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Book Reviews

Books for review are to be sent to the Book Review Editor Gösta Forsman, Department of Mathematics, University of Linköping, S-581 83 Linköping, Sweden.

Bradburn, N.M. and Sudman, S., Polls and Surveys: Understanding What They Tell Us. Jossey-Bass, Inc., Publishers, San Francisco, CA, 1988. ISBN 1-55542-098-2. xx + 249pp., $22.95.

Polls and Surveys is an extremely well-written book that should appeal to the experienced survey professional and the novice alike. Its treatment of the fundamental principles underlying survey research and discussion of many of the issues facing the profession provide a comprehensive introduction into the current state of survey research.

In this volume the authors cover a broad range of topics, including the purposes of polls and surveys, a brief history of the development of survey research, the types of organizations that conduct surveys, and an explanation of how survey data are collected. The description of how survey data are collected includes chapters on different modes of data collection, respondent selection, question wording, analyzing data, and sources of error.

For those unfamiliar with survey research, this book provides a fairly complete overview, written in a relatively simple, straight-forward style. The strength of *Polls and Surveys* for polling professionals is not that there is much new in this work – an occasional data source or historical reference perhaps – but that a solid, easy-to-understand description of the elements of polling is organized and available in a single work. The authors note that one of their objectives in writing this book was to provide a work that pulled together the many aspects of surveys and treated the "whys" of polling as well as the "hows." In this, they have succeeded admirably.

In addition to the overview on conducting polls that this work supplies, its merit lies in some of the "gems" about survey research it provides. In a single sentence or paragraph, for example, the authors provide valuable information about topics ranging from the Current Population Survey to the importance of personality traits for interviewer

success and the reasons for weighting data. A seven-line summary (p. 107) of the relative costs of personal, telephone, and mail surveys is indicative of the type of clear, concise treatment of the topics in this work. Their statement concerning the quality of research (p. 75) bears repeating: "We have often observed studies unable to meet their major objectives because they were so underfunded that the research design that emerged was inadequate. Such research results in wasted money and decreased confidence in the use of opinion and market research and is best left undone if it cannot be done right." If this caution prevents even one poorly designed study from being conducted, it will have served its purpose well.

One modification I would make to this work would be in the section on data analysis. The presentation of casual models and the discussion of normalized regression coefficients and sampling variance is at a level above the rest of the book and may discourage readers who would otherwise find the topics quite understandable. Instead, I would have preferred a slightly more extended discussion of some of the pitfalls of polling, particularly the limitations of pseudo-polls and "overnight" surveys. I am also less optimistic than the authors about the future of polls, and believe that the obstacles presented by considerations such as declining response rates, the increased use of answering machines to screen calls, and legal restrictions will present a greater challenge to the profession. My differences with the authors, however, represent only minor points; overall, *Polls and Surveys* is an excellent book that can serve as a handy reference work for survey professionals, as a text in an introductory course on survey research, or as an overview on the topic for anyone with a general interest in public opinion research.

Robert W. Oldendick
University of South Carolina
Columbia, SC
U.S.A.

Cohen, A.C. and Whitten, B.J., Parameter Estimation in Reliability and Life Span Models. Marcel Dekker, Inc., New York, 1988. xv + 394 pp.

This book discusses methods of estimation for the commonly used exponential, Weibull, gamma, and lognormal distributions and the less commonly used Rayleigh, Pareto, inverse Gaussian, and generalized gamma distributions. The authors discuss both complete and right censored data, but do not discuss regression analysis.

In the past 15 years, many books have been published on life and survival data analysis. This book, however, is different from the others because it gives detailed treatment of estimation for models with threshold parameters (e.g., the three-parameter Weibull and lognormal distributions). These "nonregular" models have sample spaces that depend on the unknown threshold parameter and thus the usual regularity conditions do not hold and nonstandard asymptotic theory is required (e.g., Smith 1985). The authors have published many papers in this area and most of this work has been included, along with some extensions and other material.

It is well known that moment estimators can be inefficient. Also, as reviewed by the authors, when fitting threshold parameter models, standard maximum likelihood (ML) methods, which are commonly used with censored data, can result in problems like the existence of unbounded likelihoods. For uncensored data, the authors suggest, as an alternative, modified moment estimators which use the information in the first order statistic instead of the third sample moment to estimate the distribution parameters. For censored data problems, they suggest a similar modification for ML estimators.

