

# Reviews of Books and Teaching Materials

## Basic Business Statistics: A Casebook.

Dean FOSTER, Robert A. STINE, and Richard P. WATERMAN. New York: Springer-Verlag, 1997. 256 pp., \$29.95. ISBN: 0-387-98246-9.

## Business Analysis Using Regression: A Casebook.

Dean FOSTER, Robert A. STINE, and Richard P. WATERMAN. New York: Springer-Verlag, 1997. ix + 341 pp., \$29.95. ISBN: 0-387-98245-0.

The profession's views about how best to teach introductory business statistics courses are changing. Proponents of the new pedagogues argue that we must present statistics as a meaningful tool of analysis rather than as a seemingly disjointed collection of formulas. Detractors protest that proponents go too far. Foster, Stine, and Waterman (FSW) come down clearly on one side of this debate: "Virtually no formulas and very little math appears. Surprisingly, rather than making our job easier, it actually makes it far more of a challenge. No more hiding behind endless calculations. . . . We will be involved in the *more challenging* but rewarding work of understanding and interpreting the results and trying to do something useful with them!" (emphasis mine). It takes courage to suggest that the fuzzy world of messy data and interpretation of results are among the most difficult, yet useful, messages to convey to first-time statistics students. I applaud FSW's contribution to the debate.

Like the phrase data analysis, the word "cases" has become a catch-all term. Some cases are actually short homework problems; others, along the line of Harvard business cases (e.g., Shleifer and Bell [1995]), enmesh the statistical analysis within a complex organizational setting. Some case writers end their cases with a proposed solution, while others supply the data set and scenario, but no solution. Cases can give detailed guidance or virtually no hint about how to approach the problem. As output from the analysis, certain cases require only numerical answers and others are more suited to preparation of a business memo or written analysis. Most case writers encourage in-class discussions of the methods and results. Finally, the profession continues to debate whether our goals are best achieved by using only real data. Along these many dimensions, the FSW cases might be categorized as guided tours (with numerical/technical solutions) of realistic business problems using both real and manufactured data. Additional assignments at the end of each casebook allow students to go it alone.

The companion volumes by FSW are appropriate for introductory business courses. The authors have used them in MBA classes at Wharton. I find the first volume, *Basic Business Statistics*, appropriate for an undergraduate course as well. The manuscripts are divided into "classes" which tackle various statistical concepts. Material becomes increasingly complex as the data in later sections exhibit multiple deviations from ideal conditions. The casebooks use a combination of explanatory text and software output to guide the student. Almost no mathematics appears in these volumes; the authors make traditional texts available to their students who are curious about the technical details.

Students require only college algebra to tackle the easier cases. Advanced cases delve more heavily into transformations of data than is typically seen in introductory courses (a plus in my mind), requiring an understanding of logarithmic functions, for example. Even a bit of differential calculus is used in the second volume to find optimum values of estimated regression equations. Even though some students may find this intimidating, appropriate management by the instructor can help relieve such anxieties. The casebooks supply JMP output and commands (and Minitab commands in an appendix); very little prior knowledge of the software is needed.

The casebooks have appropriate topical coverage of statistics and business. Scattered throughout are examples from: finance (stock prices and returns, portfolio analysis); economics (demand estimation and prediction, profit maximization, elasticities); human resources management (employee compensation, wages, and benefits); manufacturing, operations, and process re-engineering; marketing (satisfaction surveys, direct mail advertising); real estate (house prices and construction); and accounting (cost analysis). *Basic Business Statistics* covers statistical concepts seen in most introductory courses (graphical methods through simple regression) except random variable theory, with very little coverage of probability (another

plus). *Business Analysis Using Regression* includes simple and multiple regression analysis and interpretation, residual analysis, categorical predictor and response variables, and intermediate univariate time-series analysis. Experimental design and outlier analysis appear in various forms in both volumes.

The authors use class time to walk through the cases with their students, taking tangents as necessary. I see these casebooks as ideal for on-line or distance education courses, as much of the material can be self-paced and self-directed.

Although cost may seem prohibitive to some instructors, this is not a problem specific to the FSW casebooks (which I find to be reasonably priced). To supplement these cases, most instructors will feel the need for software and/or a traditional textbook. The cost issue is less crucial to instructors willing to put a backup textbook on reserve and whose computer labs support the needed statistical software. Adding a custom-publishing option will likely be crucial to the long-term success of these casebooks.

The audience most challenged by the FSW casebooks is the instructor. As a nontraditional pedagogy, cases require that we rethink what should be taught in introductory statistics courses and how it should be taught. My experience with case teaching suggests that the transition is well worth the effort. Those intrigued by the FSW casebooks, but uncertain as how to proceed, might review Parr and Smith [in press] or attend the national conference Making Statistics More Effective in Schools of Business (see *Amstat News* for conference announcements). As a nice compromise between traditional teaching and a full-blown Harvard case course, the FSW casebooks should appeal to either first-time or experienced case teachers.

