

BUSINESS STATISTICS

FOR MANAGEMENT AND ECONOMICS

SIXTH
EDITION

DANIEL / TERRELL

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BUSINESS STATISTICS

FOR MANAGEMENT
AND ECONOMICS

SIXTH EDITION

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PREFACE

intent
new
edition

The sixth edition of *Business Statistics for Management and Economics* retains the best features of the first five editions. It also incorporates new material that our own experience and that of users of the previous editions and reviewers indicate will make for a greatly improved text. With this edition, we were intent on expanding our computer coverage, integrating MINITAB commands and solutions, adding to the exercises and Statistics at Work cases, and increasing the regression analysis coverage to include model building. In addition, considerable polishing and rewriting of this sixth edition was done with both the student and the instructor in mind. Our objectives have remained the same as before: (1) to make the subject matter clear and understandable to the student and (2) to provide the instructor with the most teachable text possible.

NEW COVERAGE

- **Model Building.** This edition of *Business Statistics for Management and Economics* contains a new chapter, "Regression Analysis—Model Building," that follows the chapter on multiple regression. The topics covered in this chapter include an overview of model building, curvilinear regression models, nonlinear regression models, and variable selection procedures. In the section on variable selection procedures we cover all possible regressions, stepwise regression, forward selection, and backward elimination. Solving problems using the computer is emphasized throughout the chapter, specifically through use of the STAT+/DATA+ and MINITAB software packages. Five interesting real data sets are provided in the Statistics at Work section for student practice.
- P46 ● **Harmonic mean and geometric mean.** In response to many requests we have added a discussion of the harmonic mean and the geometric mean. These topics should be of benefit to students who take courses in finance and economics later on in their college careers.
- **Nonparametric regression.** In our efforts to provide as many nonparametric techniques as is practical, we have included in this edition a discussion of Theil's method of regression analysis.

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- **Coefficient of variation.** In the section on measures of dispersion, we introduce the concept of the coefficient of variation and show how it is computed.
- **Outliers in regression analysis.** We define outliers and discuss methods for their detection and treatment. We state some of their possible causes. We show how MINITAB can be used to detect and deal with outliers.
- **Influential points in regression analysis.** We define influential points and discuss methods for their detection and treatment. We discuss the calculation of leverages. We show how to use MINITAB to identify and deal with influential points.
- **Box-Jenkins forecasting procedure.** We have greatly expanded our discussion of the Box-Jenkins forecasting procedure without going into the technical details of its use.

REAL DATA AND CASE APPLICATIONS

To show the relevance and application of statistics, we have devoted much effort to expanding our use of real data and an emphasis on applications.

- **Statistics at Work.** We now have 50 Statistics at Work case studies at the ends of the chapters. Many of these have real data sets that the student may use in the application of the various statistical skills they have learned. Data come from a variety of publications and organizations such as, the *Journal of Marketing Research*, the U.S. Environmental Protection Agency, and active researchers in the fields of business. We believe that students and instructors will find these cases both interesting and challenging. Sources for additional real data sets may be found in the article "Improving the Teaching of Applied Statistics: Putting the Data Back Into Data Analysis," by Judith D. Singer and John B. Willett, that appears in the August 1990 issue of *The American Statistician*, pages 223–330.
- **Real data.** The approximately 100 exercises that make use of real data appearing in the fifth edition are retained in the present edition. The Forbes data on six variables for 776 of the country's largest firms has been updated with the latest available figures.
- **Large data sets.** Nine large data sets containing from 600 to 2,100 observations, including the Forbes data, are available on a diskette for use with microcomputers in conjunction with STAT+, the statistical software package that is also available free to adopters of the text. The larger data sets also appear in print in Appendix IV. Many student exercises in the book are designed to make use of these large data sets.

PEDAGOGICAL AIDS

Most students find the study of statistics to be a difficult undertaking. In an attempt to make the subject as easy to grasp as possible, we provide many features written and designed to aid and support their learning efforts.

- ✓ ● **Chapter objectives.** Each chapter begins by identifying the key concepts and points that will be covered. The purpose of this overview is to give students a glimpse of the forest before they begin looking at individual trees.
- ✓ ● **Example solutions highlighted.** For the convenience of the student and the instructor, the solution to each of the worked-out examples is prominently displayed in color.
- P100 ● **Margin annotations.** Sprinkled throughout the chapters, margin annotations add helpful hints, insights, and highlights to the text discussion.
- P100 ● **Worked-out examples.** Key statistical techniques are clearly described and then followed by examples with worked-out solutions.
- **Exercises.** This edition contains approximately 170 new exercises, increasing students' opportunities to learn concepts and techniques. In-text and end of chapter exercises now total over 1,300.
- P122 ● **Summary.** Each chapter ends with a summary of important points and concepts, corresponding directly to the chapter objectives.
- P132 ● **Suggestions for Further Reading.** For students and instructors who want to explore particular topics more thoroughly, a list of additional readings is provided at the end of each chapter.

