these chapters, the models' likelihoods and priors are the same as those earlier in the book. This has the advantage of concreteness and allows detailed derivations, although other models and priors may be of interest. What is left unaddressed is a comparison between the Bayesian approach and the iterative approaches mentioned earlier. It should be possible to construct realistic situations that demonstrate the advantages of the Bayesian models. This would also be a useful framework within which to evaluate the sensitivity of the results to the model assumptions.

The use of source separation algorithms, particularly independent components analysis, has recently become a popular approach for analyzing fMRI data. These data offer a rich testbed for these methods, because there is substantial prior information about the response function being modeled and because there is interesting spatial structure to account for. Chapter 12 gives a case study applying the Bayesian methods developed earlier in the book to simulated and real fMRI experiments. The results are promising. The book's description of fMRI experiments will be clear to a nonspecialist. The models here can simultaneously account for the main sources of variation in the temporal data, including trends and physiological covariates that are usually "removed" during preprocessing. The extended models of Chapters 13 and 14 would be appropriate here to account for additional features in the signal, but these would be straightforward to implement. An advantage of this approach is that it provides a data-adaptive method for estimating response functions; commonly used methods either restrict to a simpler parametric model or use a separate regressor at each time point. Careful choice of a general prior for the source signals might further improve the fit.

Taken as a whole, the material in this book is technically detailed but narrow in scope, focusing on basic models and Bayesian methods. The writing is clear but does not elaborate on concepts and variations. Given the book's style and strengths, it would be appropriate for several audiences. For practitioners in an application area (e.g., fMRI) who want to study or implement methods for the source separation problem, this would serve as a useful reference because it presents all necessary technical detail. For statistics graduate students in a class on multivariate analysis or inverse problems, this could serve as a supplementary text, although it would need to be accompanied by material on other methods for the problem. In this case, most of the introductory material through Chapter 7 could be skipped. A similar recommendation holds for a short course on source separation problems. *Multivariate Bayesian Statistics* fits into a relatively small niche but serves its purpose well.

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Financial Modelling With Jump Processes.

Rama CONT and Peter TANKOV. Boca Raton, FL: Chapman & Hall/CRC, 2004. ISBN 1-58488-413-4. xvi + 535 pp. $79.95.

Before the work of Markowitz (1952), finance was more of an art than a science. Before the work of Black and Scholes (1973) and Merton (1973), financial practitioners did not have to worry about Brownian motion or Itô calculus. Since the work of Harrison and Pliska (1981), martingales have become recognized as natural tools in this area. As the limited ability of the standard Black–Scholes model to reflect financial reality has become ever clearer over the years, the pressure has been on to broaden the class of stochastic processes used in financial modeling to achieve a better fit to real markets and real data. As always, one is caught between the conflicting demands of simplicity (of concepts or of implementation) and of goodness of fit, or range of phenomenon that one can model adequately.

The thesis of this book is that *jumps* are needed in a model. The first chapter, "Financial Modelling Beyond Brownian Motion," is an eloquent and (to me) convincing argument for the necessity of jumps. At 16 pages, reading this would be a very good investment of time for anyone with access to this book.

The prototype of jump processes is the Poisson process, ubiquitous in the modeling of actuarial and insurance problems. These two processes—Brownian motion and the Poisson process—stand at opposite ends of a spectrum of processes forming an important class: *Lévy processes*, or stochastic processes with stationary and independent increments. These have a well-developed theory, and the class is flexible for modeling purposes. This book is essentially a monograph treatment of the burgeoning field of "Lévy finance," written with the practitioner as well as the student in mind.

The level of mathematical completeness, or of the prerequisites expected of the reader, is the first choice that the authors had to make. To make the book as accessible as reasonably possible to practitioners, the authors have (very sensibly) chosen to make no attempt to prove everything. Rather, they aim to "explain everything," writing what they need into the record, proving what they can, and giving detailed references to the literature (they cite 395 references) otherwise. Chapters end with a summary and further reading.

Part I (Chaps. 2–5) covers on mathematical tools. Here what is needed on measure theory, probability, and stochastic processes is summarized. Lévy processes are introduced. There is a whole chapter (Chap. 4) on building new Lévy models from old ones. Multidimensional models (dependence and copulas) are treated in Chapter 5.

Part II (Chaps. 6 and 7) covers simulation and estimation. Chapter 6, on simulating Lévy processes, includes approximation by compound Poisson processes and infinite-series representations. Chapter 7, on modeling financial time series with Lévy processes, includes the stylized facts of financial data, tail behavior (particularly heavy tails), time aggregation and scaling, and volatility clustering. I particularly liked Figure 7.6, a Venn diagram depicting the relationship between Lévy, Gaussian, and self-similar processes.

