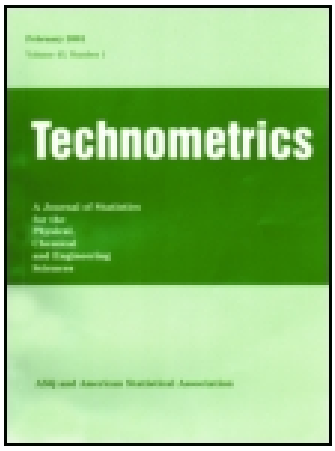

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Book Reviews

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Book Reviews

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Editor Reports on New Editions, Proceedings, Collections, and Other Books:

Fuzzy Stochastic Optimization: Theory, Models and Applications, by Shuming WANG and Junzo WATADA, Springer, 2012, 248 pp., €106.95, ISBN: 978-1-4419-9559-9.

Randomness and fuzziness are two major sources of uncertainty in the real world. In practical applications in areas of industrial engineering, management, and economics, it is common for decision makers to be confronted with information that is, simultaneously, probabilistically uncertain and fuzzily imprecise. A tailor-made mathematical tool to describe hybrid uncertainty was originally presented by H. Kwakernaak.

Fuzzy Stochastic Optimization aims to present a self-contained, systematic, and up-to-date description of fuzzy stochastic optimization based on the fuzzy random variable that is the core mathematical vehicle to model the integrated fuzzy random uncertainty. The theory presented in the book is supported with real-life case studies. Being capable of characterizing mathematically the randomness and fuzziness as an ensemble, the fuzzy random variables facilitate modeling the optimization problems on which to base decisions and help analysts deal with information that is simultaneously probabilistically uncertain and fuzzily imprecise.

The second chapter defines probability measures, possibility and credibility measures, the fuzzy variable with its expectation in possibility theory as well as the fuzzy random variable with related concepts of mean chance measure, distribution functions, expectations, and convergence mode. Some limit theorems are derived and proved. Theoretical examples of degeneration from the fuzzy random variable are given and illustrated.

The third chapter continues with a theoretical approach within the fuzzy stochastic renewal processes. Fuzzy stochastic renewal time and renewal rate are determined for a given model. Fuzzy random elementary renewal theorem is proved that gives the limit for the long-term expected renewal rate. Similarly, the authors continue with fuzzy stochastic renewal reward process and prove the fuzzy stochastic renewal theorem for the long-term expected reward rate. Two genetic algorithm examples are used for model building, a multiservice system (a parallel-series system), and a replacement problem.

The following chapter covers system reliability optimization models with fuzzy random lifetimes. The redundancy allocation problem is introduced and models are built. The computational schemes are embedded into a genetic algorithm and a hybrid solution approach is formed to solve the models. The key procedures of a hybrid algorithm are initialization, solution evaluation or solution feasibility checking by computational schemes for reliability, solution selection, solution crossover and mutation, and solution improvement. The above-mentioned models are compared and several numerical experiments are given.

The next chapter gives the mathematical formulation and model of the fuzzy random facility location model, with recourse and fixed capacity, that is a two-stage fuzzy stochastic binary integer programming issue. Solutions are illustrated and proved. Later a new computation scheme is introduced, namely the value of the recourse function at a given location decision of the two-stage model. These are designed for discrete and continuous fuzzy random parameters. As a solution the authors design a hybrid modified binary ant colony optimization algorithm (MBACO), which searches for the approximately optimal solution of the two-stage model. The hybrid mechanism uses the simplex algorithm to determine the second-stage optimal value for a given location decision and each fuzzy random realization. At the end of this chapter the MBACO algorithm is tested for the two-stage model.

Chapter 6 continues to examine two-stage fuzzy stochastic programming with value-at-risk and develops a generic model. Chapter 7 builds a model for two-stage value-at-risk-based fuzzy random facility location with variable capacity, and follows a hybrid modified particle swarm optimization approach for

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the model. This chapter concludes with numerical experiments and a comparison of the different approaches.