Giesbrecht and Kempthorne (1976), using the lognormal distribution, show that if one simply writes down the "correct" likelihood that accounts for the finite precision of our data, the likelihood is a prob-

ability, the problem of unbounded likelihood functions disappears, and the method of ML works. The necessary computations are somewhat more complicated, but this is not a problem because computers have to be used anyway. Also, this approach can be applied to the other models with threshold parameters. Cheng and Amin (1983) give another alternative for handling this problem. Comparison among the authors' modified estimators and these other alternatives would be useful.

This book concentrates almost exclusively on point estimation. Although the authors generally give asymptotic variances and covariances, little attention is given to competing methods for setting statistical intervals. For most complicated problems, like the ones treated in this book, there are no exact methods for constructing such intervals and approximations are needed. Users of these approximations need to know something about their adequacy. From my experience, relying on asymptotic normal theory can give seriously incorrect results; with unknown threshold parameters, the danger could be worse. Alternatives that use the likelihood function to set intervals (by inverting likelihood ratio tests) seem to work much better in most settings. Graphs of profile likelihoods are invaluable in complicated inferential problems like these, but are not discussed in this book. Simulation based methods like the parametric bootstrap also look promising but need further investigation. In a most interesting paper, which nicely complements this book, Smith and Naylor (1987) discuss profile likelihoods and compare Bayesian and likelihood based methods of making inferences for the three-parameter Weibull distribution. The basic ideas, however, also apply to the other distributions covered in this book and, indeed, to most other commonly used statistical models.

The authors provide graphs of the density functions for most of the distributions, a graph of Pearson curves, and a brief discussion of hazard plotting (but only for the Weibull distribution). Still, the reader of this book does not get a clear picture about how to choose among the different distributional models.

This writing style is clear and easy to read and is at a level that will make it accessible to readers who have had at least one course in mathematical statistics. It contains much information, a long list of references, many tables, and a listing of FORTRAN computer programs. It uses both real and simulated data sets to illustrate the methods, but there is little attention to practical details beyond the computation of estimates for unknown parameters and their variances and covariances.

This book will be a useful resource for individuals who will do research in this area. For individuals who are primarily concerned with practical applications and for instructors looking for a text book, however, there are better alternatives.

References

Cheng, R.C.H. and Amin, N.A.K. (1984). Estimating Parameters in Continuous Univariate Distributions with a Shifted Origin. Journal of the Royal Statistical Society, ser. B, 45, 394–403.

Giesbrecht, F. and Kempthorne, O. (1976). Maximum Likelihood Estimation in the Three-Parameter Lognormal Distribution. Journal of the Royal Statistical Society, ser. B, 38, 257–264.

Smith, R.L. (1985). Maximum Likelihood Estimation in a Class of Non-regular Cases. Biometrika, 72, 67–90.

Smith, R.L. and Naylor, J.C. (1987). A Comparison of Maximum Likelihood and Bayesian Estimators for the Three-Parameter Weibull Distribution. Applied Statistics, 36, 358–369.

William Q. Meeker, Jr.
Iowa State University
Ames, IA
U.S.A.

Groves, R.M., Biemer, P.P., Lyberg, L.E., Massey, J.T., Nicholls II, W.L., and Waksberg, J. (Eds.), Telephone Survey Methodology. John Wiley & Sons, New York, 1988. ISBN 0-471-62218-4. xx + 581 pp., £28.75.

The book is the set of the invited papers (32) presented at the International Conference on Telephone Survey Methodology in November 1987. The conference was an outstanding success. Over 400 participants from throughout the world attended instead of the 150–200 expected. The success of the conference is reflected in the standard of the volume. The book hangs together more than is usual for a volume of papers, due to the fact that the book was planned before the conference and papers were invited to cover the main issues associated with telephone surveys. It is an excellent collection and reflects the work done by the editors. It demonstrates the value of a conference restricted to a theme of topical interest.

Other papers from the conference appeared in a special edition of the Journal of Official Statistics (vol. 4, no. 4, 1988), which provides a useful complement to this book.

The volume covers research on improving quality, weaknesses in current methods, and the administrative and logistic problems in conducting telephone surveys. It is aimed at household survey researchers and graduate students with prior training in survey research as well as people thinking of conducting their first telephone survey. People already involved in telephone surveys would also find a lot of useful material in this book. Most of the papers would be of interest to practitioners with only a basic knowledge of sampling theory. Readers should be aware that the book deals with household surveys only and does not cover data collected from businesses by telephone.