Part III (Chaps. 8–13), which studies option pricing in jump models, is the longest, and for the practitioner, the most important part. "Part IIIA" (Chaps. 8 and 9) covers theory, stochastic calculus with jumps (Chap. 8), and change of measure (Chap. 9). Girsanov's theorem, on change to an equivalent measure, is the core of *risk-neutral valuation* for complete markets (such as the Black–Scholes model, where one can hedge risk completely). It plays an important, though less dominant role, in *incomplete markets*, such as Lévy models typically give. "Part IIIB," on applications, begins (Chap. 10) with pricing and hedging in incomplete markets. It continues (Chap. 11) with risk-neutral modeling with exponential Lévy processes (the extensions to the Lévy case of the exponential Brownian motions of the Black–Scholes case). Chapter 12, on integro-differential equations and numerical methods, covers the extension of the (parabolic) partial differential equations (PDEs) of the Black–Scholes theory to the partial integro-differential equations (PIDEs) in the Lévy theory (the new term, the integral term, directly reflects the new feature, the jumps). Topics covered include pseudodifferential operators and their links with Markov processes, viscosity solutions, and the fast Fourier transform (FFT). Chapter 13, on inverse problems and model calibration, is the part of the book that a quantitative analyst or financial engineer perhaps will refer to most frequently.

Part IV (Chaps. 14 and 15) goes beyond Lévy processes. Chapter 14 looks at time-inhomogeneous jump processes (with additive processes in place of Lévy processes). Chapter 15 is on stochastic volatility (SV) models with jumps. It covers in particular the work of Barndorff-Nielsen and Shephard (2001) on non-Gaussian Ornstein–Uhlenbeck processes (which depends on the theory of self-decomposability), and the work of Carr, Geman, Madan, and Yor (2003) on time-changed Lévy processes.

One of the features of this book that I like most is the illuminating asides, often (but not always) in the summary or further reading sections at the ends of chapters. To quote just one (from 10.3.4, p. 330), "... pricing by utility maximization is more similar to a portfolio allocation problem than to arbitrage pricing models." (It would take us too far afield to explore this properly here; suffice it to say that the need to feed utility or the investor's attitude to risk into the picture goes hand-in-glove with the incompleteness that comes with the jumps.) Another nice feature is the short biographies at chapter ends (Poisson, Lévy, Bachelier, Meyer).

I loved this book (so too did Peter Carr, in the publisher's blurb). It will be required reading for students (mine, at least) entering Lévy finance. My judgment is that it will be useful both within academia, particularly to people in stochastics, econometrics, and other fields wanting to develop an interest in finance, and to practitioners. True, they will need a good mathematical background and a degree of persistence, but in view of the demands of the increasingly complex financial world we live in, they need these anyway.

Not being critical, something needs to be said about what the book does *not* do. Although I think the case for jumps is very well made, the case for *independent* increments is argued (if at all) less convincingly. For ordinary purposes, it is reasonable to treat tomorrow's new price-sensitive information as independent of yesterday's. During a sustained financial crisis, it is not. We have a whole range of models of weak dependence, but it is doubtful that they would give worthwhile gains in everyday financial use. During a financial crisis, or crash (i.e., when it matters most), models for everyday use break down. That is an argument for models especially designed for market crises and turbulence, which is a matter for another book. One could hardly ask more of the authors in the 535 pages of this book.

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Insurance Risk and Ruin.

David C. M. DICKSON. Cambridge, U.K.: Cambridge University Press, 2005. ISBN 0-521-84640-4. xii + 229 pp. $65.00.

This book is designed for students and practitioners preparing for the professional examination. It contains nine chapters, on probability distributions and insurance applications, utility theory, principles of premium calculation, the collective risk model, the individual risk model, introduction to ruin theory, classical ruin theory, advanced ruin theory, and reinsurance.

This book is well written and provides a basic introduction to parts of risk theory. It clearly reflects the author's research interests. Most of the book deals with risk models and ruin theory. A very short introduction to utility theory is given. For a student learning the topic, the book is ideal, because it contains many worked-out examples and numerous exercises with a sketch of the solutions. The numerical examples are often accompanied with a discussion of whether the algorithm is stable and what numerical problems could arise. The list of references is short. It would have been nice if the notes and references had contained references to more advanced work for interested students.

