

# Short Book Reviews

Editor: Simo Puntanen

## Advanced Econometric Theory

John S. Chipman

Routledge, 2011, xiv + 393 pages, £39.99/\$65.00, softcover (also available as hardcover)

ISBN: 978-0-415-32630-8

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*Readership:* Researchers, practitioners, and students in econometrics and statistics.

Sixty (yes, 60!) years after his Ph.D. in Political Economy in the Johns Hopkins University, John S. Chipman got his latest book *Advanced Econometric Theory* published. Quite remarkable! How this happened is explained in the first paragraph of the book: “Some years ago I decided that the lecture notes I have been distributing to my students in econometrics for many years, being quite different in many ways from existing textbooks, might be worth publishing as a book. This is the result.”

And the result is an extremely good one: Professor Chipman has done a great service to the econometric & statistical society while summarizing his lectures into this book. Belonging to the same Pack of Icons as e.g., T. W. Anderson, Ingram Olkin, and C. R. Rao, he is giving further evidence that long days with statistics must be good for one’s health!

As Chipman states in the Preface, one way in which the book departs from existing textbooks is that the coverage is less exhaustive and more selective. No worries, there is enough reading anyways, and some topics that seldom get covered in econometrics textbooks, such as linear aggregation, reduced rank regression, and recursive models, are covered here in detail. The book provides 60 pages for solutions to the exercises, certainly helpful for anyone. Similarly, the personal section *Notes* at the end of the book increases the readability of this valuable work of John S. Chipman.

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## A Mathematician Comes of Age

Steven G. Krantz

Mathematical Association of America, 2012, xvii + 135 pages, \$49.95, hardcover

ISBN: 978-0-88385-578-2

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| 2. Math concepts         | 7. Is mathematical maturity for everyone? |
| 3. Teaching techniques   | The tree of mathematical maturity         |
| 4. Social issues         | Etymology of the word “maturity”          |
| 5. Cognitive issues      |   |

*Readership:* Mathematics teachers and students.

The back cover text is the following:

“This book treats the maturation process for a mathematics student. It describes and analyzes how a student develops from a neophyte who can manipulate simple arithmetic problems to a sophisticated thinker who can understand abstract concepts, can think rigorously, and can analyze and manipulate proofs. Most importantly, the mature mathematics student can create proofs and know when the proofs that he/she has created are correct.

Mathematics is distinct from other disciplines in the nature of its intellectual development. The book lays out these differences and discusses their significance.”

The author illustrates his topic from various points. He describes his and colleagues’ teaching methods and experiences and puts them into a wider context. He emphasizes the teacher’s significance as a “role model” for the students. The book contains many interesting details. For example, the author presents “four stages of the development of a mathematical child”, based on Piaget’s “four stages of learning development.”

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**Statistical Methods for Trend Detection and Analysis in the Environmental Sciences**

Richard Chandler, Marian Scott

Wiley, 2011, xiv + 368 pages, €78.00/£65.00/\$90.00, hardcover

ISBN: 978-0-470-01543-8

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| Part I. Methodology  | 8. Rainfall trends in southwest Western Australia<br>(Richard E. Chandler, Bryson C. Bates, Stephen P. Charles)   |
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*Readership:* Postgraduate students and researchers in the environmental sciences and in statistics.

The study of change is fundamental in many areas, and has become particularly important in the environmental sciences, where climate change has forced itself onto the agenda of even our politicians. One aspect of change is trend, defined in this book as “long-term temporal variation

in the statistical properties of a process, where ‘long-term’ depends on the application.” This book describes what trends are, how to detect them, and how to model them.

The book is split into two parts: the first on the statistical ideas and tools used in understanding and modelling change, and the second illustrating four applications of these ideas in the environmental sciences. The first half of the book is written (I assume) by the two named authors. The chapters in the second half have additional authors, presumably specialists in the application domains concerned. It is worth noting that this division means that the book is likely to be of value to researchers or statisticians who are modelling change in areas other than the environmental sciences as well: the first six chapters certainly provide a highly readable outline of the general statistical area, in sufficient depth that one could then go away and do effective statistical analysis.

The book kicks off with a series of short examples, which serve as a launch pad for a description of some of the challenges of modelling trend, such as autocorrelation, impact of other variables, the role of experimental design, auxiliary information such as data quality, and issues of prediction and extrapolation. A basic statistical knowledge is assumed.

The references appear at the end of each chapter, a style I personally do not like as it can make references laborious to find, rather than being gathered together at the end of the book.

I would like to believe the authors’ opening sentiment, that scientific investigations are most often motivated “by a recognition that such an understanding is beneficial to the well-being of humanity,” but I fear this may not be the case.

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### **Antieigenvalue Analysis: With Applications to Numerical Analysis, Wavelets, Statistics, Quantum Mechanics, Finance, and Optimization**

Karl Gustafson

World Scientific, 2012, xiv + 244 pages, £59.00/\$89.00, hardcover

ISBN: 978-981-4366-28-1

#### *Table of Contents*

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| 1. Introduction                                  | 7. Quantum trigonometry                    |
| 2. The original motivation: operator semigroups  | 8. Financial instruments                   |
| 3. The essentials of antieigenvalue theory       | 9. Other directions                        |
| 4. Applications in numerical analysis            | Appendix A: Linear algebra                 |
| 5. Applications in wavelets, control, scattering | Appendix B: Hints and answers to exercises |
| 6. The trigonometry of matrix statistics         |  |

*Readership:* Professionals and students in statistics and applied mathematics.

Everybody is aware of the concept of the eigenvalue but what about the antieigenvalues? So, if  $A$  is a  $p \times p$  matrix and  $x$  is a non-zero vector satisfying  $Ax = \lambda x$  for some scalar  $\lambda$ , then  $x$  is an eigenvector associated with the eigenvalue  $\lambda$ . Equivalent characterization is that  $\cos(x, Ax) = 1$ . We can now ask the question what is  $x$  such that  $\cos(x, Ax)$  is a minimum. Such a vector is called an antieigenvector and the cosine an antieigenvalue of  $A$ . This is the basis of operator trigonometry originally developed by Karl Gustafson in 1966–1969 and has since then resulted more than 75 (wow!) related papers by Gustafson and his coauthors. In particular, in 1999 Gustafson showed that antieigenvalue theory would provide interesting applications to statistics.

Here we have this personal presentation of the antieigenvalue theory. The book proceeds chronologically from Gustafson's creation of the theory to the present and the goal is to take the subject out to a wider audience. Gustafson describes his writing as follows: "In fact there were moments when I thought, why not just publish a compendium of all my papers that are on, or related to, my development of the antieigenvalue theory? But that would not open the subject, although it might be useful to do so at a later date."

The book indeed is written in a very personal way: Gustafson is not only introducing plain mathematical material to the reader but he also opens the door to historical development of the ideas; all this is very educating to the readers. I like the way Gustafson, in addition to is "real stuff", divides the chapters into sections like Perspective and Commentary. These special sections, written in a narrative style, give exceptional and interesting insight into the development of the antieigenvalue theory. All in all, Gustafson has done great job—congratulations!

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### **Selected Works of David Brillinger**

Peter Guttorp, David Brillinger (Editors)

Springer, 2012, lxii + 515 pages, €169.95/£153.00/\$229.00, hardcover

ISBN: 978-1-4614-1343-1

#### *Table of Contents*

Part I. Theoretical Statistics (7 papers)

Part II. Time Series Papers (8 papers)

Part III. Population Biology and Environment (7 papers)

Part IV. Point Processes (9 papers)

*Readership:* Specialists in time series and point processes and in statistics in the natural sciences.

This selection of published papers is a fine representation of David Brillinger's research, work that is, happily, continuing. The book starts with an interview with Victor Panaretos in *Statistical Science* ranging over Brillinger's career and his thoughts on a wide range of topics, including issues and people influencing his work, and so on. The main part of the book is then in four parts on Theoretical statistics, on Time series, on Population biology and environment and finally on Point processes. Each part is preceded by a short commentary, sometimes little more than a summary of the papers.

The first part is somewhat of a misnomer. The papers are mostly concerned with probabilistic issues with a statistical motivation, rather than, for example, with aspects of formal statistical inference. The remaining parts are a fine mix characterizing Brillinger's theoretical originality and his strong links with important and very wide-ranging scientific topics. Indeed the implicit unifying theme of the book is the strong combination of important subject-matter issues, careful mathematical representation and powerful and relevant mathematical and statistical analysis. One unifying thread to the work is an emphasis on frequency domain methods.