I anticipate students will wholeheartedly endorse the FSW casebooks. The material is easy to digest as, for instance, the authors cleverly interweave probability, the standard error of the mean, and control charts. The casebooks effectively relay the message that statistics is relevant and doable. Ideally, that is the message that should be sent in all introductory business statistics courses.

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## REFERENCES

- Parr, W.C., and Smith, M.A. (in press). "Developing Case-Based Business Statistics Courses." *The American Statistician*.  
Schleifer, A., and Bell, D.E. (1995). *Data Analysis, Regression, and Forecasting*. Cambridge, MA: Course Technology, Inc.

## The Assessment Challenge in Statistics Education.

I. GAL and J.B. GARFIELD (eds.). The Netherlands: IOS Press and The International Statistical Institute, 1997. xii + 284 pp., \$65.00. ISBN: 90-5199-3331.

According to the editors, "This book discusses conceptual and pragmatic issues in the assessment of statistical knowledge, reasoning skills, and dispositions of students in diverse contexts of instruction, both at the college and precollege level" (p. xi). The collection of articles is characterized by contributions from a wide variety of authors with perspectives from statistics education, mathematics education, assessment, educational research, teacher training, and curriculum development. The articles address both theoretical and applied aspects of teaching and assessing students' cognitions and achievements. There is something for everyone.

The first chapter, written by editors Gal and Garfield, frames the main issues with which the volume deals. It examines the common goals for statistics education at various levels, describes challenges in statistics education, and outlines the main issues addressed by each of the chapters. The authors clearly present their view of instructional goals in the statistics classroom and the differences between mathematical and statistical thinking, both valuable discussions for the statistics instructor. This chapter is well laid out, clear, and helpful in presenting theoretical groundwork for educators at all experience levels. The remainder of the book mirrors the organizational structure and interconnections that the editors set down in this first chapter. All chapters open with a brief *Purpose* statement that lists the key questions the chapter addresses, and end with an *Implications* section that reiterates key ideas and challenges raised. There is a consistency and interconnectedness throughout the book. For instance,

a number of authors refer to other articles within the collection, thereby tying together many possible disparate subjects and styles.

Contributors of subsequent chapters discuss assessment issues pertaining to one or more of the goals stated in chapter one within the context of a specific educational level. However, these authors have attempted to make their points relevant to a broad range of readers, and discuss adaptations for different age groups where relevant. For example, in Chapter 10, "Assessing Students' Statistical Problem-Solving Behaviors in a Small-Group Setting," authors Curcio and Artzt design a graphing task for middle school students. Even so, it could serve as a prototype for other grade levels and other tasks, providing general guidelines for problem solving, group work and various forms of assessment.

There are 19 chapters in all, divided into four parts. The chapters in Part I outline key curricular goals and desired outcomes in statistics education, describe recent changes and reform in thinking about the processes of instruction in the mathematical disciplines, and frame the assessment issues that, the authors feel, all educators involved in statistics education have to address.

The chapters in Part II take aim at the assessment of conceptual understanding of statistical ideas. In these four chapters authors address assessment of teachers' and students' understanding of concepts and ideas as well as learning procedures and analytic processes. They look at students' graph knowledge, modeling, and conceptual connections (that is, knowing the relationship between statistical concepts and techniques). The authors in this part look at the challenges involved in identifying learners' conceptual understanding and offer assessment approaches that address conceptual development as a process.

Part III is concerned with "innovative models for classroom assessment." It consists of eight chapters that go into use of the media, assessment of projects and group work, portfolio assessment, use of technology to aid assessment, various assessment instruments, and a look at traditional methods of assessment. These authors endeavor to illustrate new or improved ways to assess aspects of statistical knowledge in specific contexts of instruction. Chapters in this section present an assortment of detailed examples of tasks, items, and projects that can be used to assess students in a range of instructional environments and levels. Some chapters also address general theoretical or background issues that guide both the design and the interpretation of student responses, and highlight the instructional benefits that can be obtained from using these techniques.

The chapters in Part IV focus on assessing understanding of probability. These three chapters offer a diverse collection of topics. In the first, the author examines key ideas of randomness and chance variation, as well as beliefs about the place of chance in the world. She looks at these ideas from the perspective of the mathematics or statistics classroom culture; i.e., how the classroom culture reflects and fosters beliefs about the ideas of uncertainty and chance in a young child's world. In the next chapter, the authors address combinatorial reasoning and its assessment. They provide an in-depth discussion of combinatorics, what it is, types of student misconceptions and difficulties, and approaches to its assessment. Finally, the authors of the last chapter describe methods for assessing students' understanding and interpretations of probability and sampling distributions while using instructional software in a college statistics course.

This volume contains a list of contributors, with addresses, an extensive list of references, and an author index and subject index.