"Real-Life Applications" consists of two different case studies: dam control system design and location selection for frozen food plants. The first real-life case study applies the fuzzy random system reliability models as a dam control system design problem. The second real-life case study is about a location selection problem for frozen food plants. It applies the two-stage fuzzy random facility location model with recourse and fixed capacity, and the two-stage fuzzy stochastic programming with value-at-risk in location selection with fixed capacity.

The book ends with appendices: semicontinuity of a real function (basic mathematical concepts on semicontinuity of a real-valued function), some necessary results on fuzzy variables (properties of distribution functions of fuzzy random variables and their operations), binary particle swarm optimization (introduced by Kennedy and Eberhart), tabu search (introduced by Glover), a questionnaire sheet, and some answer samples for case study II. Several programming codes are given throughout the book.

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Latent Markov Models for Longitudinal Data, by F. BARTOLUCCI, A. FARCOMENI, and F. PENNONI, Boca Raton, FL: Chapman and Hall/CRC Press, 2012, 252 pp. $75.16, ISBN: 978-1439-81708-7 (H).

This book concerns the analysis of longitudinal categorical, possibly ordinal, data arising from a latent discrete-time Markov chain that allows subjects to transition from one state to another at any given time. Most of the material discussed in the book is based on the authors' earlier contributions, including the four applications used repeatedly for illustration. As part of Chapman & Hall/CRC's Statistics in the Social and Behavioral Sciences Series, the book is written for methodologically oriented readers as well as those motivated by subject matter areas in economics, psychology, and sociology, among others.

The first three chapters provide a comprehensive introduction to latent Markov models, which are amply illustrated by interesting data sets on marijuana consumption and criminal conviction history. Succeeding chapters present a variety of extensions of the basic latent Markov model that allow for constraints on the model components, covariate effects on the latent states and observed outcomes, and the inclusion of random effects in multilevel data settings. Much of the discussion should prove familiar to anyone with background in longitudinal data analysis. Additional discussions, albeit brief, on missing data and Bayesian latent Markov models round up the rest of the book's chapters.

The book includes an appendix demonstrating the application of the authors' R package LMest in fitting a latent Markov model for the marijuana consumption data. R and Matlab codes used in the book are also available from the authors' website.

I enjoyed reading this book very much: the writing style is clear and concise, and the mathematical presentation is easy to follow. Notations are well thought out and the technical derivations are thorough. The book is a valuable resource on latent Markov models to students, researchers, and practitioners.

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Mathematics for Econometrics (4th ed.), by Phoebus J. DHRYMES, New York: Springer, 2013, xvii + 419 pp., $49.99 (P), ISBN: 978-1-4614-8144-7.

Dhrymes' *Mathematics for Econometrics* is an interesting book for review in *Technometrics*. Econometrics is an area likely studied by quite a few readers, especially those with graduate backgrounds in business and/or economics. The current text offers an excellent reference for readers wishing to study econometrics in the future, or simply to have on hand when reviewing or "brushing up" on requisite mathematical skills.

Econometrics is the application of data-analytic methods in economics. It includes statistics, mathematics, and computer science. Most graduate (and some undergraduate) economics students will take at least one applied and one theoretical econometrics course during their study. *Mathematics for Econometrics* is written and designed to provide a means for filling gaps in mathematical preparation for the study of econometrics. It is not intended to provide a complete mathematical overview, nor a comprehensive rigorous mathematical treatment.

The book covers major topical areas: linear algebra, time-series, probability, and linear models. The topics are interspersed through the chapters, which are arranged as follows:

1. Vectors and Vector Spaces
2. Matrix Algebra
3. Systems of Linear Equations
4. Matrix Vectorization
5. Vector and Matrix Differentiation
6. DE Lag Operators GLSEM and Time Series
7. Mathematical Underpinnings of Probability Theory
8. Foundations of Probability
9. LLN, CLT, and Ergodicity
10. The General Linear Model
11. Panel Data Models
12. GLSEM and TS Models
13. Asymptotic Expansions

The layout substantively differs from the third edition. Chapters 7, 8, 9, and 11 are new in the fourth edition, while Chapters 6 and 12 have been altered and updated. Chapter 13 was moved (previously Chapter 7), and Chapter 6 was renamed to reflect additional content and a more general time series focus. Broadly, the main content changes are the addition of probability and time series. These additions are relevant given the potential approaches to teaching econometrics.