The book is divided into six sections with each of the editors responsible for a section. They have also prepared an overview style paper at the beginning of each section. This has worked well. The editors have been able to give sufficient attention to each paper in their section so that they are of good standard without the overall continuity of the volume being lost. The six sections are:

- Coverage of the Household Population by Telephones
- Sampling for Telephone Surveys
- Nonresponse in Telephone Surveys
- Data Quality in Telephone Surveys
- Computer-Assisted Telephone Interviewing
- Administration of Telephone Surveys.

There are 4-7 papers in each section.

I found the overview chapters to be particularly useful, especially Lepkowski's chapter which reviewed telephone sampling designs (although possibly too much emphasis on Mitofsky-Waksberg designs and not enough on dual frame designs); Groves and Lyberg's chapter reviewing studies of nonresponse in telephone surveys; Biemer's extensive review of studies of the effect of telephone interviewing compared with other modes; and Nicholls's excellent summary of CATI developments.

A comprehensive bibliography is included, which covers unpublished as well as published material. This is an important feature in view of how much of the experience in telephone interviewing is contained in internal reports.

For anyone involved in telephone surveys, the book provides essential background on both the shortcomings and advantages of telephone interviewing as well as collecting most of the latest developments in telephone interviewing research. It is highly recommended to all who are interested or involved in telephone surveys.

David Steel
Australian Bureau of Statistics
Belconnen
Australia

Hochberg, Y. and Tamhane, A.C., Multiple Comparison Procedures. John Wiley & Sons, New York, 1987. ISBN 0-471-82222-1. xxii + 450 pp., £38.95.

The book is a comprehensive modern account of multiple statistical inference. After a short general introduction, Chapter 2 gives the basic concepts and results for multiple comparison methods. Chapter 3 includes the theory of single step multiple comparison procedures of Scheffé and Tukey type. Stepwise procedures for pairwise comparisons and design of experiments for multiple comparisons are treated in Chapters 5 and 6. These chapters comprise Part I which is devoted to fixed effect linear models with homoscedastic normal errors.

Part II discusses other types of models. Chapter 7 is devoted to procedures for one-way layouts with unequal variances followed by Chapter 8 on two-way layouts and random covariates. Different types of distribution-free procedures as well as the new robust methods are presented in Chapter 9. Scattered problems like procedures for categorical data, comparison of variances, graphical procedures, procedures for interactions and partitioning are collected in Chapter 10. The last chapter deals with optimality. This is followed by appendixes on general theory (Gabriels STP, stepdown procedures, useful inequalities, and distribution theory) and a number of useful tables.

The book covers the subject very well and it also includes recent works up to 1986. It will probably replace Miller (1981) as the standard reference text on multiple statistical inference. Beside covering much new material, the present book also devotes more space to explaining concepts, theories and methods than Miller (1981) which just presented methods and their properties.

There is a vast and rapidly growing literature on multiple comparison and it is almost impossible to include everything. Nevertheless, this book covers a great deal and my impression is that there are enough references for all general use. Researchers in particular subfields may, of course, find some references missing, but I think that this is unavoidable.

Despite its volume the book could be used as a text for graduate students with, of course, a proper selection of material.

My general opinion of the book is that it is very well written and provides solid insights into the subject. I am convinced that it will serve as a general reference book and as a comprehensive textbook for several years. It should be of great use to researchers and practitioners in statistics.

References

Miller, R.G. Jr (1981). Simultaneous Statistical Inference. 2nd Edition. Springer Verlag (1st Edition McGraw-Hill 1966).

Sture Holm
University of Göteborg
Göteborg
Sweden

Israëls, A., Eigenvalue Techniques for Qualitative Data. DSWO Press, Leiden, 1987. ISBN 90-6695-020-X. 302 pp., Dfl. 35.50.

Correspondence analysis and canonical correlation analysis have been explored as methods for analysis of qualitative data since early work by H.O. Hirschfeld and R.A. Fisher published between 1935 and 1940. These approaches to analysis of data are distinguished by their use of data-dependent scores for the categories of qualitative variables. Scores are chosen to optimize criteria developed from correlation analysis or regression analysis of continuous variables. In practice, the scores, regression coefficients, and correlation coefficients used in the analysis are computed by computation of eigenvalues and eigenvectors or by computations of a singular value decomposition. Although the earliest work in this area considered relationships between two qualitative variables, the basic techniques of correspondence analysis and canonical

correlation analysis of qualitative data may be generalized in a variety of ways to apply to relationships among more than two qualitative variables.

