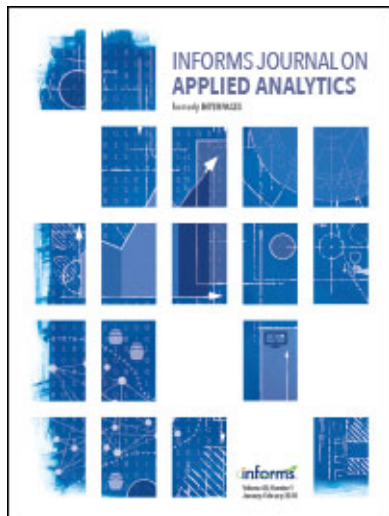




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Book Reviews

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To cite this article:

Wenjing Shen (2018) Book Reviews. Interfaces 48(2):176-180. <https://doi.org/10.1287/inte.2018.0945>

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Book Reviews

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<https://doi.org/10.1287/inte.2018.0945>

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Abstract. In *Book Reviews*, we review an extensive and diverse range of books. They cover theory and applications in operations research, statistics, management science, econometrics, mathematics, computers, and information systems. In addition, we include books in other fields that emphasize technical applications. The editor will be pleased to receive an email from those willing to review a book, with an indication of specific areas of interest. If you are aware of a specific book that you would like to review, or that you think should be reviewed, please contact the editor. The following books are reviewed in this issue of *Interfaces*, 48(2), March–April: *Statistical Intervals: A Guide for Practitioners and Researchers*, William Q. Meeker, Gerald J. Hahn, and Luis A. Escobar; *Green Transportation Logistics: The Quest for Win–Win Solutions*, Harilaos N. Psaraftis, ed.

MEEKER, WILLIAM Q., GERALD J. HAHN, LUIS A. ESCOBAR. 2017. *Statistical Intervals: A Guide for Practitioners and Researchers*. John Wiley & Sons. 648 pp. \$110.00.

This book is the second edition of *Statistical Intervals: A Guide for Practitioners* by Hahn and Meeker. Since the publication of the first edition in 1991, it has become the definitive source on the computation of statistical intervals.

More than half of the material in the second edition is new. It includes seven new chapters on more general methods for statistical intervals, which have become mainstream in the past 26 years. Luis A. Escobar has joined Bill Meeker and Gerry Hahn as authors of the new edition. All are highly regarded researchers and applied statisticians. The presentation of the material reflects their hands-on experience with the methods in their applied work and research. The book provides a rare combination of clear writing and technical precision, and an applied perspective on the problems being addressed. The target audience of the original edition was practitioners and applied statisticians. While keeping the applied focus of the original edition, some enhancements in the revised edition are intended for readers interested in the theory underlying statistical intervals. The subtitle of the new edition was revised accordingly to include researchers.

In the preface of the first edition, the authors explain their motivation for the book by noting that although students in introductory courses in statistics learn about confidence intervals on population parameters (e.g., mean, standard deviation), other types of intervals of importance in practice receive little or no attention. In particular, they highlight *prediction intervals* to contain future sample results and *tolerance intervals* to contain a specified proportion of the sampled population. For example, suppose a manufacturer has operational lifetime data on a sample of batteries. Based upon this information, a 95 percent tolerance interval can be used to determine a minimum and a maximum lifetime that will encompass 90 percent of the sampled population. In applications, such intervals can aid the manufacturer in assessing the likelihood of meeting regulatory limits, in determining replacement intervals, and in setting warranty times. Conversely, a purchaser of such batteries would be more concerned with lifetimes of individual units rather than some general population characteristic. In this case, the sample results can be used to construct a 95 percent *prediction interval* to contain lifetimes of a future sample of, for example, five batteries from the same population. The better-known confidence interval on the population mean would provide the wrong answer in either situation.