Topics in the linear algebra sections range from complex numbers (1.1), Hermite forms (2.4), characteristic roots (2.9), generalized inverses (3.3), linearly restricted matrices (4.3), and differentiation of traces (5.4) and determinants (5.5). As many students of econometrics will note, some matrix topics are less likely to be needed depending on the level of the course. A course that does not include experimental design is less likely to require generalized inverses. However, behavioral/experimental economics requires them. The author "errs" on the side of inclusion here, which is appropriate for a reference.

Time series topics include lag operators (6.2), vector difference equations (6.3), panel data (11.1-4), and forecasting (12.5). The coverage here is less broad relative to that of linear algebra. No autoregressive models are discussed in detail, though several (such as ARMA and ARCH) are briefly motivated. No data examples are offered, which may cause a difficulty with establishing context. That said, the basis needed to obtain context is adequate.

Included in the probability content areas are measurable spaces (7.3), integration (7.5), random variables (8.3), convergence (9.1), ergodicity (9.4), characteristic and moment generating functions (13.4). The treatment here is measure-theoretic. This will resonate with more analysis-inclined readers (as it should). Those preferring a mathematical statistics approach will find a greater challenge with the topics. The inclusion of martingales (9.3) is advantageous for the study of game theory, a subject commonly covered in economics programs.

The linear models content includes least squares estimators (10.2), asymptotics (10.6), multiple GLM (10.8), exogenous and endogenous variables (12.1), two-stage least squares (12.2), the structural VAR model (12.4). The coverage illustrates the specifics of econometrics vis-a-vis general statistics. Economists routinely encounter explanatory variables that are correlated with the error term. Such endogenous variables (as opposed to exogenous) must be accounted for in a model such as two stage least squares.

Each section contains necessary definitions, theorems, and propositions. Many (but not all) have supporting proofs accompanying. The notation is standard, but often requires background in analysis and/or abstract algebra. The student/reader lacking this previous exposure most likely will struggle with the measure theoretic notation.

The overall mix of topics is sufficiently inclusive for the study of econometrics, especially with the addition of probability and time series. If there is a drawback, it is the missing context in the introduction of topics. Without context, the sections appear to be a nonintegrated whole. This "limitation" is overcome by the purpose for the book. The reader should have appropriate context given an accompanying econometrics text (such as Greene 2011).

The writing style is largely appropriate for the intended audience. The caveat is the lack of examples and problems. The ostensible assumption is that the reader will have said items in the textbook(s) of the course being taken. Unfortunately, many readers will be using this text as a reference with which to overcome deficiencies in the given course. These readers will need additional references.

Overall, the book serves as an excellent handbook, and more than fulfills the stated purpose. Statisticians will find it useful as well, both as a reference and as a potential course supplement. It should be used as intended, and not as a substitute for the rigors necessary to be prepared for the intensive study of econometric methods. Anyone with the equivalent of a baccalaureate degree in mathematics will be prepared to use the text. One with deficiencies in certain areas (such as analysis, abstract algebra, and advanced calculus) will struggle with the notation. It also may be used as supplementary material in a theoretical econometrics course. As a stand-alone text for virtually any course, it would be insufficient.

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Bayesian Filtering and Smoothing, by Simo SARKKA, Cambridge, UK: Cambridge University Press, 2013, 252 pp. $36.99, ISBN: 978-1-1076-1928-9.

The highly qualified author has written a useful, informative, and quite readable book on Bayesian filtering and smoothing. Here are some comments on each chapter.

Chapter 1, What are Bayesian filtering and smoothing, provides a very brief description of Bayesian filtering and smoothing followed by 14 somewhat broad applications such as spread of infectious disease and target tracking.

