

balance of policies to adequately compensate victims and to effectively deter malpractice—is an excellent accessible introduction to these difficult issues.

A researcher interested in medical malpractice will probably not find the book useful. Most of the ideas and facts presented in the book have been presented in more detail (by the conference participants themselves) elsewhere. Numerous unsubstantiated and sometimes contradictory assertions weaken the book. No references appear, frustrating the reader who wants to find the source of a quoted statistic or research an issue further. The lack of references is especially frustrating given the controversial and contradicted assertions repeatedly made throughout the book. One speaker cites the source of a statistic as the American Medical Association. Two pages later, a representative of the AMA refutes quoted statistic and states that its source is definitely not the AMA.

We do recommend the book to those with a general interest in medical malpractice. Through spicy dialogue, the book presents a broad overview of the issues in the malpractice liability system and the perspectives of the various parties within the system: lawyers, physicians, and malpractice insurers.

Actuarial Mathematics, by Newton Bowers, Hans Gerber, James Hickman, Donald Jones, and Cecil Nesbitt. (Society of Actuaries, 475 N Martingale Road, Schaumburg, Illinois, IL 60173, U.S.A., 1986). xxiv + 624 pages.

Reviewer: Jean LeMaire, University of Pennsylvania

The new monumental textbook *Actuarial Mathematics*, sponsored by the Society of Actuaries, has finally appeared after years of preparation by the five authors. Its study is required for all future North American actuaries, as preparation for their examination on life contingencies. Very little of the material is specific to the United States or Canada, so the book could be adopted by other Associations of Actuaries and non-American universities. The reviewer has taught chapters 2 to 15 to undergraduate students in actuarial science in approximately 75 hours. A 20-hour introduction to financial mathematics preceded the latter material.

Basic knowledge of financial mathematics is assumed at all times, as well as a solid background in undergraduate calculus and probability theory. A 3-page appendix reviews the most common probability distributions and some calculus formulas for finite differences; but otherwise many theorems from calculus and probability theory are routinely used without an explanation. The reader should be prepared for constant use of conditional expectations, moment-generating functions, integration by parts, etc. Quite often only the key steps of a mathematical derivation are provided, and some computation is required to "move from one line to the next."

From a pedagogical point of view, the presentation of the book is impeccable; interesting examples illustrate each new concept. An interpreta-

tion is provided for the most important formulas. Each chapter concludes with a lengthy series of exercises.¹

The major innovation introduced by this book is the probabilistic approach to the mathematics of life contingencies. This breakthrough is definitely not going to facilitate the work of actuarial students, but it is long overdue. Instead of limiting themselves to computing net single premiums and expectations (in many former textbooks even without explicitly referring to the underlying stochastic process), actuaries are now expected to compute variances, ruin and loss probabilities for most contracts, whether on a single life or on a portfolio of policies.

Before reviewing the work chapter by chapter, it might be useful to mention what the book does not cover: (1) stochastic interest rates. The interest rates used to convert future payments to a present value are considered deterministic at all times, and are usually assumed constant; (2) estimation of parameters. The construction of mortality tables, for instance, is not discussed; and (3) computing methods. Issues like the optimal organization of input data, simulation, and computation in actuarial models, are not envisaged.

Chapter 1 provides an introduction to the economics of insurance, using utility theory. It serves as a background for the remainder of the book, but it is not essential, since utility theory is not used in the sequel.

Chapter 3 introduces the basic random variables that will be used throughout the text: the survival function, the (continuous) time-until-death for a person aged x , the (discrete) curtate-future-lifetime, and the force of mortality. An illustrative mortality table is presented and discussed. It is used in many exercises in the sequel. Assumptions for fractional ages are briefly discussed, as well as the most classical analytical laws of mortality, and the use of Select and Select-and-Ultimate tables.

The most classical policies (term, whole life, endowment, annuities, and their variants) are reviewed in chapters 4 to 7. Computation of net premiums, variances, and net premiums reserves are discussed. The probabilistic approach enables the authors to develop many interesting examples that offer the readers a glimpse of recent research topics in actuarial science, such as premium calculation principles and recursive calculations. Some practitioners may regret that rather theoretical presentation of these and other chapters. The continuous approach, based on integrals, is always presented before the discrete approach. Readers need to study thoroughly several chapters before getting some acquaintance with insurance practice.

¹The solution of most exercises, without derivation, is to be found in an appendix. A worthwhile addition to the textbook is the study manual published annually by ACTEX, and distributed by The Actuarial Bookstore, P.O. Box 318, Abington, Connecticut 06230. It contains detailed solutions to all the textbook exercises, many supplementary problems and multiple choice questions, and the solution to recent Society of Actuaries examination questions. Study manual #150, \$42. #151, \$18.