The new edition consists of 18 chapters and a substantially expanded set of technical appendices. The first 11 chapters are based on the original edition with various updates and a complete rewrite of Chapters 5–7. These chapters describe confidence, prediction, and tolerance intervals and offer numerous examples of their applications in commonly encountered situations that involve samples from the normal, binomial, and Poisson distributions. Chapter 1 includes an insightful discussion of the practical assumptions required in using the intervals. The authors stress the importance of distinguishing between enumerative and analytic studies. Statistical inference assumes that one is dealing with a so-called enumerative study (i.e., a study on a static population). For example, estimating the proportion of defective units in a production lot, based on a random sample drawn from that lot, is an enumerative study. In many real-life situations, one is dealing with an analytic study. For example, in designing a product, one uses the results from a sample of early prototype units to extrapolate performance under high-volume production in the future. The results of an analytic study apply for a future process only to the degree to which the future process resembles the sampled process. The authors point out that in such cases a statistical interval provides merely a lower bound on the total uncertainty, reflecting only the sampling variability. Chapter 2 provides a general description of different types of statistical intervals and their applications. Chapters 3 and 4 address the construction of statistical intervals based on samples from a normal distribution. Chapter 5 discusses distribution-free intervals, which do not require a distribution assumption concerning the population from which the sample was drawn. Chapters 6 and 7 provide methods for calculating statistical intervals based on samples from the binomial and Poisson distributions. Chapters 8–10 address sample-size requirements for statistical intervals. Chapter 11 presents nine case studies based on the methods of the first 10 chapters. These case studies deal with such topics as forecasting demand for spare parts, estimating the probability of passing an environmental emissions test, and estimating the reliability of a circuit board. The scenarios described are typical of situations that frequently arise in everyday applications in business and industry.

Since the publication of the first edition, significant developments have occurred in more general methods of computing statistical intervals. These include likelihood-based intervals, bootstrapping, and other simulation-based methods, and Bayesian methods. Chapters 12–18 discuss these state-of-the-art methods, which are becoming increasingly available to statistical practitioners because of advances in statistical computations and software. These procedures have applicability for constructing statistical intervals in more complicated and nonstandard situations involving, for example, sample data from nonnormal distributions, nonlinear regression models, random-effects models, hierarchical models, censored data, and correlated data. Chapter 12 describes statistical intervals based on inverting the likelihood ratio test. Chapters 13 and 14 are dedicated to bootstrap statistical intervals. The authors cover both nonparametric and parametric bootstrap methods. Chapters 15–17 describe statistical intervals based on Bayesian methods. They include an informative description of Markov chain Monte Carlo (MCMC) simulation, which provides the computational engine that underlies modern Bayesian analyses. The application examples vary from common situations that involve the normal, binomial, and Poisson distributions to more advanced applications involving hierarchical models and longitudinal repeated measures models. Chapter 18 contains seven advanced case studies that are based on the newly described methods. These case studies include computation of confidence intervals for components of variance in a measurement process, a tolerance interval to characterize the distribution of process output in the presence of measurement error, and the use of prior information to estimate the service-life distribution of a rocket motor.

Consistent with the tradition of the first edition, the authors omitted the theory and derivations in the main body of the book. They carefully explain the assumptions and potential pitfalls that underlie the various methods of interval estimation. They also added a set of appendices that describe the theoretical foundation for many of the topics covered (e.g., computing coverage probabilities, maximum-likelihood theory, pivotal methods, generalized pivotal quantities, order statistics, Bayesian inference). These enhancements make the book more self-contained and are a useful addition. Practitioners whose main interest is to learn how

to use the methods in their work can skip the technical appendices.

The two chapters on case studies based on real applications are one of this book's strong points. In each case study, the authors describe the context of the application and the available data, offer an insightful discussion of the type of statistical interval that would be most appropriate, conduct graphical analysis of the data, offer a critical examination of the underlying assumptions of the method, and typically apply several alternative methods and compare the results. Many of the examples and associated discussion reflect the authors' experience in industrial applications involving product development, quality assurance, and reliability. In addition, the newly added chapters contain examples from such diverse topics as estimation of treatment effect in a marketing campaign, credit card and ATM fraud, baseball batting averages, and performance assessment of sales agents.

