Applied Longitudinal Analysis.

Applied Longitudinal Analysis, Garrett M. FITZMAURICE, Nan M. LAIRD, and James H. WARE, Hoboken, NJ: Wiley, 2004, ISBN 0-471-21487-6, xix +506 pp., $89.95.

There have been a couple of previous books on longitudinal data that I have liked. (See Ziegel 1997 for a report on Hand and Crowder 1996 and especially Ziegel 2003 for the report on Diggle, Heagerty, Liang, and Zeger 2002.) This one, however, is certainly my favorite. This is a large and comprehensive book with a perfect balance between development of methods and application of methodology. The considerable set of examples uses statistical computing based on PROC MIXED, PROC GENMOD, and PROC NLMIXED in SAS. SAS files and output files are available at a website. The book is intended for both statisticians and other graduate students who have a good background in regression analysis and an interest in applications in the medical and health sciences.

The authors note in the Preface (p. xvi) that "one of our goals is to demonstrate that methods for longitudinal analysis are special cases of more general regression methods for clustered data." This perspective is offered immediately in Chapter 1, "Longitudinal and Clustered Data." The authors point out that sampling from naturally occurring groups can give rise to clustered data where measurement correlations have other causes besides time relationships. The regression modeling context for longitudinal data is established in the first chapter. Following an introduction to the concepts specific to longitudinal data, the methods for modeling are laid out in the two major parts: linear models for continuous longitudinal data and generalized linear models for discrete longitudinal data. The last part of the book focuses on the relationship of modeling for longitudinal data to more generalized models for clustered data.

The models for continuous data are the ones that can be estimated using PROC MIXED. Following a couple of chapters on estimation and inference are chapters on modeling the mean as a response profile, modeling the mean with a parametric curve, modeling the covariance, and modeling linear mixed effects. This part of the book concludes with a chapter on residuals analyses and other diagnostics.

The material on generalized linear models begins with an overview chapter and an introduction to PROC GENMOD. There are also chapters on generalized estimating equations and on generalized linear mixed-effects models. The first of these chapters discusses PROC NLMIXED. The topics of the last part of the book include approaches for missing data, aspects of experimental design, repeated-measures methods, and multilevel models. An Appendix gives the necessary background in matrix algebra.

REFERENCES

Diggle, P., Heagerty, P., Liang, K., and Zeger, S. (2002), Analysis of Longitudinal Data (2nd ed.), New York: Oxford University Press.

Hand, D., and Crowder, M. (1996), Practical Longitudinal Data Analysis, New York: Chapman & Hall.

Ziegel, E. (1997), Editor's Report on Practical Longitudinal Data Analysis, by D. Hand and M. Crowder, Technometrics, 39, 112.

_____ (2003), Editor's Report on Analysis of Longitudinal Data (2nd ed.), by P. Diggle, P. Heagerty, K. Liang, and S. Zeger, Technometrics, 45, 181.