Chapter 2, Bayesian inference, gives a fairly standard introduction to Bayesian inference. One small suggestion is not to give uninitiated readers the impression that choosing a prior is necessarily subjective.

Chapter 3, Batch and recursive Bayesian estimation, provides a very effective example of Bayesian estimation for a simple linear regression using a pedantic style that I find useful.

Chapter 4, Bayesian filtering equations and exact solutions, includes the celebrated Kalman filter.

Chapter 5, Extended and unscented Bayesian filtering, extends the Kalman filter to the nonlinear case, essentially by using Taylor series approximations to the functional form

Chapter 6, General Gaussian filtering, introduces Gaussian moment matching and filters.

Chapter 7, Particle filtering, is a nice treatment of particle filtering, extending Gaussian filtering to allow, for example, multimodal distributions.

Chapter 8, Bayesian smoothing equations and exact solutions, introduces Bayesian smoothing in which the unknown state vector is estimated using all previous and available future measurements, which is suitable in retrospective analyses. Prior to Chapter 8, the filtering uses only the present measurement and estimate of the previous state to estimate the current state.

Chapter 9, Extended and unscented smoothing, extends Chapter 5 by allowing Gaussian approximations to be formed for non-linear state space models.

Chapter 10, General Gaussian smoothing, introduces the Gaussian smoother and Gauss-Hermite cubature integration based approximations.

Chapter 11, Particle smoothing, points out that Gaussian approximations are not always sufficiently accurate, in which case Monte Carlo (particle) approximations such as sequential importance resampling are preferred.

Chapter 12, Parameter estimation, covers parameter estimation. All previous chapters assume that model parameters were known (and so are more probabilistic than statistical in focus).

This is a concise and well-written text that achieves its goal stated in the Preface to concisely introduce nonlinear Kalman filtering and smoothing, particle filtering and smoothing, and related parameter estimation methods. The book aims to be an introduction aimed at advanced undergraduates (this would be a stretch for most undergraduates in my opinion) or early graduate students, so mathematical details are not overly emphasized; however, I agree with the author's claim that mathematically inclined readers are provided with enough mathematical details. Chapters 1–12 each include short collection of exercises, many of which are supported by Matlab code by the author. Also, the author cites many of his own articles in an impressive collection of journals covering both theory and applications.

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Generalized Weibull Distributions, by Chin-Diew LAI, New York: Springer, 2014, viii+118 pp., $54.99, ISBN: 978-3-642-39105-7.

The Weibull distribution is one of the most commonly used statistical distributions in survival or reliability data analysis. Numerous generalizations and modifications of the Weibull distribution have been proposed and studied in the literature. This brief monograph attempts to summarize the up-to-date status of the research and development of generalized Weibull distribution.

The book is made up of four chapters:

Chapter 1. Weibull distribution

Chapter 2. Generalized Weibull Distributions

Chapter 3. Models Involving Two or More Weibull Distributions

Chapter 4. Discrete Weibull Distributions and Their Generalizations

In summary, Chapter 1 provides the background information and preliminaries of the classical two-parameter and three-parameter Weibull distributions and some real applications of these Weibull distributions. Chapter 2 first reviews the construction methods of generalizing continuous statistical distributions in general. Then, 24 different continuous generalized Weibull models or classes of distributions where Weibull is a special case are discussed. Chapter 3 reviews some generalizations of Weibull models obtained from two or more Weibull distributions. The constructions of some discrete Weibull distributions and their modifications are discussed in Chapter 4.

This book is penned in a clean and concise style which prepares the readers to stick with the principal features of each generalized statistical distribution and its applications. Instead of delivering detailed mathematical treatments for each of the generalized Weibull models, the author offers the functional forms and discusses the important characteristics of each generalized Weibull model, and then points the readers to the original research article where the model was proposed as well as some associated articles.

To comprehend most of the materials in this book, basic knowledge of probability and statistics, especially in probability models, statistical distributions, and transformations of random variables, normally covered in undergraduate level courses should be sufficient. This book is a great resource for researchers in theory of statistical distributions, applied statisticians and reliability engineers who want a bird's eye perspective of the most up-to-date synopsis on generalizations and modifications of the Weibull distribution.