In many parts of both editions, the authors use the R software to compute statistical intervals. They provide additional resources on software for statistical intervals on the book's webpage, <http://www.wiley.com/go/meeker/intervals>. These include the R package StatInt, which contains additional functions that are useful for computing statistical intervals, Open BUGS scripts for the Bayesian examples, and a comprehensive assessment of statistical software regarding their statistical-interval capabilities. The comparison includes JMP 13, Minitab 17, R/StatInt, SAS 9.4, and IBM SPSS Statistics 24.

The book will appeal to diverse groups of readers. The first 11 chapters can serve as a useful guide for practitioners and applied statisticians. The technical level of the chapters in this first part of the book is appropriate for practitioners with a working knowledge of introductory-level statistics. In addition, readers at any level who are interested in learning more about different types of statistical intervals and their applications will benefit from these chapters. The newly added chapters (Chapters 12–18) and the technical appendices are particularly useful for readers who are involved with more advanced and nonstandard applications. These chapters can also be valuable for researchers and graduate students who wish to learn about the developments that have occurred in the past few decades.

In the preface of the book, the authors explain why producing this revised edition took so long. The result, however, is superb and well worth the wait. With this radically revised and updated edition, the book further seals and secures its place as the definitive source on statistical intervals.

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PSARAFTIS, HARILAOS N., ED. 2016. *Green Transportation Logistics: The Quest for Win–Win Solutions*. Springer. 558 pp. \$179.00.

The study of the environmental sustainability of road transportation remains a challenge in our current society, even considering that green transportation has been a well-known research arena for the past 10 years (Dekker et al. 2012), as *Green Transportation Logistics: The Quest for Win–Win Solutions* highlights. This book is a clear attempt to simultaneously place greater importance on economic and environmental criteria related to green transportation. Therefore, the investigation of trades-offs between these criteria takes a preferential position in this book's design.

This book contains 15 chapters, one annex, and 558 pages. Its core is based on SuperGreen (www.supergreenproject.eu), the European Union (EU) project that painstakingly defines and studies the concept of green corridors—integrated transportation routes that reduce environmental impact via multimodality (European Commission 2007). This term is essential to establishing sustainable ways to guide transportation convoys crossing European infrastructures. Providing details of the use of that expression allows potential readers to better understand how intermodal transportation reduces environmental impacts. The book's editor is the main coordinator of the SuperGreen project and the authors of most chapters are researchers in the SuperGreen project. Likewise, some of the concepts presented were previously discussed in Psaraftis and Panagakos (2012).

The book's preface presents an overview of the book and its main topics: transportation, mobility, global CO₂ emissions, and environmental impact. This preface is a good introduction because it helps the reader understand the book's challenges and contributions. This work can be divided into two sections. The first

or introductory part (Chapters 1–6) describes and analyzes essential terminology, such as green corridor or transportation emissions. The second part (Chapters 7–15) describes applications and cases of *green corridors*.

In Chapter 1, the authors intelligently describe political issues; they present various official EU documents related to freight transport. Chapter 2 provides an introduction to the calculation of transportation emissions and their methodological difficulties. Chapter 3 discusses the basic concepts about green corridors and their key performance indicators. Chapter 4 shows the connection between road networks and green corridors, while Chapter 5 introduces the green technologies in transportation. After reading these chapters, the reader can understand the complexity of the problem at hand: many stakeholders interact in developing rules, implementing policies, and evaluating results. Chapters 3–5 extensively depict and analyze the literature on green corridors. At the end of Chapter 5, the reader can find a list of the most relevant sustainable technologies fields, such as engines, fuel, and vehicles. In Chapter 6, the first part concludes with a discussion of the role information and communication technologies (ICT) can play in green transportation. Although ICT cannot alone reduce environmental impacts, these technologies help by collecting related data and monitoring behaviors to better combat environmental challenges.