INCREASED COMPUTER COVERAGE

- **MINITAB integration.** With this edition we have included printouts of MINITAB commands and solutions for many of the worked out examples in the computer analysis sections. A MINITAB appendix highlights the major MINITAB commands as well. (MINITAB is a registered trademark. Further information on this software package may be obtained from MINITAB Data Analysis Software, 3081 Enterprise Drive, State College, PA 16801; telephone: 814-238-3280; telex: 881612.)
- **STAT+ integration.** As with the last edition, for many of the worked-out examples we also display printouts from STAT+, a software program designed specifically for this book.
- **DATA+.** To assist users of our STAT+ package, we provide many of the large data sets on our DATA+ disk.
- **Computer analysis.** More emphasis is placed on the usefulness of the computer in performing analytic tasks. Strategically located computer analysis sections illustrate computer solutions for previously worked-out examples. These sections reinforce the idea that the computer is a convenient and efficient computational tool.
- **Computer coded exercises.** Many of the end of section and end of chapter exercises (identified by ☐) are especially suitable for solving with a computer. These exercises provide students numerous opportunities to practice their computer skills.

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SUPPLEMENTARY MATERIALS

- **Solutions manual.** The solutions manual, available free to adopters of the text, contains step-by-step solutions to all the student exercises.
- **Study Guide.** The study guide has a programmed-instruction format that enables students to check their ability to use computational techniques by comparing their step-by-step solutions on the right side of a given page with step-by-step answers that appear on the left side. To check their mastery of statistical concepts, students complete fill-in-the-blank questions. Again the answers are conveniently provided in the left column of the page.
- **Instructor's Resource Manual and Test Bank.** The instructor's resource manual and test bank, provided free to adopters of the text, contains a total of 2,333 test items categorized by type as follows: fill-in-the-blank, 566; computational, 383; multiple choice, 822; true/false, 562.
- **Computerized Test Generator.** For use with IBM-PCs and compatibles, the computerized test generator is easy-to-use, menu-driven, and allows instructors to edit existing questions, create and add their own questions, and provide multiple versions of the same test. Tests can be saved and stored, and multiple print options are available.
- **Computer Software.** The following statistical software packages are now available free to adopters of the text.

STAT+. Designed specifically for use with this textbook, STAT+ will run on IBM and IBM-compatible microcomputers. It contains programs that perform the calculations necessary to obtain solutions to exercises presented in the chapters on descriptive statistics and inferential statistics. The package will also construct many of the graphs that are discussed in the book. This package is free to adopters of the text.

DATA+. DATA+ is a system of programs developed to support the use of sampling in concert with STAT+. It contains all the large data sets presented in the book, including the *Forbes* data. Users may use the random number generating capability of DATA+ to automatically select simple random samples from these data sets. The samples can, in turn, be transported to the STAT+ system for the desired analysis. In addition, DATA+ allows the user to store additional data bases, demonstrate the function of the central limit theorem, and generate custom-made binomial tables to supplement published tables. It is capable of tabulating binomial probabilities for sample sizes from 1 to 500 and values of p from 0.001 to 0.999. This package is free to adopters of the text.

Business Statistics for Management and Economics, sixth edition, may be used in either a one- or two-term course in business statistics. When used as the text for a two-term course, instructors will probably want to cover the material in the first seven chapters during the first term. For the second term instructors may select topics from among the remaining chapters to provide a course to meet the particular needs of their students.

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When the text is used for a one-term course instructors again have considerable flexibility in designing a course especially for their students. Some instructors may wish to cover the first seven chapters in detail. Others may wish to omit some of the topics in the first seven chapters in order to provide enough time to include selected topics from Chapters 8 through 17.

The text is equally appropriate for instructors who wish to use computers extensively and for those who do not. The text contains generous amounts of raw data that are especially appropriate for computer analysis. On the other hand, instructors who do not wish to make use of a computer also will find the text suitable for their needs.

We retain in this edition the chapter and section numbering system that we employed in all previous editions. Sections are numbered consecutively with the section numbers separated from the chapter numbers by a period. Within sections, examples, exercises, figures, and tables, are each numbered consecutively and their numbers are separated from the section number with a period. Thus, for example, Exercise 9.4.5 identifies the fifth exercise in Section 4 of Chapter 9.

We are deeply indebted to many people who have contributed to the production of this fifth edition of *Business Statistics for Management and Economics*.

We are especially grateful to members of the faculty of the Department of Decision Sciences at Georgia State University, who used the first five editions in their classes and made invaluable suggestions for improvement. We particularly appreciate the efforts of Professors Brian Schott and Geoffrey Churchill, who wrote the computer programs to produce the binomial, Poisson, and normal distribution tables found in Appendix I.

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