Many of the papers are an ideal base for a reading and study group of students and others working in time series.

The papers are virtually all, or perhaps all, easily available through contemporary electronic library systems. This raises the general issue of the viability of collections of this kind in the current economic climate. Your reviewer emphatically prefers the book to a list of accessible pdf

files, and ideally the library of any group with a serious interest in time series analysis should have copy; I hope that many will indeed be able to afford it.

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## Expansions and Asymptotics for Statistics

Christopher G. Small

Chapman & Hall/CRC, 2010, xiv + 343 pages, £59.99/\$94.95, hardcover

ISBN: 978-1-58488-590-0

### Table of Contents

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| 1. Introduction                              | 6. The Laplace approximation and series |
| 2. General series methods                    | 7. The saddle-point method              |
| 3. Padé approximants and continued fractions | 8. Summation of series                  |
| 4. The delta method and its extensions       | 9. Glossary of symbols                  |
| 5. Optimality and likelihood asymptotics     | 10. Useful limits, series, and products |

*Readership:* Graduate students in statistics or applied probability doing theoretical work or requiring the study of asymptotic theory to support a research activity with an applied focus. Researchers who are not specialists in asymptotics and who wish to learn more about the subject.

This book provides a broad range of analytical tools for expansions and approximations of functions arising in probability and statistics. The structure of the book is modular. Chapters 1–3 form a module on methods for expansions of functions. In particular, Chapter 1 provides the mathematical background necessary for the rest of the book. Chapters 4 and 5 describe core ideas in statistical asymptotics, including the delta method, the von Mises calculus, and the asymptotic normality and asymptotic efficiency of standard estimators as the sample size goes to infinity. Chapters 6 and 7 discuss the general saddle-point method and important particular cases such as the Laplace approximation and Edgeworth expansions. On the other hand, Chapter 8 deals with series convergence and the acceleration of that convergence. Each of Chapters 1–8 ends with a selection of problems that together cover most of the topics in the book. Finally, Chapter 9 and 10 are essentially appendices that contain useful supplementary material.

The book emphasizes that numerical and asymptotic analysis are two complementary approaches and are to be seen as partners, not antagonists. From the book: “A primary goal of asymptotic analysis is to obtain a deeper *qualitative* understanding of *quantitative* tools. The conclusions of an asymptotic analysis often supplement the conclusions which can be obtained by numerical methods.” Accordingly, the book illustrates some of the topics with relevant Maple ([www.maplesoft.com](http://www.maplesoft.com)) commands. The book also includes vignettes of several prominent mathematicians whose ideas have been instrumental in the development of asymptotics. These vignettes are interesting but can be somewhat distracting at times.

This book will be an excellent resource for researchers and graduate students who need a deeper understanding of functions arising in probability and statistics than that provided by numerical techniques.

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## Copula Theory and Its Applications

Piotr Jaworski, Fabrizio Durante, Wolfgang Härdle, Tomasz Rychlik (Editors)  
Springer, 2010, xviii + 327 pages, €79,95/£72.00/\$89.95, softcover  
ISBN: 978-3-642-12464-8

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#### Part I. Surveys

1. Copula theory: an introduction (*Fabrizio Durante, Carlo Sempì*)
2. Dynamic modelling of dependence in finance via copulae between stochastic processes (*Tomasz R. Bielecki, Jacek Jakubowski, Mariusz Niewęglowski*)
3. Copula estimation (*Barbara Choroś, Rustam Ibragimov, Elena Permiakova*)
4. Pair-copula constructions of multivariate copulas (*Claudia Czado*)
5. Risk aggregation (*Paul Embrechts, Giovanni Puccetti*)
6. Extreme-value copulas (*Gordon Gudendorf, Johan Segers*)
7. Construction and sampling of nested Archimedean copulas (*Marius Hofert*)
8. Tail behaviour of copulas (*Piotr Jaworski*)
9. Copulae in reliability theory (order statistics, coherent systems) (*Tomasz Rychlik*)
10. Copula-based measures of multivariate association (*Friedrich Schmid, Rafael Schmidt, Thomas Blumentritt, Sandra Gaißer, Martin Ruppert*)
11. Semi-copulas and interpretations of coincidences between stochastic dependence and ageing (*Fabio Spizzichino*)

#### Part II. Contributed Papers

12. A copula-based model for spatial and temporal dependence of equity markets (*Umberto Cherubini, Fabio Gobbi, Sabrina Mulinacci, Silvia Romagnoli*)
13. Non-parametric and semiparametric bivariate modelling of petrophysical porosity-permeability dependence from well log data (*Arturo Erdely, Martin Diaz-Viera*)
14. Testing under the extended Koziol-Green model (*Auguste Gaddah, Roel Braekers*)
15. Parameter estimation and application of the multivariate skew *t*-copula (*Tõnu Kollo, Gaida Pettere*)
16. On analytical similarities of Archimedean and exchangeable Marshall-Olkin copulas (*Jan-Frederik Mai, Matthias Scherer*)
17. Relationships between Archimedean copulas and Morgenstern utility functions (*Jaap Spreeuw*)

*Readership:* Academic: researcher in applied mathematics, statistics and finance; industry: actuaries and financial professionals. Mathematical engineers may also find this book interesting.

This proceedings presents a collection of articles from applied as well as theoretical point of view from a rapidly developing field of copulas.

The book is divided into two parts: “Surveys” and “Contributions”. “Surveys” provide an up-to-date account of copula models and “Contributions” provide new results. Both parts include theoretical and applied papers.

A full range of different copulas and methods is described. Since the estimation and the time-dependence pose challenges for copulas, I found the topics “dynamic copula modelling” and “copula estimation” especially advantageous. An overview of how statistics can be used in financial applications is presented. Technical applications include reliability theory and petrophysics.

The book assumes advanced knowledge in probability and statistics. It can be used for self-study or as reference material.

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## Dependence in Probability and Statistics

Paul Doukhan, Gabriel Lang, Donatas Surgailis, Gilles Teyssière (Editors)  
Springer, 2010, xv + 205 pages, €59,95/£53.99/\$69.95, softcover  
ISBN: 978-3-642-14103-4

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1. Permutation and bootstrap statistics under infinite variance (*István Berkes, Lajos Horváth, Johannes Schauer*)
2. Max-stable processes: representations, ergodic properties, and statistical applications (*Stilian A. Stoev*)
3. Best attainable rates of convergence for the estimation of the memory parameter (*Philippe Soulier*)
4. Harmonic analysis tools for statistical inference in the spectral domain (*Florin Avram, Nikolai Leonenko, Ludmila Sakhno*)
5. On the impact of the number of vanishing moments on the dependence structures of compound Poisson motion and fractional Brownian motion in multifractal time (*Béatrice Vedel, Herwig Wendt, Patrice Abry, Stéphane Jaffard*)
6. Multifractal scenarios for products of geometric Ornstein-Uhlenbeck type processes (*Võ V. Anh, Nikolai N. Leonenko, Narn-Rueih Shieh*)
7. A new look at measuring dependence (*Wei Biao Wu, Jan Mielniczuk*)
8. Robust regression with infinite moving average errors (*Patrick J. Farrell, Mohamedou Ould-Haye*)
9. A note on the monitoring of changes in linear models with dependent errors (*Alexander Schmitz, Josef G. Steinebach*)
10. Testing for homogeneity of variance in the wavelet domain (*Olaf Kouamo, Eric Moulines, Francois Roueff*)

*Readership:* Researchers in stochastic processes, statistics and mathematical economics.

The prerequisite is strong mathematical background.

This mathematically advanced book contains several recent works on the general theme of dependence for several classes of stochastic processes, and its implications on asymptotic properties of various statistics and statistical inference issues. Studied stochastic processes include weakly dependent, long-memory and multi-fractal processes. Statistical topics range from bootstrap to spectral estimation.