The second part of the book focuses on green transportation logistics applications. In Chapter 7, the authors review road freight transportation and denote it as the green vehicle routing problem. They examine many fuel consumption models to be implemented within traditional vehicle routing problems to minimize fuel consumption, instead of traditional objective functions, such as distance, time, or monetary cost (Ubeda et al. 2011, Demir et al. 2014). Trade-offs between emissions and time are further analyzed as conflicting objectives. Chapters 8, 9, and 11 are dedicated to maritime transportation, focusing on ships. They cover speed and routing optimization, several measures to reduce emissions from maritime transportation, and life cycle analysis. Chapter 8 introduces the concept of market-based measures to reduce greenhouse gas (GHG) emissions. This topic is particularly relevant in Chapter 9, which investigates the effect

of speed optimization from environmental and economic viewpoints. Similarly, Chapter 10 provides a detailed description of controlling sulphur emissions from transportation activities, and complements the study in Chapter 8, which addresses the regulation of GHG emissions. Likewise, Chapter 11 discusses a life cycle assessment to analyze air emissions from ships. The book's intermodal approach could not be complete without a description of the role of trains and aviation in sustainable transportation and their relationship to the green corridors. Chapter 12 addresses this through its discussion of green rail transportation; Chapter 13 then presents the impact of emissions on air traffic (i.e., greener air transport). Similarly, Chapter 14 explains the relationships between emissions and inland navigation. Air and rail transportation and inland navigation with an environmental perspective that highlights the importance of multimodality within the green corridors is a valuable contribution of this work. Correspondingly, Chapter 15 provides some directions for future research related to green transportation. According to the authors, green corridors and transport-mode optimization could be the primary focus of development for additional research. Finally, an annex describing the *SuperGreen* project concludes the book.

A potential conclusion of this book is that reaching a win-win situation is only possible if transportation-related external costs are internalized so that companies are forced to choose an environmentally friendly solution.

Certainly, enhancing green transportation research is important for combating climate change and pollution-related health problems. Knowing that the book focuses on transportation, anything is said about last echelon of supply chain. Whereas production and distribution operations may be forced into greening their operations by internal and (or) external rules, that effort is useless if the consumer does not regard it positively. In that sense, behavioral research is missing in this book and would have been a welcome topic. However, as the title implies, seeking win-win solutions is of utmost interest. As the authors state, one can always reduce emissions by reducing trade between cities or countries and the optimal solution would be no trade at all because it would reduce emissions to zero, which is clearly an undesirable outcome.

Therefore, we highly recommend the book for an up-to-date literature review about green transportation logistics. The first part of the book provides an excellent picture of the current situation in environmental issues, enjoyable for any reader who is interested in the topic. The second part is intended for advanced OR/MS practitioners who desire to know how their traditional methodologies can be implemented to green supply chain operations from a practical point of view. Finally, this book could be used not only by practitioners or consultants, but also by master's and PhD students in the transportation arena who want to update their knowledge on the state of freight mobility in Europe.

References

- Dekker R, Bloemhof J, Mallidis I (2012) Operations research for green logistics: An overview of aspects, issues, contributions, and challenges. *Eur. J. Oper. Res.* 219(3):671–679.
- Demir E, Bektas T, Laporte G (2014) A review of recent research on green road freight transportation. *Eur. J. Oper. Res.* 237(3):775–793.
- European Commission (2007) Communication from the commission—Freight transport logistics action plan, COM(2007) 607.
- Psaraftis HN, Panagakos G (2012) Green corridors in European surface freight logistics and the SuperGreen project. *Proc. Soc. Behav. Sci.* 48(0):1723–1732.
- Ubeda S, Arcelus FJ, Faulin J (2011) Green logistics at Eroski: A case study. *Internat. J. Production Econom.* 131(1):44–51.

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