*The Assessment Challenge* offers a comprehensive treatment of "an issue that has received little explicit attention in the statistics education literature" (p. xi). It provides a rich resource that offers a conceptual framework for teaching statistics as well a wealth of concrete suggestions for assessing students' understanding of statistics and probability. It should be valuable to anyone who teaches statistics at college and precollege levels and to anyone concerned with the education of future teachers of mathematics and statistics.

Ordering information for this book:

- IOS Press, Inc., 5795-G Burke Centre Parkway, Burke, VA 22015; fax: (703) 323-3668; email: iosbooks@iospress.com
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## Elementary Bayesian Statistics.

Gordon ANTELMAN. Cheltenham, UK: Edward Elgar Publishing, 1997. xv + 459 pp., \$120, ISBN: 1-85898-504-8.

When asked to review a textbook, I begin by reading the preface. Most authors include recommendations about the intended audience for the book, the prerequisites for using it in courses, and even advice about the pace that should be adopted over semester or quarter schedules.

Tragically, Gordon Antelman was unable to provide such advice in the preface of *Elementary Bayesian Statistics* because he passed away before the book was published. The book was completed by the editors, Madansky and McCulloch, two of Antelman's colleagues at the University of Chicago.

The only advice about how to use the book appears in the final paragraph of the inside flap of the book jacket:

*Elementary Bayesian Statistics* will be an essential resource for students as a supplementary text in traditional statistics courses. It will also be welcomed by academics, researchers, and econometricians wishing to know more about Bayesian statistics.

With all due respect to the efforts of Antelman and his colleagues, I disagree with all of the points in that book jacket paragraph.

It is not practical to use Antelman's text as a supplement. The book is very expensive. Of greater concern is Antelman's use of nonstandard notation. He used  $\tilde{x}$  to denote a random variable, instead of what I feel to be a more widely used notation such as  $X$ . He also used subscripts on probability symbols to denote named distributions. For example  $P_{D_o}$  is used to indicate probabilities for a Poisson random variable. While some of the notations Antelman employed may be more informative and less confusing than traditional notations, I believe that they would make it difficult for a student to resolve with readings in a primary reference if Antelman's book was being used as a supplement.

I find it unlikely that *Elementary Bayesian Statistics* would be a useful reference on the shelves of practicing statisticians because such people would already be familiar with either the non-Bayesian or Bayesian methodologies or both and would not need to see both presented in one text. A statistician from one of the two camps who wished to learn more about the other would be better served by a purely non-Bayesian or purely Bayesian reference, as the case may be.

The strengths of *Elementary Bayesian Statistics* are that it introduces non-Bayesian and Bayesian methodologies in a fair manner and that it incorporates Minitab simulations throughout to provide concrete examples. I believe that these strengths would make it a reasonable choice for a text in an undergraduate mathematical statistics course or in a first statistical theory course for mathematically sophisticated graduate students.

Antelman's text begins with the basics of probability theory, served with a Bayesian flavor. Collecting, summarizing, and presenting data are all covered somewhat superficially in the first chapter. The end of Chapter 1, Chapter 2 on "Some Basic Probability," and Chapter 3 on "More Basic Probability" introduce the reader to interpretations of probability, events, postulates of probability, distribution theory, and expectations and variances. Despite the presence of subjective interpretations of probability, discussion of "Dutch Book" arguments, and plenty of work with conditional distributions, the first three chapters are similar to the probability content in a number of non-Bayesian mathematical statistics texts.

Bayes' Theorem is introduced in Chapter 4, and the subsequent six chapters are paired presentations of non-Bayesian and Bayesian analyses for Bernoulli data, Poisson data, and Normal data. Antelman was very even-handed in his treatments of sampling distribution theory (he used the Bayesian phrase "predictive distribution" in place of "sampling distribution"), with accompanying material on Bayesian models for the same distributions. One of the most attractive qualities of the text is that it presents a relatively balanced introduction to non-Bayesian and Bayesian mathematical statistics.

The final two chapters of the book mix the Bayesian and non-Bayesian paradigms more than in the preceding six chapters as they cover "Estimation" and "Testing Hypotheses." Antelman's estimation chapter is similar to Chapter 6 of the same name in DeGroot (1986). In fact, the DeGroot book and Berry and Lindgren (1996) are the two most similar books to Antelman's that I can find on my bookshelf. Berry and Lindgren offer a more comprehensive overview of mathematical statistics, including chapters on "Goodness of Fit," "Analysis of Variance," and "Regression." Despite Berry's lead authorship, their text is less Bayesian than Antelman's. DeGroot's book also provides a wider coverage of statistics, and it is also a little less Bayesian than Antelman's.

The Minitab macros used throughout Antelman's text (which are also included in the appendix) separate the book from the others by providing simulations that make the concepts concrete. The collection of Bayesian