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## Statistical Tools for Finance and Insurance, Second Edition

Pavel Čížek, Wolfgang Karl Härdle, Rafał Weron (Editors)  
Springer, 2011, iv + 420 pages, €109,95/£99.00/\$149.00, softcover  
ISBN: 978-3-642-18061-3

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#### Part I. Finance

1. Models for heavy-tailed asset returns (*Szymon Borak, Adam Misiorek, Rafał Weron*)
2. Expected shortfall (*Simon A. Broda, Marc S. Paoletta*)
3. Modelling conditional heteroscedasticity in non-stationary series (*Pavel Čížek*)
4. FX smile in the Heston model (*Agnieszka Janek, Tino Kluge, Rafał Weron, Uwe Wystup*)
5. Pricing of Asian temperature risk (*Fred Espen Benth, Wolfgang Karl Härdle, Brenda Lopez Cabrera*)
6. Variance swaps (*Wolfgang Karl Härdle, Elena Silyakova*)
7. Learning machines supporting bankruptcy prediction (*Wolfgang Karl Härdle, Linda Hoffmann, Rouslan Moro*)
8. Distance matrix method for network structure analysis (*Janusz Miskiewicz*)

## Part II. Insurance

9. Building loss models (*Krzysztof Burnecki, Joanna Janczura, Rafał Weron*)
10. Ruin probability in finite time (*Krzysztof Burnecki, Marek Teuwerle*)
11. Property and casualty insurance pricing with GLMs (*Jan Iwanik*)
12. Pricing of catastrophe bonds (*Krzysztof Burnecki, Grzegorz Kukla, David Taylor*)
13. Return distributions of equity-linked retirement plans (*Nils Detering, Andreas Weber, Uwe Wystup*)

*Readership:* Graduate students, researchers and practitioners in finance and insurance.

This timely book is not merely an update of an earlier version but several chapters are dropped or thoroughly revised and new material is added.

The comprehensive book presents theoretical developments and method construction for many important practical problems in quantitative finance and insurance. It covers carefully chosen topics such as heavy tailed distributions, pricing of CAT bonds, simulation of risk processes and ruin probability approximation. The book contains new chapters on adaptive heteroscedastic time series modelling and the equity linked retirement plans.

This book brings together a wide range of statistical methods relating to finance and insurance. Additionally, the book provides the tools and algorithms for recent techniques in quantitative finance and insurance. The design of the text links theory and computational tools. The majority of chapters have quantlet codes in Matlab or R.

This book is full of interest for practitioners and academics in finance and insurance.

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## R Graphics, Second Edition

Paul Murrell

Chapman & Hall/CRC, 2011, xxvii + 518 pages, £49.99/\$79.95, hardcover

ISBN: 978-1-4398317-6-2

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| 5. The grammar of graphics: the ggplot2 package  | 15. Node-and-edge graphs             |
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| 7. The grid graphics object model                | 17. Dynamic and interactive graphics |
| 8. Developing new graphics functions and objects | 18. Importing graphics               |
| Part III. The Graphics Engine                    | 19. Combining graphics systems       |
| 9. Graphics formats                              |                                      |

*Readership:* Anyone doing serious work with graphics in R.

This is a timely revision for a well-liked book. The main changes include updated information on the core graphics engine, a chapter on *ggplot2*, a new section with short chapters on graphics extension packages such as maps and interactive graphics, and the removal of introductory material on R itself, which, as the author implies, can readily be found in many other places. The book's aims remain purely technical, it offers no recommendations on which plot to use

in any situation. Once analysts have decided what graphic they want to draw, whatever it is, however wonderful (or awful) it might look, this book is the place to go for advice on how to draw that graphic. This means that the book is not the place to go for examples of elegant or informative graphics. For those of a sensitive disposition I would suggest avoiding Figure 13.8, which apparently shows a three-dimensional mosaic plot. Up to this point in the book I had agreed with Paul Murrell's statement in his Preface that "no plot type is all bad."

The strengths of the book remain the clear exposition of the traditional and grid graphics systems and the numerous examples (for which the code is, of course, available on the book's website). The new coverage of many other graphics packages adds to the book's attractiveness and in particular the chapter on *ggplot2* is an excellent introduction to a complex package. The book is not in colour and there is little about colour in the book. Paul Murrell has published a valuable article on colour with Achim Zeileis and Kurt Hornik, "Escaping RGBland," which is listed in the references, but I could not find where it was referred to. The index was little help in that search and in general I found the index disappointing. That is a minor gripe about a very good book, which will be of use to anyone working seriously with graphics in R. Just do not expect advice on which graphics to draw.

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### **An Introduction to Applied Multivariate Analysis with R**

Brian Everitt, Torsten Hothorn

Springer, 2011, xiv + 273 pages, €49.95/£39.95/\$59.95, softcover

ISBN: 978-1-4419-9649-7

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| 2. Looking at multivariate data: visualization | 7. Confirmatory factor analysis and structural equation models |
| 3. Principal components analysis               |  |
| 4. Multidimensional scaling                    | 8. The analysis of repeated measures data                      |
| 5. Exploratory factor analysis                 |  |

*Readership:* Students seeking a first introduction to multivariate analysis.

This book gives a nice, light overview of classical multivariate methods with examples worked through in R. It offers neither full statistical background of the methods nor a detailed explanation of the software. There is a place for this kind of book, giving readers an idea of what a subject is like without requiring them to study it in depth. The examples used are mainly old ones and involve just small data sets. This is useful for illustrating the ideas, though readers will have to look elsewhere for larger data sets, which better reveal the power of the methods and the software. It is an old-fashioned curiosity of the book that many data sets are printed in full. The data tables are never referred to and the data sets are probably all available in R, so the reasons for doing this are unclear.

The authors emphasize the importance of graphics in their introduction, in their first chapter and through the book. They have a second chapter, which is devoted entirely to visualization for looking at multivariate data. This makes it all the more surprising that the graphics in the book are disappointing, strangely uninformative, and not always easy to read (particularly the scatterplot matrices). In a few cases the authors' interpretation of their own graphics is also

rather lax. Perhaps this is a subtle educational approach, encouraging readers to be on their guard and pay close attention, as they cannot be sure that everything is done quite right. It is like using software that you have not worked with before, perhaps even an R package, where you have to tread carefully to ensure that results calculated are actually correct.

This book can be recommended as teaching support for two reasons. It provides a gentle introduction to multivariate methods and it offers many examples of graphical displays, which can be discussed, criticized, and improved.

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### Bayesian Modelling in Bioinformatics

Dipak K. Dey, Samiran Ghosh, Bani K. Mallick (Editors)

Chapman & Hall/CRC, 2011, xxv + 440 pages, £59.99/\$89.95, hardcover

ISBN: 978-1-4200-7017-0

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| <ol style="list-style-type: none"> <li>1. Estimation and testing in time-course microarray experiments (<i>C. Angelini, D. De Canditiis, M. Pensky</i>)</li> <li>2. Classification for differential gene expression using Bayesian hierarchical models (<i>Natalia Bochkina, Alex Lewin</i>)</li> <li>3. Applications of the mode oriented stochastic search (MOSS) algorithm for discrete multi-way data to genomewide studies (<i>Adrian Dobra, Laurent Briollais, Hamdi Jarjanazi, Hilmi Ozcelik, Hélène Massam</i>)</li> <li>4. Non-parametric Bayesian bioinformatics (<i>David B. Dunson</i>)</li> <li>5. Measurement error and survival model for cDNA microarrays (<i>Jonathan A. L. Gelfond, Joseph G. Ibrahim</i>)</li> <li>6. Bayesian robust inference for differential gene expression (<i>Raphael Gottardo</i>)</li> <li>7. Bayesian hidden Markov modelling of array CGH data (<i>Subharub Guha</i>)</li> <li>8. Bayesian approaches to phylogenetic analysis (<i>Mark T. Holder, Jeet Sukumaran, Rafe M. Brown</i>)</li> <li>9. Gene selection for the identification of biomarkers in high-throughput data</li> </ol> | <ol style="list-style-type: none"> <li>(<i>Jaesik Jeong, Marina Vannucci, Kim-Ahn Do, Bradley Broom, Sinae Kim, Naijun Sha, Mahlet Tadesse, Kai Yan, Lajos Pusztai</i>)</li> <li>10. Sparsity priors for protein–protein interaction predictions (<i>Inyoung Kim, Yin Liu, Hongyu Zhao</i>)</li> <li>11. Learning Bayesian networks for gene expression data (<i>Faming Liang</i>)</li> <li>12. In-vitro to in-vivo factor profiling in expression genomics (<i>Joseph E. Lucas, Carlos M. Carvalho, Daniel Merl, Mike West</i>)</li> <li>13. Proportional hazards regression using Bayesian kernel machines (<i>Arnab Maity, Bani K. Mallick</i>)</li> <li>14. A Bayesian mixture model for protein biomarker discovery (<i>Peter Müller, Keith Baggerly, Kim Ahn Do, Raj Bandyopadhyay</i>)</li> <li>15. Bayesian methods for detecting differentially expressed genes (<i>Fang Yu, Ming-Hui Chen, Lynn Kuo</i>)</li> <li>16. Bayes and empirical Bayes methods for spotted microarray data analysis (<i>Dabao Zhang</i>)</li> <li>17. Bayesian classification method for QTL mapping (<i>Min Zhang</i>)</li> </ol> |
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*Readership:* The book is suitable for a seminar course for Bayesian statisticians interested in Bioinformatics. The book has 17 articles, each with good coverage.

