximations for the compound Poisson distribution are given namely the Edgeworth expansion, the normal power approximation, the gamma-approximation etc. Also some more recent techniques, such as the inversion of the characteristic function, the recursion algorithm are also dealt with.

Mostly based on the normal power approximation of the compound Poisson distribution the authors discuss in Chapter 4 some practical problems related to a one-year time span such as: evaluation of the fluctuation range of the annual underwriting profits and losses, the reserve-funds, the problem of greatest retention, the influence of several retention limits, excess of loss reinsurance, stop-loss reinsurance, experience rating.

In Chapter 5 the variance is used as a measure of stability to design an optimal form of reinsurance to discuss reciprocity of two companies and the equitability of safety loadings.

In Chapter 6 a completely new chapter (not appearing in the previous editions) is included considering the risk processes with a time span of several years. In this case the basic parameters of the risk process are continually subject to alterations which are partially revealed as trends and partially as cyclical. The effect of these phenomena is modelled for carrying out long-term considerations,

e.g., the Poisson parameter is adapted to take into account the trends as well as cycles (by means of an autoregressive process). In addition the problem of forecasting the future flow of business is studied. The method is also adapted for coping with inflation. Investment is a new topic developed. Ruin probabilities for a finite time period come into the picture for discussing the problem of solvency. This chapter ends with the description of the Monte Carlo simulation of risk business.

In Chapter 7 several applications of the risk processes with a time span of several years developed in the previous chapter are given: the evaluation of net retentions, the effect of cycles, the effect of the time span, the effect of inflation, dynamic control rules and a solvency profile.

By means of cohort analysis the results of risk theory are then adapted to the life insurance branch in the following chapter.

In Chapter 9 infinite time ruin probability is studied essentially by means of the adjustment-coefficient. Some practical consequences are deduced.

The final chapter describes the application of risk theory to business planning. In the previous chapters many applications of a risk theory, such as the estimation of a suitable level for the maximum net retention, the evaluation of stability, the safety loading and the magnitude of the funds have been treated as isolated aspects of an insurance business. In this chapter a picture of the management process in its entirety is built up. An integration of the risk theoretical aspects in the context of other management aspects, not of actuarial nature, is carried out.

The book ends with some appendices containing derivations and proofs of some of the mathematical results obtained in the book: derivation of the Poisson and mixed Poisson processes, Edgeworth expansion, Infinite time ruin probability, Computation of limits of finite time ruin probabilities, Random numbers.

In addition the book contains quite a lot of interesting exercises (and their solution), an author index, a bibliography, a subject index as well as a necessary list of symbols.

In conclusion this book on risk theory where formulae are approached from the practical point of view shows to practical actuaries that some of the theoretical results lead to a better understanding of what is going on. To theoretical actuaries (at universities) the book gives a motivation for going on with theoretical research. Although this book has just appeared it is clear from discussions with students that it provides us with insurance models and material which is highly appreciated by people preparing for the actuarial profession.

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M. GOOVAERTS, F. DE VYLDER and J. HAEZENDONCK (1984). *Insurance Premiums. Theory and Applications*. North-Holland, Amsterdam. xi + 406 pages, US \$63.75/Dfl.150.00

This book introduces the reader to areas of insurance mathematics which have so far not been published on this scale in the form of a textbook. The individual