Despite the early introduction of correspondence analysis and canonical correlation analysis by distinguished statisticians, these and related analytical tools have entered into statistical practice rather slowly. Before computers became widely available, the need to compute eigenvectors and eigenvalues of matrices created a natural impediment to their adoption; however, even after computation gradually became less and less a problem, analysis of qualitative data by optimal scores did not become widespread, especially outside of Europe. Several explanations can be considered. The scoring techniques were based on concepts originally developed for continuous data, so their appropriateness for discrete data was not self-evident. The analyses based on optimal scores had very little supporting theory designed to provide rigorous statistical tests, estimated standard deviations, and confidence intervals. Log-linear models and latent-class models specifically developed for qualitative data became increasingly familiar to researchers. These latter methods of analysis were associated with formal tests of fit and both exact and approximate confidence intervals and test procedures. The models developed possessed considerable flexibility and had meaningful interpretations.

Over time, correspondence analysis and other techniques based on data-dependent scores have gradually returned to statistical practice. Generally, work on correspondence analysis and canonical analysis such as Benzécri et al. (1973) has emphasized exploratory description of data, with relatively little consideration given to formal inference, although exceptions such as O'Neill (1978a,b) and Haberman (1981) exist. Formal models have also been proposed in which restrictions are placed on canonical models (Gilula and Haberman 1986, 1988) and similar models have also been used with a parametrization in terms of logarithms of joint probabilities (Goodman 1980). These analyses have used maximum likelihood estimates to construct test statistics and confidence intervals.

Israëls' book describes eigenvalue techniques for analysis of qualitative data within a somewhat traditional context. As suggested by the title, analysis involves scores which correspond to eigenvectors and eigenvalues of matrices. Scores based on maximum likelihood or on a logarithmic parametrization of cell probabilities do not appear, and relationships with latent-class models considered in Gilula (1979) do not appear. Most analyses are exploratory in nature. The book differs somewhat from traditional books on correspondence analysis in its serious consideration of inferences based on complex samples and in the variety of techniques presented. The book makes extensive use of data from the Netherlands Central Bureau of Statistics, and analyses of these data are quite thoughtful. As in other traditional work on correspondence analysis, there is relatively little emphasis on meaningful parameter interpretations and on models with probabilistic interpretations.

As described in the Introduction (Chapter 1), topics range from traditional correspondence analysis for two qualitative variables (Chapter 3), multiple correspondence analysis for several qualitative variables (Chapter 4), composite, conditional, and partial correspondence analyses for analysis of relationships of two sets of qualitative variables (Chapter 5), qualitative regression analysis for prediction of one qualitative variable by several qualitative variables (Chapter 6), qualitative canonical correlation analysis for analysis of relationships between sets of qualitative variables (Chapter 7), and qualitative redundancy analysis to explore relative contributions of different variables to the observed relationships (Chapter 9). In addition, Chapters 2 and 8 and Appendix C review material from multivariate analysis of continuous data. The reader interested in further material has access to an extensive bibliography. Some attention is given to estimation of parameter variances, especially in Appendix B.

The book is generally clearly written, although the language is occasionally

awkward. The book should be readily read by a reader with a good knowledge of matrix algebra and reasonable familiarity with regression analysis. Nonetheless, this reader at times felt overwhelmed by a vast number of methods with associated matrices and vectors in the various chapters that were similar but not quite the same. This problem particularly afflicted the reader in comparisons of Chapters 5 and 7. An investigator who wished to implement the methods presented should be able to do so given access to computer routines cited by the author or given access to standard software packages which permit ready manipulation of matrices and vectors.

The reviewer found few errors in the papers. The one problem of some interest arose in the introductory chapter. The citation on log-linear models does not take into account their use with preassigned scores for categories.

On the whole, the book is a valuable resource for any investigator interested in analysis of qualitative data by assignment of scores to variable categories. The choice of examples may make the book particularly attractive to statisticians interested in survey research.

References

Benzécri, J.-P. et al. (1973). L'analyse des données. Tome 2: Correspondances. Dunod, Paris.

Gilula, Z. (1979). Singular Value Decomposition of Probability Matrices: Probabilistic Aspects of Latent Dichotomous Variables. Biometrika, 66, 339–344.

Gilula, Z. and Haberman, S.J. (1986). Canonical Analysis of Contingency Tables by Maximum Likelihood. Journal of the American Statistical Association, 81, 780–788.