The book under review has seventeen articles, most of which model and analyze microarray data, and a few take up other major problems in Bioinformatics, namely, protein–protein interaction (Kim *et al.*), protein biomarkers (Müller *et al.*), and phylogenetics (Holder *et al.*). All the papers are well written, providing a good entry into the subject matter issues as well as Bayesian issues like choice of likelihood and prior.

The biggest strength of the book is the variety of problems that can be addressed through microarray experiments. I have always thought of the latter as either providing static data on

differential expression (DE) or lack of expression, or a dynamic data, providing a short time series for DE of each gene for time course microarray experiments. How wrong I was! I provide a brief overview of the variety of problems discussed by different authors.

In article #12, Lucas *et al.* discuss very basic issues on the kind of gene expression one is analyzing. The data can be clean and simple with basically a single intervention or based on samples derived from living tissues of living subjects. One then studies the famous “shotgun” method.

In article #13, Maity and Mallick study the relation between the first type of data and hazard rate for a given disease. Among the statistical innovations is the use of Gaussian process priors and covariate selection using reproducing kernel Hilbert spaces (RKHS) . . . all explained clearly, made ready for application, and shown in action for a real data.

For a Bayesian reader, a good starting point is article #15 by Yu *et al.* It makes clear the standard Bayesian analysis for the so-called static case. For the dynamic case, with time series data, article #1 by Angelini *et al.* is a good place to begin. Two other papers in the same direction are #16 by D. Zhang and #17 by M. Zhang.

Much of the microarray data are about cancers and tumors. Article #7 by Guha provides a very readable introduction to cancer biology. Some other interesting papers on microarray data are #5 by Gelfond *et al.* on the measurement error, a very important but almost always neglected issue, and #4 by Dunson, which provides a very informative survey on the recent applications of Bayesian Non-parametrics (especially mixtures with Dirichlet process as mixing distribution) to cluster analysis in Bioinformatics. This can also be a very powerful technique for variable selection.

Overall this is a remarkable survey of different types of microarray data and analysis of such data.

I have a humble suggestion to the editors. Any collection like this, which is the result of lot of work, would be even more useful if it comes with some editorial advice on where to begin and in what order to read. The arrangement of the papers seems somewhat haphazard.

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West Lafayette, IN 47909, USA

## **IBM SPSS Statistics 19 Made Simple**

Colin D. Gray, Paul R. Kinnear

Psychology Press, 2012, xiv + 671 pages, £20.95/\$39.99, softcover

ISBN: 978-1-84872-069-5

### *Table of Contents*

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| 1. Introduction  | 9. Within subjects experiments                          |
| 2. Getting Started with IBM SPSS Statistics 19         | 10. Mixed factorial experiments                         |
| 3. Editing data sets                                   | 11. Measuring statistical association                   |
| 4. Describing and exploring your data                  | 12. Regression  |
| 5. More on graphs and charts                           | 13. The analysis of covariance (ANCOVA)                 |
| 6. Comparing averages: two-sample and one-sample tests | 14. Analyses of multiway frequency tables               |
| 7. The one-way ANOVA                                   | 15. Predicting category membership: logistic regression |
| 8. Between subjects factorial experiments              | 16. The search for latent variables: factor analysis    |

*Readership:* Students and researchers on or considering courses using SPSS.

This new release book, which is an update on the author's previous books of this genre, is written for any student, lecturer or researcher who wishes to do some statistical analysis with SPSS. No previous knowledge of SPSS is assumed and the authors have incorporated annotated snapshots of dialog boxes and output to aid the reader and to clarify the text. The text contains practical instructions on using SPSS, advice on the selection of appropriate statistical tests with an informal explanation of the rationale of each technique, the assumptions of the statistical model underlying each statistical test are described and where necessary advice on how to proceed should the readers data fail to meet the model's requirements. There is also help with the interpretation of the SPSS output and suggested further reading. The book also has an accompanying website see <http://www.psypress.com/spss-made-simple>, which contains data sets to use with the relevant chapters. For lecturers/instructors who adopt this text there are power point slides and multi-choice questions provided free of charge.

This book is not a comprehensive account of SPSS nor is it a statistical text but is a useful guide to help the reader to use SPSS and to analyze their own data.

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 Caxton House, Borough Road, London SE1 0AA, UK

### **Quantitative Data Analysis with IBM SPSS 17, 18 & 19: A Guide for Social Scientists**

Alan Bryman, Duncan Cramer

Routledge, 2011, xxv + 377 pages, £25.99/\$47.99, softcover (also available as hardcover)

ISBN: 978-0-415-57919-3

#### *Table of Contents*

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| <ol style="list-style-type: none"> <li>1. Data analysis and the research process</li> <li>2. Analyzing data with computers: first steps with SPSS 17, 18, and 19</li> <li>3. Analyzing data with computers: further steps with SPSS 17, 18, and 19</li> <li>4. Concepts and their measurement</li> <li>5. Summarizing data</li> <li>6. Sampling and statistical significance</li> <li>7. Bivariate analysis: exploring differences between two variables</li> </ol> | <ol style="list-style-type: none"> <li>8. Bivariate analysis: exploring relationships between two variables</li> <li>9. Multivariate analysis: exploring differences among three or more variables</li> <li>10. Multivariate analysis: exploring relationships among three or more variables</li> <li>11. Aggregating variables: exploratory factor analysis</li> </ol> |
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*Readership:* Students, lecturers, and researchers using SPSS in the areas of psychology and sociology.

This book is aimed at using helping readers to use SPSS for statistical analysis. The text introduces readers to the main statistical techniques used by psychologists and sociologists. However, the useful step-by-step guide could be used for students involved in other areas who wish to use SPSS. No previous knowledge of SPSS, statistics, or computing is assumed and key issues such as sampling, statistical inference, conceptualization, and measurement and selection of appropriate tests is included. What is particularly useful are the answers to the questions included at the end of each chapter. The book also has an accompanying website see <http://www.psypress.com/brymancramer>, which contains data sets to use with the relevant chapters. For lecturers/instructors who adopt this text there are power point slides and multichoice questions provided free of charge.

This book incorporates the wealth of experience gained by the authors and takes the students from the beginning of data analysis and leads them through their analysis with plenty of explanations on the way.

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### **Statistical Analysis of Clinical Data on a Pocket Calculator: Statistics on a Pocket Calculator**

Ton J. Cleophas, Aeilko H. Zwinderman  
 Springer, 2011, viii + 58 pages, £35.99/€39.95/\$59.95, hardcover  
 ISBN: 978-94-007-1210-2

#### *Table of Contents*

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| 1. Introduction                      | 12. Odds ratio  |
| 2. Standard deviations               | 13. Log likelihood ratio tests  |
| 3. t-Tests                           | 14. McNema's tests  |
| 4. Non-parametric tests              | 15. Bonferroni t-test   |
| 5. Confidence intervals              | 16. Variability analysis  |
| 6. Equivalence tests                 | 17. Confounding   |
| 7. Power equations                   | 18. Interaction   |
| 8. Sample size                       | 19. Duplicate standard deviation for reliability<br>assessment of continuous data |
| 9. Non-inferiority testing           | 20. Kappas for reliability assessment for binary data                             |
| 10. Z-test for cross-tabs            | 21. Final remarks   |
| 11. Chi-squared tests for cross-tabs |   |

*Readership:* Students, researchers, and teachers involved with Clinical data analysis.

The authors have used their experience as masters' and doctorate class teachers of the European College of Pharmaceutical Medicine (EC Socrates Project) in putting this text together. They have found, from their experience, that performing statistical analysis on a calculator to be a useful aid for the students learning and that statistical results can be obtained much quicker than using a statistical software package.