It is noteworthy to mention that modifications of the Weibull distribution have undergone an extended phase of growth in the past decades and they are still active research topics in statistics and applied sciences. It is hard, if not impossible, for a single book to cover all the generalized Weibull models available in the literature. To complement this short monograph, readers interested in the theory and applications of generalized Weibull models may also consult the books written by Murthy, Xie, and Jiang (2004) and Rinne (2008, Section 3.3), and a recent review article written by Almalki and Nadarajah (2014) which provides an extensive review of some discrete and continuous generalized Weibull models.

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Penalty, Shrinkage and Pretest Strategies: Variable Selection and Estimation, by S. Ejaz AHMED, New York: Springer, 2014, ix+115 pp., $54.99 (P), ISBN: 978-3-319-03148-4.

Given the skyrocketing amount of information that can be nowadays collected and stored virtually in all fields, from social media to climate research to omics studies and business analytics, there exists an ever increasing interest in estimation procedures that are applicable to such massive datasets. In addition to developing new techniques such as various penalty estimation and its variants, this Big Data revolution has revived a substantial interest to the so-called pretest and shrinkage estimators that have been in the literature for more than five decades. This in turn urged to include topics on pretest, shrinkage and penalty estimation procedures to a variety of graduate courses ranging from core multivariate regression to advanced data mining and portfolio management. However, surprisingly it is relatively hard to find a book that provides a comprehensive and cohesive introduction to foundations of shrinkage estimation and that at the same time presents a broad overview of the current state of affairs in shrinkage-type methodology. The book *Penalty, Shrinkage and Pretest Strategies: Variable Selection and Estimation* is one of a very few such books and is a lucid and focused exposition of shrinkage-type methods and their appraisal in respect to penalty estimators.

The objective of this book is to lay the foundation for shrinkage-type estimators and to compare statistical properties of penalty and non penalty estimation strategies for some popular linear models. The text is conveniently organized into six chapters, systematically covering the full model, submodel, penalty, pretest and shrinkage estimation procedures and their asymptotic properties for multiple linear regression, partially linear regression and Poisson regression models. It is particularly useful that each chapter is essentially standalone and can be read as an independent topic. Finite sample performance of all methods is evaluated by Monte Carlo simulations and there are a number of illustrative case studies from medicine, public health, and business.

Chapter 1 presents an introduction to estimation strategies, with a particular focus on pretest, shrinkage estimation in a multiple regression model. Flowchart of the shrinkage estimation strategy (Fig. 1.1) allows inexperienced readers to better understand the scope of the methods described in this book.

Chapter 2 introduces linear shrinkage and pretest estimation strategies of the mean parameter of normal and Poisson models. When reliable information on normality exists, the suggested linear shrinkage estimator outperforms the classical estimator. Otherwise, if the distribution information is just nearly certain, one may employ the shrinkage pretest strategy that is also discussed in this chapter.

Chapter 3 addresses the estimation strategies when data are fused from multiple sources. In particular, Chapter 3 suggests efficient estimation procedures based on a combination of pooled and individual pretest and James-Stein estimators and discusses the asymptotic and finite sample performance of these estimators using mean squared error criterion.

Estimation strategies for multiple linear regression are discussed in Chapter 4. The chapter starts from revisiting the penalty estimation methods (LASSO; smoothly clipped absolute deviation method, SCAD; adaptive LASSO; and minimax concave penalty, MCP) and then proceeds to evaluating the new strategies motivated by Stein-rule and pretest estimation procedures.

Chapter 5 extends the improved estimation strategies to partially linear models. Asymptotic bias and risk analysis of these estimators are assessed theoretically and via extensive simulations.

Finally, Chapter 6 is devoted to shrinkage-type estimators in Poisson regression models. The chapter theoretically investigates asymptotic distributional bias and risk of the full model, submodel, and shrinkage estimators and evaluates their final sample performance by simulations and applications to the Australian health survey data and U.S. firms' takeover bids.