The sequence of chapters 8 to 10 introduces multiple life functions and multiple decrement models and applies them to insurance contracts involving two lives, and to the design of pension plans. Numerous exercises familiarize the reader with the practice of employee benefit plans, providing benefits for retirement, death, disability, and withdrawal.

Expenses are—at last—introduced in chapter 14 which deals with Insurance models including expenses. The preceding models are extended to incorporate acquisition and administrative expenses, and accounting requirements. The different loading techniques and modified reserve methods are discussed, mainly through examples.

The sequence of chapters 2-11-12-13 provides an excellent and modern introduction to risk theory, despite the fact that some important recent developments had to be by-passed, being outside the scope of the book. Chapter 2 provides a welcome survey of important probabilistic concepts, presented in an insurance framework. The computation of the sum of independent random variables and its approximation by means of the central limit theorem are reviewed through several examples. Chapter 11 focuses on the computation of the aggregate claims distribution. The compound Poisson and compound negative binomial models are introduced. For the former, three different methods to compute the distribution are presented and abundantly illustrated (two methods compute convolutions; the third is the recursive method). Approximations by the normal and the translated Gamma distributions conclude the chapter. The surplus process is analyzed in chapter 12. The adjustment coefficient is defined in the continuous and discrete cases, and the theorems for computing the (infinite horizon) ruin probability in both cases are stated. The maximal aggregate loss random variable is characterized, as well as the distribution of the first surplus below the initial level. Some interesting applications of risk theory are outlined in chapter 13. It is for instance shown how to compute net stop loss premiums using the recursive formula of chapter 12, and how stop loss reinsurance is linked to a dividend formula in group insurance. The effect of reinsurance on the probability of ruin is illustrated by means of examples, both for proportional and non-proportional reinsurance. Those examples naturally lead to a theorem that states the superiority of non-proportional over proportional reinsurance, if the (unrealistic) assumption is made that the reinsurance loadings are the same.

The other chapters (15 to 19) develop special topics, that are nevertheless of extreme importance to practicing actuaries: nonforfeiture benefits, dividends, special policies (such as installment refund annuities, mortgage protection, products whose benefits are linked to the performance of an investment fund, options to modify benefits, reversionary annuities), as well as the major actuarial cost or funding methods for defined benefit pension plans. Some parts of chapters 14 and 15 (valuation laws, regulations for nonforfeiture benefits) are specific to the United States and Canada, hence of lesser value to actuaries that do not practice in North America.

Among the seven appendixes to this book, appendix 4 is especially noteworthy, since it presents a comprehensive survey of the international actuarial notation.

For actuaries and future actuaries, this lengthy textbook is a major revolution: it will have a deep impact on the education and the practice of actuarial science throughout the world, for several decades. For non-actuaries, the earlier chapters provide an excellent introduction to life insurance mathematics. The remainder of the textbook, admittedly not easy to read for non-mathematics, is a good presentation of the new trends and developments of actuarial science.

Risk and Insurance, by Mark R. Greene and James S. Trieschmann, Seventh Edition, (South-Western Publishing Company, 1988), 785 pages.

Reviewer: William A. Scroggins, Jr., Jacksonville State University

Twenty-seven years have elapsed since the first edition of *Risk and Insurance* was published. The seventh edition continues to offer a modern and comprehensive picture of the principles and practices of risk and insurance. The writing style has remained clear, concise, and eminently suitable for the sophisticated reader.

The authors have extensively revised and reorganized the seventh edition, enhancing flexibility for the classroom environment. The new edition is divided into eight major parts. The first three parts examine the nature of insurance and risk management, the insurance industry as an institution, and the legal environment of insurance.

Parts 4 and 5 have undergone extensive reorganization to provide a consumer orientation. Part 4 includes life and health insurance, retirement plans, estate planning, and buying life insurance. Part 5 is concerned with typical property coverages such as automobile, homeowners, and miscellaneous lines, as well as buying property insurance.

Statistical applications for risk management included in Part 1 in earlier editions now appears later in Part 6, which is concerned with business risk management. The coverages in Part 6 include property, liability, workers' compensation, and crime.

Government insurance programs are examined in Part 7, while Part 8 focuses on international insurance. The latter was omitted in the fifth and sixth editions but is now reintroduced to reflect the global business environment and to meet accreditation requirements of the American Assembly of Collegiate Schools of Business.

Risk and Insurance is one of the leading introductory insurance texts on the market. The seventh edition has been improved in a number of ways to help make it the state of the art as a teaching instrument. Each chapter now begins with a statement of new terms and learning objectives. Also, boxed reading materials from the current literature have been added to each chapter. These include current events, court cases, and case situations that illustrate the practical side of theoretical concepts. The number of end-of-chapter questions

Copyright of Journal of Risk & Insurance is the property of Blackwell Publishing Limited and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.