For a short book it has a considerable number of chapters, each one being very brief. This is not a comprehensive statistical book and the reader needs to know when and why they use the relevant statistical techniques. There are a very small number of exercises for the reader to test their understanding and in some chapters there are no exercises at all. This book seems to be aimed at a niche market and does not have a great deal of explanation on the statistical techniques employed. If a student knows what they are doing, statistically speaking, then it is a good quick guide.

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### **Biostatistics: A Computing Approach**

Stewart Anderson  
 Chapman & Hall/CRC, 2012, xx + 306 pages, £39.99/\$79.95, hardcover  
 ISBN: 978-1-58488-834-5

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| 1. Review of topics in probability and statistics | 8. Analysis of repeated measures data  |
| 2. Use of simulation techniques                   | 9. Non-parametric methods              |
| 3. The central limit theorem                      | 10. Analysis of time to event data     |
| 4. Correlation and regression                     | 11. Sample size and power calculations |
| 5. Analysis of variance                           | Appendix A: Using SAS                  |
| 6. Discrete measures of risk                      | Appendix B: Using R                    |
| 7. Multivariate analysis                          |  |

*Readership:* Students who have an interest in the application of statistical methods but do not necessarily intend to become statisticians.

This textbook is based on a course that the author has given for a number of years and so it is probably a good buy for anyone taking the course. Whether it is such a good buy for other potential readers is another matter. Despite the claims of the book's blurb, it does not focus "on visualization and computational approaches associated with modern and classical techniques." The graphics included are disappointing and often badly reproduced, and there are hardly any displays of data. Few modern techniques are covered, and those that are, are covered only briefly. Quite why ANCOVA gets a short section of its own while linear models are not discussed is a puzzle. The book has the flavor of an updated set of lectures, where some sections have been updated better than others. Including in the first chapter a "Standard Normal Table" of three pages squashed into less than one and a half pages (though still spread over three) is surely the printer's fault! But why bother with the table in the first place? A major advantage of modern computational support for statistics is that such tables are no longer needed. Both SAS and R are used throughout (although Minitab is used in at least one example for no particular reason), and there are also plenty of manual calculations given in full. This means there is less space for explanation of concepts and several important topics are only mentioned in passing. Surprisingly there are technical slips. Ones I noticed were: Cochran's criterion for using a chi-square test of a  $2 \times 2$  table is misstated; the expected value integral of the Cauchy distribution is not infinite, it is undefined; in the regression section the term confidence intervals is always used, even when a prediction interval is calculated.

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**Principles of Applied Statistics**

D. R. Cox, Christl A. Donnelly

Cambridge University Press, 2011, vii + 202 pages, £55.00/\$95.00, hardcover (also available as softcover)

ISBN: 978-1-107-01359-9

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| 1. Some general concepts     | 6. Model formulation              |
| 2. Design of studies         | 7. Model choice                   |
| 3. Special types of study    | 8. Techniques of formal inference |
| 4. Principles of measurement | 9. Interpretation                 |
| 5. Preliminary analysis      | 10. Epilogue                      |

*Readership:* Applied statisticians, subject-matter specialists using statistical ideas, postgraduate students of statistics concerned with the relationship between the theory and methods they are learning and the effective application of the ideas.

Some years ago, I started making notes for a book with the working title “*The Theory of Applied Statistics*.” The intention was to help readers understand the practical application of the tools, which they may have learnt about in the abstract, to convey the notion that life, and data, was always more complicated than the simple expositions of techniques they’d received, and to try to accelerate the acquisition of the practical ability to extract meaningful information from data. Other things intruded, and I did not get very far with that book. And now I need not write it at all. Cox and Donnelly have done it for me. And far better than I could have done.

The first chapter of the book presents an overview of the issues to be covered, while subsequent chapters focus on particular aspects, such as data collection, model formulation, interpretation, and so on. This gives a rather different flavor to the first and subsequent chapters. The range of material covered by the later chapters is quite extraordinary, especially given that it is packed into just 200 pages.

The book is full of gems, clearly distilled from a lifetime of interacting with real data and developing methods for squeezing useful understanding from it. Such things as (p. 3) “a large amount of data is in no way synonymous with a large amount of information,” something that not all researchers always appreciate (a hundred measurements on one person is not equivalent to one measurement on a hundred people); (p. 6) “it may be a crucial part of the analysis to clarify the research objectives,” a point I particularly liked, having spent far too much time trying to work out what it was researchers actually wanted to know; (p. 9) “analyses should be as simple as possible, but no simpler,” something which academic statistical consultants can sometimes forget; (p. 97) “models can be classified in many ways, of which probably the most important is by the extent to which they are either *substantive* or *purely empirical*”; (p. 110) “unless there is a good reason otherwise, models should obey natural or known constraints even if these lie outside the range of the data”; and so on.

While reading the book, I was uncomfortably reminded, time and time again, of how long it had taken me to grasp some of these important truths of statistical practice: of how large is the step from a grasp of the mechanics of a statistical tool to the ability to use it effectively in real work. However, since the truths often appear as almost throwaway lines in the book, it did occur to me to wonder to what extent an inexperienced reader might fail to grasp their importance. My point is that, while I think a new statistician will learn a great deal from reading this book in isolation, considerably more could be extracted if the reading was guided—so that apparently casual remarks which in fact had great content could be metaphorically highlighted. In short, I think the book would form an excellent basis for a reading group—say for statistics MSc students—guided by an experienced applied statistician. I believe this would help the students to notice and grasp the important messages in its pages, and indeed would accelerate their ability to analyze data effectively.

It probably goes without saying that that the book is largely non-mathematical, given that its aim is to discuss principles of statistical practice. But the authors do assume that the reader is familiar with how statistical models are built, and thus illustrate their discussion using mathematical expressions. Again, I think this means that guidance from an experienced mentor, when reading the book, would substantially enhance its value. The points made in the text are liberally illustrated with real examples gleaned from the authors’ own experience of tackling real problems, typically separated out from the text as boxes.

Overall this book provides very clear coverage of the non-technical aspects of statistical practice: a superb outline of the meta-level issues of actually analyzing data and answering

statistical questions. It would provide an ideal complement to the more traditional courses to which statistics students are exposed.

And—I cannot resist—should anyone still require convincing, it demonstrates perfectly that statistics is not merely a branch of mathematics.

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### **A Primer on Experiments with Mixtures**

John A. Cornell

Wiley, 2011, xii + 351 pages, £73.50/€88.20/\$110.00, hardcover

ISBN: 978-0-470-64338-9

#### *Table of Contents*

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| 1. Introduction   | 4. The analysis of mixture data                              |
| 2. The original mixture problem: designs and models for exploring the entire simplex factor space | 5. Other mixture model forms                                 |
| 3. Multiple constraints on the component proportions  | 6. The inclusion of process variables in mixture experiments |
|   | 7. A review of least squares and the analysis of variance    |

*Readership:* Researchers who perform experiments on mixtures and statisticians advising on such experiments. More generally, all who work or teach in the area of experimental design.

This is essentially a fourth edition of the classic John Cornell writings on experimental design and analysis for mixtures ingredients. The second edition was a major revision and the third a minor revision. This new book is a reduced-length, fully updated re-writing of the third edition; chapters 1, 2, 4, 5, 6, 7, and 9 have been rewritten and recast to form chapters 1–7 of this new offering. The title contains the word “Primer”. This indicates a book positioned to offer a gentler introduction to the material, along with a thorough updating. As the author writes in his preface, the idea is “to try and lower the degree of difficulty in understanding the principles behind experimenting with mixtures by offering a book without all the unnecessary formulas that might have previously appeared in journal articles or dissertations.” This idea is entirely successful and the exposition is excellent, as we have come to expect. Recommended!

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 1300 University Avenue, Madison, WI 53706–1532, USA

### **Statistical Modeling of the National Assessment of Educational Progress**

Murray Aitkin, Irit Aitkin

Springer, 2011, xii + 161 pages, £53.99/€59.95/\$69.95, hardcover

ISBN: 978-1-4419-9936-8

#### *Table of Contents*

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| 1. Theories of data analysis and statistical inference | studies                            |
| 2. The current design and analysis                     | 5. 1986 NAEP math survey           |
| 3. Psychometric and survey models                      | 6. Analysis of all 1986 math items |
| 4. Technical reports—data analyses and simulation      | 7. 2005 NAEP math survey—Texas     |

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| <ul style="list-style-type: none"> <li>8. 2005 NAEP math survey—California</li> <li>9. Conclusions</li> <li>A. 1986 survey results, 30 item subscale</li> <li>B. 1986 survey results, full 79 items</li> </ul> | <ul style="list-style-type: none"> <li>C. Model parameter estimates and SEs, 2005 Texas survey</li> <li>D. Model parameter estimates and SEs, 2005 California survey</li> </ul> |
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*Readership:* Researchers interested in the analysis and reporting of large-scale surveys.