Each chapter concludes with an overview of current theoretical and methodological challenges, open problems and future research directions and is equipped with a list of references for further reading. Undoubtedly this volume will serve as an excellent textbook for advanced undergraduate and graduate courses involving penalty and non penalty estimation and as a references source for professional statisticians and practitioners.

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Editor Reports on New Editions, Proceedings, Collections, and Other Books:

Spatial Microsimulation: A Reference Guide for Users, by Robert TANTON and Kimberley L. EDWARDS. New York: Springer, 2013, viii+277 pp., $129.00 (H), ISBN: 978-94-007-4622-0.

This edited volume serves as a guide for those looking to learn more about spatial microsimulation modeling. At a time when policy analysts and related agencies are facing the challenge to provide a convincing representation comprehensive by modeling the interaction between the system itself and individual units, microsimulation models are starting to be seen more widely as a practical way to collect data. This strategy is used by social scientists, mainly because it allows policy analysts to investigate potential impacts before implementing the policy at hand. The challenges in this area are further complicated in today's society due to availability of the ultrahigh dimensional datasets. This volume presents a step by step guide for the development of spatial microsimulation. *Spatial Microsimulation: A Reference Guide for Users* focuses on a multitude of reasons that microsimulation modeling is an ideal way for researchers and policy makers to gather data of small areas. Examples include how to acquire and prepare the data, and the possibility of different kinds of models based on different methods together with the data's limitations. The content within this volume could prove very useful for practitioners who want to develop a spatial microsimulation model for a problem under consideration. This volume is divided into four parts with a total of 16 chapters. Part I is mainly an introduction of several topics later outline throughout the chapters, and provides background knowledge into each chapter, as well as preliminaries. Chapter 1 also gives a very brief introduction of the rest of chapters. The book is summarized clearly in the first and final chapters. Parts II and III are the main drive of the volume as they both focus on the methodology and application of static and dynamic spatial microsimulation models. Finally, part IV deals with the modal validation and suggests areas for future research.

Below is a biased selection of topics of the papers in the book:

- Introduction to Spatial Microsimulation: History, Methods and Applications
- Building a Static Spatial Microsimulation Model: Data Preparation
- Estimating Small-Area Income Deprivation: An Iterative Proportional Fitting Approach
- Spatial Microsimulation Using a Generalised Regression Model
- Linking Static Spatial Microsimulation Modelling to Meso-scale Models: The Relationship Between Access to GP Services and Long-Term Illness
- Projections Using a Static Spatial Microsimulation Model
- SimEducation: A Dynamic Spatial Microsimulation Model for Understanding Educational Inequalities
- Challenges for Spatial Dynamic Microsimulation Modelling
- Validation of Spatial Microsimulation Models

The book is well organized and topics appear sequentially. This text includes many useful topics and procedures for practitioners and researchers alike in the arena of spatial microsimulation. The contributions within the text are written in such a way that it allows accessibility to readers with moderate to strong knowledge of statistics, computer science, and related areas, since this is a genuine transdisciplinary area. One of the main strengths of the volume is that the methodolgy and concepts are clearly presented and are munificently illustrated with data examples. The mathematical treatment and formalism is moderate and the narrative is reasonably modern and clear. I took particular interest in the chapters on small area estimation. Those intending to research further into the benefits of the use of microsimulation models should find this text very informative.

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Mathematical Demography: Selected Papers (2nd, revised ed.), by David P. SMITH and Nathan KEYFITZ, New York: Springer, 2013, xxiii+335 pp., $179.00 (H), ISBN: 978-3-642-35857-9.

This revised edition collates papers on mathematical demography that date back from Roman times to the late twentieth century. This is an extension of the edition of Smith and Keyfitz (1977) collection of demographic classics, which is out of print now. This text could serve as a reprint of the original volume, however in the new edition the commentaries by Smith and Keyfitz have been updated and extended by the current editors of this collection.

