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BOOK REVIEW

T. A. Walls & J. L. Schafer (Eds.) (2006). *Models for intensive longitudinal data*. New York: Oxford University Press. 288+xxii pp. US$ 65.00. ISBN: 13-9780195173444.

The Scope

The book *Models for intensive longitudinal data* is an edited volume consisting of eleven chapters by 23 authors. These chapters are separate contributions without links to the other chapters. To escape the impression that this is a fragmented book, the editors Theodore A. Walls and Joseph L. Schafer start with a twelve-page Introduction. This Introduction gives an extensive overview of the chapters and the topics of the book. Also the relevance and some recurring themes regarding analyzing intensive longitudinal data are discussed.

The first chapters of the book deal with existing techniques for longitudinal analysis. The initial chapters focus on multilevel models—which in various places are called hierarchical linear models, random-effects models, or mixed-effects models—and on marginal modeling through generalized estimating equations. These models can be fitted to data entirely with existing statistical software, but special considerations arise when applied to intensive longitudinal data.

Later chapters introduce a variety of less well known but useful methodological tools from item response theory, functional data analysis, time series, state-space modeling, analysis of dynamical systems through stochastic differential equations, engineering control systems, and point process models. Real data examples are drawn from psychology, studies of smoking and alcohol abuse, brain imaging, and traffic engineering. Potential future applications to numerous other kinds of data are also used.

The Importance

The volume is devoted to the explanation and demonstration of new statistical approaches for the analysis of intensive longitudinal data. Many references on longitudinal analysis are already available. These references often tend to focus on examples on no more than about ten occasions. Traditional sources of longitudinal data—panels surveys, clinical trails, studies of human growth or development—are usually able to achieve their goals with only a few waves of measurement. As the capacity of computers to store and process information continues to increase, and as new technologies expand the possibility for data capture in diverse areas of science, longitudinal databases with a much higher intensity and volume of data are becoming commonplace. The ability of researchers to gather intensive longitudinal data has outstripped the capabilities of many data analysts to model them.

The interest in models for intensive longitudinal data was originally sparked by studies in behavioral science that rely on handheld computers, beepers, web interfaces, and other new tools for data collection. The editors of the book found that data with similar features arise in many disciplines. Moreover, thoughts of some kinds of scientific questions that give rise to intensive longitudinal data share much in common. These questions pertain to processing

and expressing of time-varying characteristics, to understanding the processes involved, and to learning what influences determine the course of these processes. The editors thought that the mainstays of longitudinal data analysis—multilevel models with random effect for individual subject—could address some of these questions if they were creatively applied and extended, but they were clearly inadequate for handling other issues. Other methods, such as time series analysis or spatial analysis, on the other hand, are designed for large numbers of occasions, but typically involve only a single time series rather than series from multiple subjects.

The editors of the book found that applied statisticians, biostatisticians, and methodologists in many fields are already analyzing intensive longitudinal data with varying degrees of success, but they had no common language with respect to common features of the data by which to communicate their success or to learn from one another. The aim of this book is to help to define the modeling of intensive longitudinal data as a distinct emerging field and to serve as the first step filling in the void.

The Intended Audience

The book is addressed to statisticians, data analysts, and methodologically oriented researchers in the social sciences, health sciences, engineering, and any other field in which longitudinal data are collected and analyzed. The eleven chapters presuppose an intermediate knowledge of probability and statistics, including the properties of random variables and vectors, basic matrix algebra, regression, and occasional simple calculus. The material is accessible to anyone with a graduate training in statistics or biostatistics and to those who, through involvement and experience with quantitative research, have gained a working knowledge of the existing tools of longitudinal modeling. The authors of the chapters do not shy away from technical material when essential, but avoid unnecessary details and jargon and provide enough discussion so that readers may grasp the major points without needing to understand every formula. Also every chapter tries to motivate and illustrate the methods with real data examples.

The volume will serve as a desk reference for investigators who collect and analyze ILD. Many of the chapters include succinct primers on popular methods for longitudinal analysis, making the book useful to a wide audience of statisticians, modelers, professional researchers, and advanced students. As a research tool, it will help to inform scientists who lead, design, and carry out intensive longitudinal data production studies and help them to develop appropriate analytic strategies. Furthermore, this volume can inspire more statisticians and methodologists to become involved in this field, to develop new methods, and expand the possibilities for modeling intensive longitudinal data in the years ahead.

Topics Not Covered

The book covers a large range of methods and techniques. Nevertheless, one omission is event-history models for recurrent events and for processes involving multiple spells or states. Another omission is the rapidly expanding body of techniques for causal inference, especially in the presence of time-varying confounding. Furthermore, the editors have not chosen to address techniques of variable reduction over many occasions of measurement. Finally, the editors did not consider the increasingly vast and important literature on inference issues for single subject analyses.

On Line Resources with the Book

Some authors of chapters of the book have supplied programs and source code examples. These are available on the website accompanying the book: www.oup.com/MILD. Nevertheless, the author of this review was not able to get access to this website, which is of course rather disappointing.

Other Books on the Subject

Although the authors claim to have written a unique book, several other books have the same purpose and the same intended audience, e.g., Horn and Collins (1991), Levine and Fitzgerald (1992), Keren and Lewis (1993), Newell and Molenaar (1998), Little, Schnabel, and Baumert (2000), Collins and Sayer (2001), Moskowitz and Hershberger (2002), Cohen, Cohen, West, and Aiken (2003), Fitzmaurice, Laird, and Ware (2004), Madeau and McArdle (2005), Bollen and Curran (2006), Boker and Wenger (2006), and Van Montfort, Oud, and Sattora (2006). These books are also editing volumes and also deal with longitudinal models in the behavioral and related sciences.

Conclusions

Over the past decade a widespread agreement has been developing, that serious causal analysis should be based on longitudinal data. The longitudinal models and analysis procedures in this book have been written by experts in longitudinal analysis and are representative for current longitudinal approaches in the behavioral and related sciences. The book therefore addresses most of the researchers in the behavioral and related sciences, such as psychology, sociology, education, psychology, economics, management, and medical sciences. The book also addresses methodologists and statisticians, who are professionally dealing with longitudinal analysis, to enhance their knowledge of the type of models covered and the technical problems involved in their formulation. In addition, the book offers applied researchers new ideas about the use of longitudinal analysis in solving their problems. Apart from the fact that several edited volumes deal with a similar approach and subject, the book is still interesting for many readers.

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