This book is a description of research and data analysis carried out by the authors on the National Assessment of Educational Progress (NEAP) data carried out for the National Centre for Educational Studies. The purpose of their work was to evaluate a new approach to the analysis and reporting of the large-scale survey data collected for the NEAP. The new approach is based on multilevel statistical and psychometric model for the students' responses to the test items.

The authors describe the data in detail, the models they have employed to analyze this data and the subsequent results obtained. The chapters contain discussions, conclusions, resolutions, and summaries where appropriate and leave the reader with much food for thought. Two main years, that is 1986 and 2005, are looked at in more detail.

This book is of interest to those in the field of education who are interested in the statistical analysis of student responses to educational test items.

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### **Modern Statistics for the Social and Behavioral Sciences: A Practical Introduction**

Rand Wilcox

Chapman & Hall/CRC, 2012, xx + 840 pages, £49.99/\$89.95, hardcover

ISBN: 978-1-4398-3456-5

#### *Table of Contents*

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| <ul style="list-style-type: none"> <li>1. Introduction</li> <li>2. Numerical and graphical summaries of data</li> <li>3. Probability and related concepts</li> <li>4. Sampling distributions and confidence intervals</li> <li>5. Hypothesis testing</li> <li>6. Regression and correlation</li> <li>7. Bootstrap methods</li> <li>8. Comparing two independent groups</li> <li>9. Comparing two dependent groups</li> <li>10. One-way ANOVA</li> </ul> | <ul style="list-style-type: none"> <li>11. Two-way and three-way designs</li> <li>12. Comparing more than two dependent groups</li> <li>13. Multiple comparisons</li> <li>14. Some multivariate methods</li> <li>15. Robust regression and measures of association</li> <li>16. Basic methods for analyzing categorical data</li> <li>Appendix A. Answers to selected exercises</li> <li>Appendix B. Tables</li> <li>Appendix C. Basic matrix algebra</li> <li>Appendix D. References</li> </ul> |
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*Readership:* Postgraduate students in the social sciences.

This book is designed for a two semester, introductory course for graduate students in the social sciences. The text describes and illustrates statistical techniques that have been developed over the last half-century that deals with known problems associated with classical techniques. Relative advantages/disadvantages of various techniques are presented so that the reader can be helped to understand the choices they make on using the techniques. A wide range of topics is covered in this lengthy text as can be seen from the table of contents above. A considerable number of illustrations are included and the book focuses on using R for its computer software application. Chapter 1 introduces R and the book contains 900 R functions. Each chapter starts with a general introduction and leads the reader gently through the use of R to perform

the relevant statistical calculations. The appendix contains the relevant statistical tables and a comprehensive reference list. Sadly there are only answers to selected questions but plenty for the reader to check their understanding.

A useful text for the audience specified, that is postgraduate students in the social science disciplines.

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### **Mathematical and Statistical Methods for Actuarial Sciences and Finance**

Cira Perna, Marilena Sibillo (Editors)

Springer, 2012, xii + 408 pages, £99.00/€109.95/\$149.00, hardcover

ISBN: 978-88-470-2341-3

#### *Table of Contents*

Collection of 49 papers presented at the MAF 2010 Conference (see [www.springerlink.com/content/978-88-470-2342-0](http://www.springerlink.com/content/978-88-470-2342-0)).

*Readership:* Mathematicians and statisticians in insurance and finance.

The MAF 2010 Conference, organized by the University of Salerno in Ravello, Italy, was developed on the basis of cooperation between mathematicians and statisticians working in the insurance and finance fields. The papers are drawn from this conference and give a flavor of the research and real life applications of statistical and mathematical models used in the actuarial and financial sciences. The interdisciplinary approach aims to aid research further into the areas of finance and insurance and this is a difficult text for the novice to be able to follow, however for those researching this area it is a useful text to read.

The book is of interest to specialists in the field and is more like a journal. The papers cover a wide range of applications and considerable knowledge of mathematics and statistics as well as insurance and finance is needed to appreciate and fully understand the contents.

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### **The Foundations of Modern Time Series Analysis**

Terence C. Mills

Palgrave Macmillan, 2011, xiv + 461 pages, \$110.00, hardcover

ISBN: 978-0-230-29018-1

#### *Table of Contents*

1. Prolegomenon: a personal perspective and an explanation of the structure of the book
2. Yule and Hooker and the concepts of correlation and trend
3. Schuster, Beveridge, and periodogram analysis
4. Detrending and the variate difference method: Student, Pearson and their critics
5. Non-sense correlations, random shocks, and induced cycles: Yule, Slutsky, and Working
6. Periodicities in sunspots and air pressure: Yule, Walker and the modelling of superposed fluctuations and disturbances
7. The formal modelling of stationary time series: Wold and the Russians
8. Generalizations and extensions of stationary autoregressive models: from Kendall to Box and Jenkins
9. Statistical inference, estimation and model building for stationary time series

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| 10. Dealing with non-stationarity: detrending, smoothing, and differencing<br>11. Forecasting non-stationary time series<br>12. Modelling dynamic relationships between time series | 13. Spectral analysis of time series: the periodogram revisited and reclaimed<br>14. Tackling seasonal patterns in time series<br>15. Emerging themes<br>16. The scene is set |
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*Readership:* Researchers and postgraduate students in times series and econometrics. Historians of statistics.

This is not a standard textbook on time series analysis, although a reader working their way through it would emerge with an excellent understanding of the area. Instead it shows how modern time series analysis developed, tracking progress from the ideas of Galton, Pearson, and others about correlation in the last decade of the nineteenth century, to the appearance of the Box and Jenkins classic *Time Series Analysis* in 1970—although there is then a final chapter which looks at the major subsequent advances.

Apart from the substantive and detailed description of the statistical development, it is full of fascinating gems—such as what must surely be one of the shortest abstracts for a paper ever published: the abstract to Alfred Cowles III paper “Can stock market forecasters forecast?” which read simply “It is doubtful.”

The final paragraph of the book begins “Where does the subject go from here?” and Mills notes that, while some may doubt that the tremendous theoretical advances have enhanced the quality of applied research, advanced time series methods are being used in an increasingly wide range of application areas. He notes in particular meteorology and climatology, but he could have added neurology and astrophysics.

This is a valuable book for anyone working in time series analysis, PhD students entering the area, or anyone who wishes to acquire an in-depth understanding of how we got to where we are now. If, like me, you enjoy seeing how statistical ideas have developed, then this book is for you.

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 London SW7 2AZ, UK

### **Optimal Design of Experiments: A Case Study Approach**

Peter Goos, Bradley Jones

Wiley, 2011, xiv + 287 pages, £60.00/€72.00/\$95.00, hardcover

ISBN: 978-0-470-74461-1

#### *Table of Contents*

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| 1. A simple comparative experiment<br>2. An optimal screening experiment<br>3. Adding runs to a screening experiment<br>4. A response surface design with a categorical factor<br>5. A response surface design in an irregularly shaped design region | 6. A “mixture” experiment with process variables<br>7. A response surface design in blocks<br>8. A screening experiment in blocks<br>9. Experimental design in the presence of covariate<br>10. A split-plot design<br>11. A two-way split-plot design |
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*Readership:* Researchers who perform experiments and statisticians advising on such experiments. More generally, all who work or teach in the area of experimental design.

When one first looks at this book, it appears to be the story of 11 actual consulting cases that the authors jointly undertook. Each study is presented as a real life one with full conversations

between the two author consultants and named experimenters. Actually, this is not real life, one finds. Although the examples are based on genuine problems, the detailed conversational presentation between the consultant authors and their imaginary clients is a construction. On the one hand, this is often statistically interesting and exciting; on the other hand, parts of it can be tedious. How many times can one read things like “Mark, looking at Brad” (p. 192) before wishing it were not there *this* time? When one reads a statistic book, one tends to go over the material again and again to understand the full detail. It is annoying to see detail that is not really relevant, but which must be read past yet again. Some people will love this book; some will not. If you can stomach the repetition of constructed stories with stage directions together with excellent advice, you will profit greatly from this slim volume. The actual statistical content is first class.