The book is divided into five parts:

- Part 1: The Life Table
- Part 2: Stable Population Theory
- Part 3: Attempts at Prediction and the Theory They Stimulated
- Part 4: Parameterization and Curve Fitting
- Part 5: Probability Models of Conception and Birth

This text begins with a biographical sketch for Keyfits and Smith, and provides detailed information about them. There are 35 chapters in this book. This collection is a piece of history and is comprised of crucial source material equally for researchers, graduate students and practitioners. Most of the chapters in the book elucidate the profound roots and ongoing strength of mathematical demography.

A biased selection of chapters showcases the various papers included in this revised edition that are not found in the original:

- "Tables of Annuity Values Which Were Sanctioned by the Roman Law for the Purposes of the Lex Falcidia," C.F. Trenerry (1926)
- "An Estimate of the Degrees of the Mortality of Mankind," Edmund Halley (1693)
- "A Treatise on the Valuation of Annuities and Assurances on Lives and Survivors," Joshua Milne (1815)
- "Formal Treatment of Aggregate Mortality Data," Wilhelm Lexis (1875)
- "Relation between Birth Rates and Death Rates," Alfred J. Lotka (1907)
- "Resolving a Historical Confusion in Population Analysis," Paul A. Samuelson (1976)
- "The Fundamental Theorem of Natural Selection," R.A. Fisher (1958 (1930))
- "The Population Consequences of Life History Phenomena," Lamont C. Cole (1954)
- "Population Waves," Harro Bernardelli (1941)
- "On the Use of Matrices in Certain Population Mathematics," P.H. Leslie (1945)
- "Nuptiality, Fertility, and Reproductivity," S.D. Wicksell (1931)
- "Model Fertility Tables: Variations in the Age Structure of Childbearing in Human Populations," Ansley J. Coale and T. James Trussell (1974)
- "On the Rate of Growth of the Population of the United States since 1790 and its Mathematical Representation," Raymond Pearl and Lowell J. Reed (1920)
- "Theoretical Basis of Measures of Natural Fertility," Louis Henry (1972 (1953))

Mathematical Demography: Selected Papers contains an abundance of information, historical backgrounds, and development on the subject. The revisions made in this updated second edition were successful in including details that were perhaps overlooked in previous editions. Smith and Keyfitz's decision to remove unnecessary sections from the original papers proves to be a wise one, as it allows for more room for updated calculations in the revised volume. Due to the nature of the historical background, this text goes into great detail when giving reasons to why one may want to calculate the aforementioned topics. Those looking to study mathematics and science related fields would greatly benefit from reading this text.

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Linear Mixed Models: A Practical Guide Using Statistical Software (2nd ed.), by Brady T. WEST, Kathleen B. WELCH, and Andrzej T. GALECKI, Boca Raton, FL: Chapman and Hall/CRC Press, 2014, 440 pp., $71.96 (H), ISBN: 978-1-4665-6099-4.

The first edition of this book was released in 2007. A review of the previous edition was published in the *Journal of the American Statistical Association* in 2012, and was written by Gregory E. Gilbert (Gilbert 2012). This updated edition focuses on showing readers how to easily perform complex linear mixed model (LMM) analyses via a variety of software programs. Like the first edition, the current edition provides readers knowledge and understanding of how to use LMMs. Though this edition is very detailed, I strongly suggest reading the review of the first edition in *JASA* to gain some insight into the changes that were made between the first and second editions.

The book covers a broad range of topics and applications, and updates the case studies presented in the first edition, among others. This text is directed toward applied statisticians and researchers in search of a board and accessible reference of linear models. The authors West, Welch, and Galecki did an excellent job making substantial revisions in this edition. One addition in particular, is a new chapter (chapter 8), titled "Models for Data with Crossed Random Factors: The SAT Score Example."