Gilula, Z. and Haberman, S.J. (1988). The Analysis of Multivariate Contingency Tables by Restricted Canonical and Restricted Association Models. Journal of the American Statistical Association, 83, 760–771.

Goodman, L.A. (1981). Association Models and Canonical Correlation in the Analysis of Cross-Classifications Having Ordered Categories. Journal of the American Statistical Association, 76, 320–334.

Haberman, S.J. (1981). Tests for Independence in Two-Way Contingency Tables Based on Canonical Correlation and on Linear-by-Linear Interaction. Annals of Statistics, 9, 1178–1186.

O'Neill, M.E. (1978a). Distribution Expansions for Canonical Correlations from Contingency Tables. Journal of the Royal Statistical Society, ser. B, 40, 303–312.

O'Neill, M.E. (1978b). Asymptotic Distributions of the Canonical Correlations from Contingency Tables. Australian Journal of Statistics, 20, 75–82.

Shelby J. Haberman
Northwestern University
Evanston, IL
U.S.A.

Saris, W.E. (Ed.), Variation in Response Functions: A Source of Measurement Error in Attitude Research (Series on Sociometric Research, No. 3). Sociometric Research Foundation, Amsterdam, 1988. ISBN 90-70947-08-0. xix + 233 pp.

This edited collection consists of three parts:

Part 1 demonstrates the existence of differences in response functions between respondents. By this the author means that different persons, even with the same latent opinion, may express their opinion differently in their response, i.e., reliably give different responses. (Chapters 1–5.)

Part 2 discusses the implications of the presence of interindividual differences in response functions for the interpretation of survey research results about opinions. It is concluded that the presence of such differences raises severe interpretational problems, for instance, when studying relationships between different opinions. (Chapters 6–10.)

Part 3 suggests tentative ways of taking into account variation in response behavior. It is concluded that corrections after data have been collected are difficult and that the preferable way is to provide the respondents with instructions that minimize the scope for different response functions. They should be given at least two reference points chosen in such a way that the relation is fixed between the subjective opinion scale and the response scale. (Chapters 11–15.)

The book contains an author index but no subject index. References are given after each chapter. Although it is an edited collection, real effort has been given to fit each chapter into the structure of the book. Partly as a consequence of this, the book is easy to read in spite of the complex topic. The spacious typography with not so much text to a page adds to this.

One, however, misses a discussion of the relation of response function thinking to modern psychometric theory about errors stressing different sources of variance in observed scores and avoiding a true score concept. Nevertheless, the basic assumptions made by the author appear reasonable. As I understand it, he assumes that there exists for each individual a true latent value for the opinion about a specific issue but that the function through which this value is translated into an observed score can be different for different persons.

Accepting this starting point it appears clear that, if large differences in response functions exist for certain studied opinions, this raises severe problems for the interpretation of the results. This point is made clear in many chapters in the book.

What is somewhat less clear is the demonstration of different response functions for opinions. A latent opinion cannot be studied directly and rather indirect ways had to be used by the authors. The judgement of the length of lines, which is used extensively in experiments by the authors, provides a useful starting point for studying the phenomenon of interindividual differences in response functions. Nevertheless, it is not sufficient for drawing conclusions about these for opinions. When studying the phenomenon empirically for opinions it is hard to fulfill the necessary assumptions (especially to be able to fix the same latent opinion value for different persons). Nevertheless, in my opinion the authors make a reasonable case for the existence of such differences.

The advice on how to make instructions that minimize differences in response functions appears to be sound. This is a point of great interest to the survey practitioner.

To sum up, this is a book of considerable interest to the survey researcher. It stimulates thinking about the fundamental assumptions concerning the measurement and study of attitudes and points to potentially serious problems with current research practices. Practical suggestions are also given for dealing with these problems.

Lars R. Bergman
Statistics Sweden
Stockholm
Sweden

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References should be given in accordance with the following style:

Lininger, C. and Warwick, D. (1975). The Sample Survey, Theory and Practice. New York: McGraw-Hill.

Pomeroy, W.B. (1963). The Reluctant Respondent. Public Opinion Quarterly, 27, 287–293.

Platek, R., Singh, M.P., and Tremblay, V. (1978). Adjustments for Non-response in Surveys. In Survey Sampling and Measurement, ed. N.K. Namboodiri, New York: Academic Press.

National Center for Health Statistics (NCHS) (1965). Health Interview Responses Compared with Medical Records. Vital Health Statistics, P.H.S. Publication no. 1000, ser. 2, Washington, D.C.: Government Printing Office.

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