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### Regression for Categorical Data

Gerhard Tutz

Cambridge University Press, 2012, x + 561 pages, £55.00/\$90.00, hardcover

ISBN: 978-1-107-00965-3

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| 1. Introduction  | 12. The analysis of contingency tables: log-linear and graphical models  |
| 2. Binary regression: the logit model                          | 13. Multivariate response models   |
| 3. Generalized linear models                                   | 14. Semi- and non-parametric generalized regression                      |
| 4. Modelling of binary data                                    | 15. Prediction and classification  |
| 5. Alternative binary regression models                        | A. Distributions   |
| 6. Regularization and variable selection for parametric models | B. Some basic tools  |
| 7. Regression analysis of count data                           | C. Constrained estimation  |
| 8. Multinomial response models                                 | D. Kullback–Leibler distance and information-based criteria of model fit |
| 9. Ordinal response models                                     | E. Numerical integration and tools for random effects modelling          |
| 10. Semi- and non-parametric generalized regression            |  |
| 11. Tree-based methods   |  |

*Readership:* Statisticians and students of advanced statistics.

Tutz’s book is a comprehensive textbook on models with categorical response variables. It covers the theory and computation clearly and thoroughly and appears to be right up to date. The material is well structured and the writing style is good. I am glad to have a copy of the book and I am pleased to recommend it to others, though I have two reservations. There are many interesting real data sets used as examples in the book, yet the analysis of them is mostly brief and the complex models fitted are hardly discussed. A student who had mastered all of this book would know the theory well and be in an excellent position to develop it further, but I doubt if they would know how to apply it. There should be more information about the data sets (real data sets always have special features you need to understand to model them properly), and more discussion of the choice of variables and of the choice and comparison of models. It is puzzling, as presumably the author and his group in Munich have done all this work and could easily offer valuable advice to their readers. And it cannot be due to a page limit imposed by the publisher, as the book is already over 550 pages long. There is an accompanying R package for the book, *catdata*, containing most the data sets in the book that are not available

elsewhere and some vignettes. The vignettes are like the book, instead of describing how and why analyses are carried out, they just give the code and the resulting output. Strange. My second reservation is that graphics are used primarily to show results and rarely to show data. In a book emphasizing the analysis of categorical data, it is astonishing that mosaic plots are only mentioned on two pages, that they are defined overly restrictively, and that the two examples given are poor. But to reiterate, I recommend this book highly for its coverage of theory and computation.

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### **The Crossing of Heaven: Memoirs of a Mathematician**

Karl Gustafson

Springer, 2012, xvi + 176 pages, €39,95/£35.99/\$59.95, hardcover

ISBN: 978-3-642-22557-4

#### *Table of Contents*

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| 1. The Child in Iowa          | 9. Wives, Lovers, Friends  |
| 2. The Boy in Boulder         | 10. Close Calls            |
| 3. The Student in Poverty     | 11. Mathematics            |
| 4. Computers and Espionage    | 12. High Finance           |
| 5. First Publication          | 13. The Improbabilities    |
| 6. Into Academia              | 14. Realities              |
| 7. The World Opens            | 15. The Crossing of Heaven |
| 8. Personas and Personalities |                            |

*Readership:* General public with some background in mathematics and information technology, especially anyone interested in researchers' memoirs.

I received a review copy of Karl Gustafson's memoirs some months ago, but it took a while until I started reading the book. Then I was captivated. Gustafson has been involved in rock climbing, secret governmental projects, and so on, as told in his book *The Crossing of Heaven: Memoirs of a Mathematician*.

Gustafson is a story-teller of considerable skill, even though he belittles his capability to analyze his actions and motivations. But I felt the storytelling was extremely convincing, giving psychological motivation to the reasons why Gustafson grew up to be the way he is.

Gustafson tells of his modest family background and how as a student all the money had to be earned by himself, mostly with physical labor. Occasionally there were possibilities for free food and lodging, but the living conditions were really sparse.

When still a student, Gustafson got involved in a governmental project, in which early computers were used to analyze information collected by radar and satellite. Gustafson wrote software and operated computers, and all of this was highly classified.

Those who are interested in computing should note that Gustafson reveals, e.g., where the term cache memory comes from (cache belonged to the vocabulary of intelligence agencies). Gustafson was one of the first to explore the ideas of cache memory when more computational power was needed.

Also, it was delightful to read how Gustafson used four computers in parallel, making the paper tape run from one computer to the next one. Later this technique was known as pipelining. A lot of care was needed when programming the computers so that there were no breakages or jams in the pipeline.

Gustafson's work in computing was a bit of a sideline in his career, and would have remained secret—and the memoirs perhaps unwritten—if Gustafson had not learned that his work in computing had been declassified. In fact, it was a revelation how well the US government was able to analyze information collected by satellites, without the Soviets having a clue about this.

Gustafson has a wide background in mathematics, from pure to applied. An interesting anecdote related to John Nash, from whom Gustafson received a letter while making a research visit abroad. Something in an article written by Gustafson, maybe the postal number, initiated a strange flow of thoughts in Nash's mind, and he mailed these thoughts in a letter to Gustafson, without having later any recollection of the letter.

Rock climbing was important to Gustafson since 13 years old. He was first to climb several difficult rock faces, sometimes narrowly escaping serious injury. But rock climbing teaches concentration: "When one's life hangs in a delicate life and death balance somewhere on the rocks over Boulder, the mind is more naturally focused on footholds and handholds, how good the belay is, and what's the best next move. Mountain climbing, and especially rock climbing, has this Zen-like effect of cleaning and simplifying the mind."

Gustafson does not do rock climbing anymore, because of accidents: "I stopped rock climbing at age 50 after a dangerous pendulum off-route on a high peak exactly three weeks after my girlfriend had died on a climbing trip to Peru."

And finally, with Gustafson's own words, what the book is about: "[I]t is in the flavor of human interactions that our lives find their true meaning. You will find many in this book."

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Ministry of Education and Culture,  
P.O. Box 29, FI-00023 Government, Finland

## **Understanding The New Statistics: Effect Sizes, Confidence Intervals, and Meta-Analysis**

Geoff Cumming

Routledge, 2012, xiv + 519 pages, £29.95/\$49.95, softcover (also available as hardcover)

ISBN: 978-0-415-87968-2

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| <ol style="list-style-type: none"> <li>1. Introduction to the new statistics</li> <li>2. From null hypothesis significance testing to effect sizes</li> <li>3. Confidence intervals</li> <li>4. Confidence intervals, error bars, and p values</li> <li>5. Replication</li> <li>6. Two simple designs</li> <li>7. Meta-analysis 1: introduction and forest plots</li> <li>8. Meta-analysis 2: models</li> <li>9. Meta-analysis 3: large-scale analyses</li> <li>10. The non-central t distribution</li> </ol> | <ol style="list-style-type: none"> <li>11. Cohen's d</li> <li>12. Power</li> <li>13. Precision for planning</li> <li>14. Correlations, proportions, and further effect size measures</li> <li>15. More complex designs and the new statistics in practice               <ol style="list-style-type: none"> <li>A. Loading and using ESCI</li> <li>B. ESCI for the normal and t distributions, and values of z and t</li> <li>C. Guide to the ESCI modules and pages</li> </ol> </li> </ol> |
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*Readership:* Any researchers who use hypothesis testing, "including psychology, education, economics, management, sociology, criminology, and other behavioral and social sciences; medicine, nursing, and other health sciences; and biology and other biosciences."

The author is Emeritus Professor in the Department of Psychology at La Trobe University. That gives a context which explains his using the term "the new statistics" to describe the use of estimation and confidence intervals as an alternative to "null hypothesis significance testing."

Some might consider both strategies as exemplifying “old statistics,” and regard other areas or schools of statistics as “the new statistics,” but psychologists have a long history of being focused on identifying that an effect exists, and so making heavy use of hypothesis testing procedures. This book is the latest in a series of efforts, stretching back half a century, to try to change this practice in favor of point and interval estimates. A novelty is the emphasis on combining information from different studies using meta-analytic techniques.

One particularly interesting aspect of this book is that it presents research evidence “on how people understand—or misunderstand—particular statistical concepts.” This presentation of evidence makes it an interesting complement to the familiar subjective arguments rolled out by the protagonists of various schools of statistics about why they believe other schools’ perspectives are confused or difficult to grasp. It is also something, which statisticians, as leading protagonists of the evidence-based movement, should welcome. The author distinguishes between technical evidence and cognitive evidence, saying about the latter that it “may be just as important if misconception is to be avoided, and readers are to understand results as well as possible.” One can hardly argue with that.