New prominent features that are presented in this current edition include:

- Fitting linear mixed models to complex survey data
- Bayesian inference strategies
- A new chapter on models with crossed random effects that uses a case study to illustrate software procedures capable of fitting these models
- Power analysis methods for longitudinal and clustered study designs, including software options for power analyses and suggested approaches to writing simulations
- Use of the lmer () function in the lme4 package in R
- Updated graphical procedures in the software packages
- Substantially revised index to enable more efficient reading and easier location of material on selected topics or software options
- More practical recommendations on using the software for analysis
- A new R package (WWGbook) that contains all of the data sets used in the examples
- Includes many nice examples to illustrate the individual suggested methods

Further, the data analyses are carried out using the newest versions of the software packages, and the authors give the latest information on the options and landscapes of the software procedures available for fitting linear mixed models by commonly used software packages, making the new edition worthwhile. In addition, the computer programs and software codes are all available on their listed website.

The literature review is relevant and thorough for low-dimensional cases. The chapters are nicely structured, well presented and motivated. Perhaps a section on concluding remarks at the end of the each chapter would have enhanced the value of the book. The main strength of the book is that it offers many numerical examples that are based on real data sets emerging from a host of research. The lack of exercise questions would make it difficult to use this text as an academic textbook, but *Linear Mixed Models: A Practical Guide Using Statistical Software* will be equally attractive to practitioners, graduate students and researchers.

As a final note, I would like to point out that the new edition is silent on high-dimensional cases where the number of variables may exceed the sample observations, or it may be increasing with the sample size. Research related to linear mixed models is reported in current literature. Additionally, some penalty and shrinkage estimation techniques can be introduced in the estimation of the regression parameters when the model is sparse. Ahmed (2014) provides an overview and comparison of these estimation strategies for multiple regression and partially linear models.

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Extremes in a Changing Climate: Detection, Analysis and Uncertainty, by Amir AGHAKOUCHAK, David EASTERLING, Kuolin HSU, Siegfried SCHUBERT, and Soroosh SOROOSHIAN, New York: Springer, 2013, xiv + 426 pp., $129.00 (H), ISBN: 978-94-007-4478-3.

Research in climate change is an interesting and challenging area, and perhaps controversial. This edited volume is comprised of 13 chapters emerging from a wide range of topics on detecting extremes, trend analysis and associated uncertainties with such analysis. However, emphasis is placed on presenting methods for analyzing climate extremes in a non stationary setup. In addition, the edited volume features hydrometeorology global datasets and the applications for analyses of extremes. The book presents compact and accessible strategies providing concepts and methodological developments with applications. One of the more appealing features of the book is that it offers several case studies on extreme climate changes, making the book valuable and application friendly.

In an edited volume, I always read the Preface to assess the content and strength of the book. In this volume, the editors have done a great job in detailing why this book is useful for analyzing climate change, and giving a brief summary of each chapter. There are two main uses for this book:

- As a primary reference on the existing methodologies for the purpose of analyzing climate extremes.
- As a textbook for teaching a graduate course in related disciplines, for example, civil and environmental engineering, earth system science, and others.

As previously stated, the book covers the developments and applications of several methodologies for analyzing and interpreting the data arising from climate extremes. Furthermore, this book nicely provides an overview of the current state of affairs. It gives examples, a good number of color figures, and real data analysis. The organization of the text makes it useful equally as a graduate textbook and as a reference book. Within this text, I find chapters 1, 3, and 7 especially engaging. Also, an interesting note is that chapter three uses Bayesian analysis, which clearly reveals the power and beauty of statistical methods in applications.

The titles of the respective chapters are:

- Chapter 1: Statistical Indices for Diagnosing and Detecting Changes in Extremes
- Chapter 3: Bayesian Methods for Non stationary Extreme Value Analysis
- Chapter 7: Stochastic Models of Climate Extremes: Theory and Observations

All the papers in this book are nicely organized and are consistent in style and presentation. Each paper begins with an abstract and then introduction and concludes with a list of references. As one can envision with this type of book, the topics are very diverse in nature, but interesting and useful for the practitioner and researcher alike. It may have benefited readers further if the chapters were organized into sub groups so that topics would be outlined clearly, though the text still functions without this. Overall, *Extremes in a Changing Climate: Detection, Analysis and Uncertainty* successfully goes beyond achieving its objectives and goals, and makes for a great read.

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