A brief examination of the files provided shows that the code generally works, but the .R files are incomplete, in that they just say in comments, “you need to load this package” or “use this data.” It would have been much better, for teaching purposes, if the author provided an R package tied to the book.

Michael Friendly
Chair, Quantitative Methods,
Psychology Department,
York University,
Toronto, Canada

ZUCCHINI, W. and MACDONALD, I. L. **Hidden Markov Models for Time Series: An Introduction Using R**. CRC Press, Boca Raton, Florida, 2009. Xix + 275 pp. \$82.95/£50.99, ISBN 9781584885733.

In 1997, Iain MacDonald and Walter Zucchini published their monograph *Hidden Markov and Other Models for Discrete-Valued Time Series*. Twelve years late the same authors have produced what is essentially the second edition of the book. Two changes: the title is now simply *Hidden Markov Models for Time Series*, and the order of the authors has switched. The reason to remove the other models for discrete-valued time series is, say the authors, that “most of the ‘other models’, though undoubtedly of theoretical interest, has led to few published applications.” On the other hand, the field of hidden Markov models (and their close counterparts, latent class transition models) has exploded. Hence the new book focuses only on this class of models, and in fact mainly on a particular subclass, those where the observation distribution is Poisson.

The first half of the book deals with the probabilistic and statistical theory. The first chapter describes mixture models, Markov chains, and various reduced parameterizations of higher-order Markov chains. Here a reference to the work by Fernández and Galves (2002) would have been a useful addition. The hidden Markov model and its likelihood are introduced in Chapter 2, and Chapter 3 deals with optimization of the likelihood. The Baum–Welch expectation–maximization algorithm is introduced in Chapter 4, although the authors are not convinced that it has an advantage over other ways of computing and optimizing the likelihood.

In Chapter 5, tools for forecasting and state estimation (with a term borrowed from speech recognition state estimation is called decoding here) are described. Model selection (using Akaike information criterion and Bayesian information criterion) and model assessment (using pseudoresiduals, i.e., probability integral transformation of the marginal distribution) are the topic of Chapter 6. Bayesian analysis, somewhat hampered by the issue of label switching or nonuniqueness of the coding of the states, is described in Chapter 7, and some extensions to more complicated observation distributions are described in Chapter 8, concluding the theoretical part. Throughout these chapters the tools are illustrated using worldwide data on large earthquakes.

The second half of the book deals with applications. These are essentially the same (although sometimes carried a little further) as those in the last chapter of the first edition. They include epileptic seizures, wind directions, Old Faithful eruptions, financial data, etc. Throughout the authors carry out some analysis, which is interesting, but unfortunately stop short of answering the scientific questions that must have motivated the collection of the data. In some examples the analysis could easily have been a little more sophisticated. In the wind direction example, it would have made sense to use atmospheric variables as covariates, so that one could see what weather conditions would lead to a 180° wind direction change (no such event was observed, but had a positive probability under the fitted model).

The book has a subtitle, *An Introduction Using R*. The R code used for fitting Poisson hidden Markov models in the book is given in an appendix, and is also available from the first author’s website, `http://www.statoek.wiso.uni-goettingen.de/cms/user/index.php?lang=de&section=research.software.` There is, however, a recent R package on CRAN (Comprehensive R Archive Network) called HiddenMarkov, written by David Harte. It has almost the same functionality as the functions in the book, including residual analysis, state estimation, etc., and a wider range of observation distributions. The only thing missing from `HiddenMarkov` is calculation of Akaike information criterion and Bayesian information criterion, which is easily done from the likelihood.

Overall, this book has a very nice mix of probability, statistics, and data analysis. It is suitable for a course in stochastic modeling using hidden Markov models, but also serves well as an introduction for nonspecialists.

References

Fernández, R. and Galves, A. (2002). Markov approximations of chains of infinite order. *Bulletin of the Brazilian Mathematical Society* **33,** 295–306.

Harte, D. (2011). *HiddenMarkov: Hidden Markov Models. R package version 1.4–4*. Wellington, New Zealand: Statistics Research Associates. Available at: `http://cran.at.r-project.org/web/packages/HiddenMarkov` (accessed July 26, 2011).

MacDonald, I. L. and Zucchini, W. (1997). *Hidden Markov and Other Models for Discrete- valued Time Series*. New York: Chapman & Hall/CRC.

Peter Guttorp
University of Washington and Norwegian Computing Center,
Department of Statistics and SFI^2,
Seattle and Oslo

BERRY, S. M., CARLIN, B. P., LEE, J. J., and MULLER, P. **Bayesian Adaptive Methods for Clinical Trials.** CRC Press, Boca Raton, Florida, 2011. Xvii + 305 pp. \$89.95/£57.99, ISBN 9781439825488.

The use of (both Bayesian and non-Bayesian) adaptive designs and methods in clinical trials is becoming increasingly popular, with much theoretical and practical work being done in recent years. This book, written by a well-known team of Bayesian experts, seeks to provide an overview of Bayesian adaptive approaches for clinical trials. This is illustrated by examples based on actual clinical trials. The book adopts a pragmatic approach, with strong emphasis on encouraging the implementation of the methods discussed. To facilitate this, R and WinBUGS (which is one of standard tools for implementing Bayesian methods in practice) codes are provided.