Overall it provides a clear description of the difficulties people have in interpreting  $p$ -values, as well as an accessible description of how to combine evidence from multiple studies using meta-analysis. It will be valuable to researchers in the behavioral and social sciences, who wish to move beyond the superficial level in the statistical interpretation of their results.

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### **Probability and Statistical Models: Foundations for Problems in Reliability and Financial Mathematics**

Arjun K. Gupta, Wei-Bin Zeng, Yanhong Wu

Birkhäuser, 2010, xii + 267 pages, €49.95/£44.99/\$59.95, hardcover

ISBN: 978-0-8176-4986-9

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| 1. Preliminaries                                 | 7. Association and dependence |
| 2. Exponential distribution                      | 8. Renewal theory             |
| 3. Poisson process                               | 9. Risk theory                |
| 4. Parametric families of lifetime distributions | 10. Asset pricing theory      |
| 5. Lifetime distribution classes                 | 11. Credit risk modelling     |
| 6. Multivariate lifetime distributions           |                               |

*Readership:* Students of Applied Probability, Finance, Actuarial Science at a Master’s level.

This is basically a book on two topics. The first topic (about two-thirds of the book) is on problems of reliability, i.e., on life-time distributions, starting with the exponential, and going all the way to IFR, DFR, and their extensions. The extensions include multivariate life distributions, association and dependence. There is a good treatment of Renewal Theory, both the basic stuff and several new approximations. Except for the basic renewal theorem of Blackwell, which is stated without proof, all other results are carefully proved.

The second half is on applications of probability theory to finance, covering risk theory, asset pricing, credit risk modelling, and hedging strategies. The famous Black–Scholes formula gets a heuristic treatment.

The first part is very well written, crisp, and clear. The second part seems a bit less clear. On the whole an interesting book on Applied Probability.

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 Department of Statistics, Purdue University,  
 West Lafayette, IN 47909, USA

### **Maximum Likelihood Estimation and Inference: With Examples in R, SAS, and ADMB**

Russell B. Millar

Wiley, 2011, 374 pages, €72.00/£60.00/\$110.00, hardcover

ISBN: 978-0-470-09482-2

#### *Table of Contents*

Part I. Preliminaries	equations
1. A taste of likelihood	9. ML inference in the presence of incidental parameters
2. Essential concepts and iid examples	10. Latent variable models
Part II. Pragmatics	Part III. Theoretical Foundations
3. Hypothesis tests and confidence intervals or regions	11. Cramér-Rao inequality and Fisher information
4. What you really need to know	12. Asymptotic theory and approximate normality
5. Maximizing the likelihood	13. Tools of the trade
6. Some widely used applications of maximum likelihood	14. Fundamental paradigms and principles of inference
7. Generalized linear models and extensions	15. Miscellaneous
8. Quasi-likelihood and generalized estimating	Appendix: Partial solutions to selected exercises

*Readership:* Applied scientists, researchers, graduate students, and particularly anyone who uses likelihood and such methods to their studies and applications.

The maximum likelihood methodology for statistical estimation and inference is well-established and widely used in many areas. This book offers a good account of ideas and results and reflects a practical taste. It starts with a preliminary introduction to likelihood modelling, and carries on with a number of pragmatic issues and theoretical results. The essential topics discussed include MLEs, likelihood ratio and Wald tests, the delta method, bootstrapping, prediction, EM algorithm, Cramér-Rao inequality, and Fisher information, consistency and asymptotic normality, among others. Several advanced topics and maximum likelihood variants are also covered, for example, latent variable models, quasi-likelihood and generalized estimating equations. Many chapters are supported by motivating and iid examples and displays of SAS, R, and ADMB codes. A range of applications were featured from statistics to medicine, biology, and ecology, among other disciplines. The last chapter, i.e., Chapter 15: Miscellaneous, includes a question to test if the reader thinks like a frequentist or a Bayesian, some useful distributions, software extras and remarks on automatic or algorithmic differentiation for MLE in ADMB. Partial solutions are given to some of the chapter-end exercises. There is the web site: <http://www.stat.auckland.ac.nz/~millar/> where computing resources and data sets used for examples in the book are provided. This book is well-presented and would suit applied scientists, researchers, graduate students, and particularly anyone who uses likelihood and such methods to their studies and applications.

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**Linear Algebra and Linear Models, Third Edition**

R. B. Bapat

Hindustan Book Agency and Springer, 2012, viii + 167 pages, £29.99/€39.95/\$49.95, softcover

ISBN: 978-1-4471-2738-3

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| 1. Vector spaces and subspaces                      | 7. Linear estimation                          |
| 2. Rank, inner product, and non-singularity         | 8. Tests of linear hypotheses                 |
| 3. Eigenvalues and positive definite matrices       | 9. Linear mixed models                        |
| 4. Generalized inverses                             | 10. Miscellaneous topics                      |
| 5. Inequalities for eigenvalues and singular values | 11. Additional exercises on rank              |
| 6. Rank additivity and matrix partial orders        | 12. Hints and solutions to selected exercises |

*Readership:* Advanced undergraduate and first-year graduate students taking courses in linear algebra, linear models, multivariate analysis, and design of experiments. Useful source of results for researchers in mathematics and statistics.

The first edition of this book came out in 1993, 19 years ago, and I bet that since then the book has been selling pretty smoothly because the brand-new third edition is now lying on my desk. Yes, over the years I have been recommending Professor Bapat's book to my students and I seem to continue doing so. One essential reason is that his style to approach the linear statistical models and related matrix theory is not far away from what I am used to do (and too old to change). The other very useful feature is that Bapat has done great job in carefully selecting the material and limiting it up till 167 pages only (first edition having 124 pages). This thoughtfully made selection makes the book an exceptionally handy textbook for teaching.

In this third edition the material has been completely reorganized and there is a new chapter on linear mixed models and a chapter containing additional problems on matrix rank. Both chapters warmly welcome! There is a huge amount of books related to linear models available but there is definitely room for such a nice package as this one!

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**Statistics and Data Analysis for Financial Engineering**

David Ruppert

Springer, 2011, xxii + 638 pages, €89.95/£81.00/\$99.00, hardcover

ISBN: 978-1-4419-7786-1

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| 2. Returns                            | 10. Time series models: further topics |
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| 4. Exploratory data analysis          | 12. Regression: basics                 |
| 5. Modelling univariate distributions | 13. Regression: troubleshooting        |
| 6. Resampling                         | 14. Regression: advanced topics        |
| 7. Multivariate statistical models    | 15. Cointegration                      |
| 8. Copulas                            | 16. The capital asset pricing model    |

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| 17. Factor models and principal components | 20. Bayesian data analysis and MCMC                |
| 18. GARCH models                           | 21. Non-parametric regression and splines          |
| 19. Risk management                        | A. Facts from probability, statistics, and algebra |

*Readership:* The book is specially suitable for Master's level students of Financial Engineering. They are the intended readers. However, the exposition is so good that others can read with profit if they are willing to work with data coming from financial markets.

The book covers different aspects of classical statistics, data analysis, and Bayesian Analysis in 21 excellently written chapters. Both regression, including non-parametric regression and splines, in which the author is a very distinguished expert, and time series are well covered. Unusual special topics, not usually found in statistics books, include copulas, GARCH models, Co-integration, Capital Asset Pricing Model, and Factor Models.

I have sampled all the chapters and I have seldom seen a book with such a wealth of material at this level, presented so well. Coverage of the five special topics mentioned in the previous paragraph is superb, tight, but full of insight, even for copulas and GARCH models, which I knew beforehand. Strongly recommended to first learners of these topics.

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West Lafayette, IN 47909, USA

A Guide for Social Scientists. By Alan Bryman, Duncan Cramer. As with previous editions, Alan Bryman and Duncan Cramer continue to offer a comprehensive and user-friendly introduction to the widely used IBM SPSS Statistics. The simple, non-technical approach to quantitative data analysis enables the reader to quickly become familiar with SPSS and with the tests available to them. No previous experience of statistics or computing is required as this book provides a step-by-step guide to statistical techniques, including: Non-parametric tests. Correlation. Simple and multiple regression. Analysis of variance and covariance. Factor analysis.