The first chapter gives the basics. In an actuarial context, useful distributions are introduced, and their basic characteristics are stated. It seems a little strange that moments are calculated by differentiating the moment-generating function when it is often simpler to calculate them directly. Later, used reinsurance treaties are introduced. For practical use, the methods of numerical calculation of convolutions are interesting.

The chapter on utility theory is very short and gives only the basic notions and ideas with some examples. An application is the zero-utility premium principle described with all other important premium principles in the following chapter. It is a pity that utility theory is not worked out further. For example, the author could have proved that the premiums exceed expected claims, a property that is justified later with ruin theory.

The next two chapters describe collective and individual risk models. Emphasis is on the difference between the two, so that it should be clear when to apply which model. Besides the distributions, the effect on reinsurance is investigated. Approximations are given, and numerical issues like the Panjer recursion, de Pril's formula, and Kornya's method are discussed.

Almost half of the book is on ruin theory. Starting with the discrete model, the topic is introduced. Then classical Cramér–Lundberg theory is presented through elementary proofs. The only approximation discussed is the de Vylder approximation of the ruin probability; other approximations are given in the exercises. This may be because the other approximations are more complicated to motivate. Then refined results, such as the severity of ruin, the capital before ruin, and the maximum before ruin, are found with clever arguments. The distribution of the time of ruin is calculated numerically and approximatively. Unfortunately, no heavy-tailed distributions are considered. It would have been interesting to see the accuracy of the approximations for Pareto and log-normal claim size distributions. These distributions are important in practice. Another advanced topic is optimization of barrier dividend strategies, a topic only recently considered in the literature.

In the last chapter, the choice of reinsurance is considered. Two principles are discussed: optimal (exponential) utility and maximization of the Lundberg exponent. One could criticize that only explicitly solvable examples are discussed. The reader could get the wrong impression that all optimization problems can be easily solved.

All in all, this is a nice textbook, especially for students with a limited background in probability. In particular, it should be useful for students studying for the professional examination. However, an extension of the nonruin part would have been useful so that students could learn more on other important topics in non–life insurance, such as utility theory and optimal reinsurance. I am not aware of any book on the same level in which ruin theory is treated so deeply. The numerous exercises allow for the application of theory immediately. For this reason, this book is also ideal for an applied course for students which only a basic introduction to probability.

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Flowgraph Models for Multistate Time-to-Event Data.

Aparna V. HUZURBAZAR. Hoboken, NJ: Wiley, 2005. ISBN 0-471-26514-4. xii + 270 pp. $94.95.

This book presents an interesting alternative to the usual modeling of multistate time-to-event data. Multistate models arise in a number of applications in both biomedical and engineering applications. They are most often modeled by parametric or semiparametric models for the state transition intensities. A good review of these models can be found in special issue of *Statistical Methods in Medical Research* (Andersen and Keiding 2002).

This book presents an alternative approach based on flowgraph models. A flowgraph models the waiting times in each state rather than modeling the transition intensities from one state to the next. These waiting times are modeled parametrically using a combination of probabilities and moment-generating functions. The author proposes a Bayesian analysis of the flowgraph models, with the end result being a Bayes predictive density.

The book comprises nine chapters. The first chapter is an introduction to multistate models and flowgraphs. Chapter 2 presents the basic results in flowgraph modeling. Here the author shows how multistate models can be broken into submodels of simpler parallel and series systems. Using these representations and basic results on moment-generating functions, the model can be used to obtain the moment-generating function of the time to transition from any state to any other state. Chapter 3 deals with the problem of inverting the moment-generating function to find the density function. The authors introduce the saddlepoint approximation to the problem.

The fourth chapter deals with (right-) censored data. The basic survival quantities and the Kaplan–Meier estimator are introduced. The censored data histogram is then presented as a tool for selecting the parametric model to be used in the flowgraph.

Chapter 5 presents the Bayesian approach to estimation for the flowgraph model. The author presents "exact" Bayes methods with conjugate priors and explicit expressions for the posterior density. When the integration involved in computation of the likelihood is not tractable, the author suggests several techniques for sampling from the posterior. These include Gibbs sampling, rejection sampling, Laplace's method, and slice sampling. Slice sampling is emphasized here as the best tool for flowgraph models.

Chapter 6 presents R and/or MAPLE code for some of the more computational methods presented in earlier chapters. This includes R code for censored data histograms, MAPLE code for the saddlepoint approximation, and R code for Bayesian and likelihood analysis of the flowgraph model. These are the main routines and require functions and subroutines from the author's website.

Chapters 7 deals with semi-Markov models through birth and death processes. Chapter 8 looks at the problem of incomplete data. Incomplete data