The book is organized into six chapters. It starts with a brief overview of statistical approaches for clinical trials including the role of adaptivity in clinical trials, and a comparison of the differences between Bayesian and frequentist approaches. It then moves on to discuss Bayesian inference in greater detail, with Chapter 2 forming a nice stand-alone chapter that would be useful for anyone wanting an introduction to Bayesian methods, particularly in the context of medical research. The remaining two thirds of the book then focus on specific types of clinical trials. In particular, the authors devote one chapter each to phase I, phase II, and phase III clinical trials, followed by a final chapter on "special topics," covering a number of issues and problems that either cut across or do not fit neatly into the categories of a phase I, II, or III trial. Chapter 3 on phase I trials is devoted almost entirely to a discussion of methods relating to dose finding clinical trials involving toxic compounds. Chapter 4 on phase II trials discusses designs for both single arm as well as multiarm phase II trials. It provides a summary of some of the current commonly used (frequentist) phase II designs, before moving on to discuss designs that incorporate Bayesian adaptive features and decision theoretic designs. Chapter 5 looks at phase III randomized controlled trials. This is arguably the type of clinical trial that comes to most people's minds when they think of a clinical trial. Specific issues covered include adapting the sample size, futility analysis, and dropping arms, with issues relating to (adaptive) randomization having already been covered in Chapter 4. Finally, Chapter 6 deals with common issues that arise in practical clinical trials such as incorporating historical data, handling multiplicity, and subgroup analysis.

Although there are undoubtedly some advantages of organizing the book in this manner, the definition of what constitutes the different phases of clinical trials does have some variation from disease to disease. Here, the oncology experience of the authors is evident in the choice of topics covered in each chapter (particularly the chapters on phase I and phase II trials). The authors do allude to this, but indicate that "the methods are equally applicable in a wide variety of noncancer drug and device settings." My own sense is that although this is probably true, there are a number of aspects of cancer clinical trials that are quite different from those in other diseases, so it would probably be fair to say that researchers/statisticians who work in oncology clinical trials would especially benefit from this book.

Having said that, much of the book should be accessible to nonstatistician readers with interest/involvement in clinical trials across different disease areas, while even Bayesian medical statistician readers should find the book to be a helpful resource. The authors, while clearly advocating the use of Bayesian approaches, nevertheless take a very pragmatic approach to the issue. They argue for Bayesian methods that demonstrate good frequentist properties and that are practical to use. This is a refreshing change from some other books and papers that also advocate Bayesian methods, but which while theoretically interesting, are difficult to implement in practice.

In summary, I found this book to be well written and interesting. It is very timely given the interest in adaptive designs, and should be a useful resource for statisticians and nonstatisticians alike interested in adaptive clinical trials from a Bayesian perspective.

Say Beng Tan
National Medical Research Council,
Singapore

KLEINMAN, K. and HORTON, N. **SAS and R Data Management, Statistical Analysis, and Graphics**. CRC Press, Boca Raton, Florida, 2010. Xix + 323 pp. $71.95/£45.99, ISBN 9781420070576.

R and SAS are currently two of the most used statistical software packages. SAS is commercial software that has been around for over 30 years. R is an open source programming language for statistical analysis, with syntax very close to the software S that was first available almost 20 years ago. In the recent years, R popularity has increased enormously while SAS has kept a strong user basis among statistics practitioners. Currently both packages are used by analysts worldwide to carry on innumerable data management, analysis, and graphical representation tasks ranging from very basic numerical operations to the fitting of complex statistical models. Additionally a vast library of code is publicly available for both programs in the form of SAS macros, R packages, or even snippets of documented code in the public domain. Also, both systems are used as laboratory tools in the teaching of a variety of data-analysis courses at the undergraduate, graduate, and professional level. Consequently it is not uncommon to come across the question from an experienced SAS or R user about how to "translate" code or how to perform in one system a task that has been documented for the other. This book is timely because it addresses the current issue of comparative R and SAS programming.

The book covers a large number of statistical or data-management tasks without going into much depth in each. Tasks are grouped into six very wide sections or chapters. Data-management section addresses topics such as data input, output and manipulation, matrix operations, basic programming (e.g., control structures, interaction with OS), and mathematical functions and probability distributions. Basics statistics procedures include descriptive univariate and bivariate statistics, contingency tables, and mean comparisons in two populations. Two sections are devoted to linear models covering from basic regression and analysis of variance to generalized linear mixed models. A section on graphics reviews the most commonly used plots in descriptive analysis (e.g., histograms, box plots, scatter plots, etc.), and it includes details on how to customize figures by adding extra symbols, smooth fit lines, and various annotations. Finally a miscellaneous section touches on power computation, simulations, and a few advanced models (e.g., Bayesian Poisson regression). The book also includes introductory appendixes to SAS