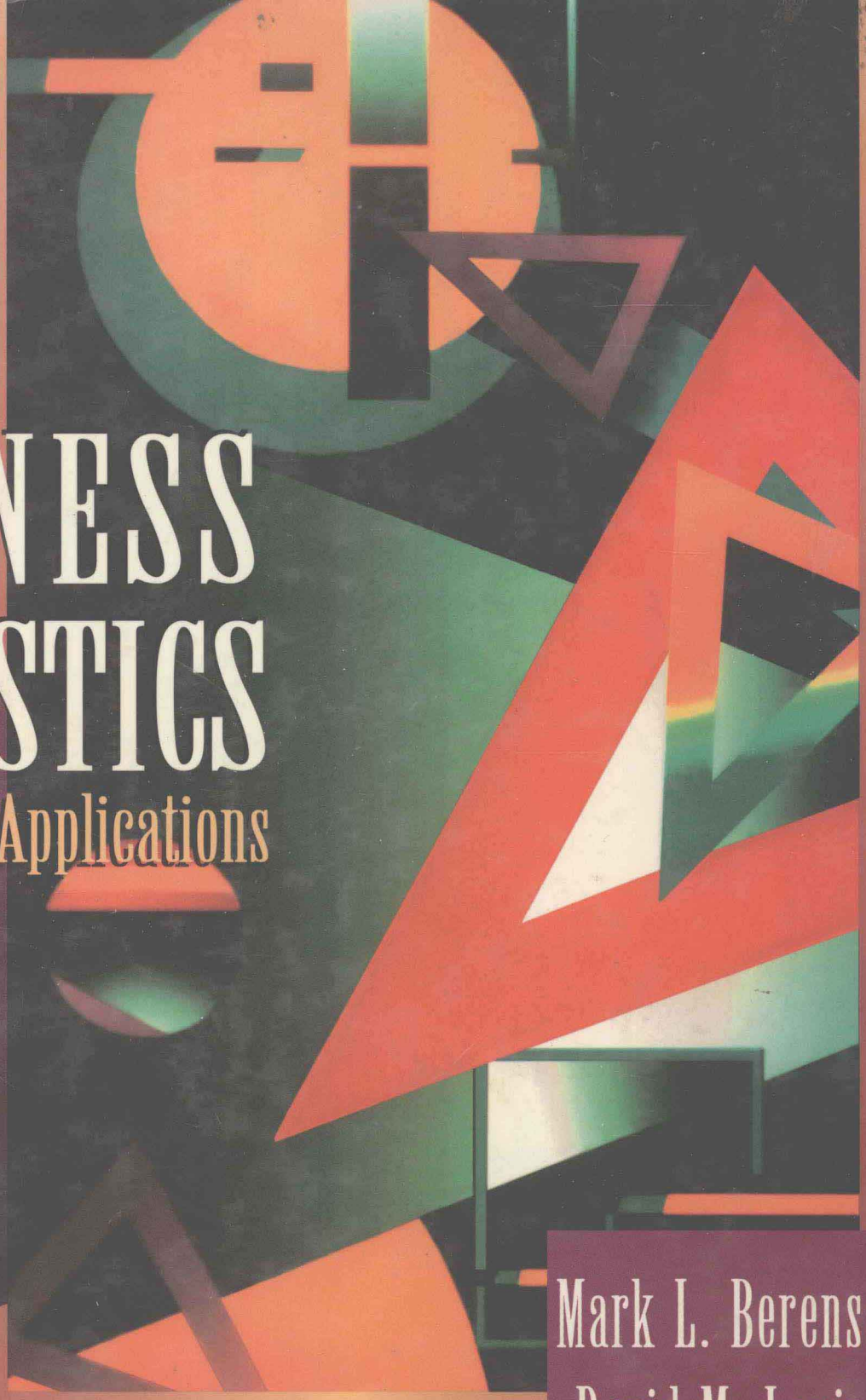
SIXTH EDITION

BASIC BUSINESS STATISTICS

Concepts and Applications



Mark L. Berenson
David M. Levine

Sixth Edition

BASIC BUSINESS STATISTICS

CONCEPTS AND APPLICATIONS

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Prentice Hall, Englewood Cliffs, New Jersey

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Preface

When planning or revising a textbook, the authors must decide how the text will differ from those already available and what contribution it will make to the field of study. Initially, when we began writing the first edition of *Basic Business Statistics* in 1976, we thought that what was missing from other introductory business statistics texts was a common theme to hold together the various topics and provide a sense of realism for the student. Thus we conceived of a practical, data-analytic approach to the teaching of business statistics through the development and use of a survey (and database) that integrates the various topics, permitting a cohesive study of the subject of business statistics.

In proposing changes for the sixth edition of *Basic Business Statistics,* our major objective is continuous quality improvement of prior editions

- by incorporating trends in pedagogy (for example, active and collaborative learning)
- by demonstrating the increased use of statistical software on personal computers
- by presenting modern statistical developments
- by including trends in business school curriculum (for example, ethics, globalization, and quality)

so that the student will appreciate the value of the subject of statistics in the business school curriculum and find more joy in learning.

As we perceive it, the fundamental strengths of our text are its innovative, data-analytic survey-research approach and its internal pedagogical features.

Main Feature: A Data-Analytic Survey Research Approach

A *scenario* is created in which an employee-benefits consulting firm (the B & L Corporation) is hired to conduct a survey of the full-time employees of an automobile parts manufacturer (Kalosha Industries) in order to develop an employee profile that measures job satisfaction, evaluates longevity and career progress, and assesses attitudes and beliefs. The results of this Employee Satisfaction Survey are intended to assist in the development of an employee-benefits package that would please the workers, strengthen their relationship with management, and demonstrate that Kalosha Industries is taking a proactive role in establishing a TQM environment. The 400 sampled responses to the Employee Satisfaction Survey (that is, the database) obtained in Chapter 2, "Data Collection," are used for examples and student projects throughout the text and serve as a means for integrating such topics as descriptive statistics, probability, statistical inference, and regression analysis.

The use of an actual survey, examined from beginning to end, serves as an integrated case study and provides the students with a cohesive approach to learning the subject of business statistics. In addition, it enables the students to realistically understand the process of data-analytic survey research and aids them in conducting such research in other courses and in occupational settings.

The Employee Satisfaction Survey is developed in Chapter 2 and used as text examples and/or as student project assignments in Chapters 3–6, 8, 10, 12–15, 17, and 18. Section material and student projects dealing with the Survey are highlighted in color and with an icon.

Main Feature: Student Problems, Projects, and Case Studies

Learning results from doing. This text provides the student with the opportunity to select and solve from among the *1,200* problems presented at the end of sections as well as at the end of chapters. Most of these problems apply to realistic situations (using real data whenever possible) in various fields including accounting, economics, finance, health care administration, information systems, management, marketing, and public administration.

- The ***End-of-Section Problems*** give the students the opportunity to reinforce what they have just learned.
- The ***Chapter Review Problems*** included at the end of each chapter are based on the concepts and methods learned throughout the chapter.
- Both the ***End-of-Section*** and ***Chapter Review Problems*** either "stand alone" or refer to other problems within the particular chapter.
- ***Interchapter Problems*** are those that refer to problems in earlier chapters.
- The ***Answers to Selected Problems*** (indicated by the ● symbol) appear at the end of the text.
- A series of ***Collaborative Learning Mini-Case Projects*** are presented throughout the text.
- A set of ***132 Survey/Database Projects*** pertaining to the Employee Satisfaction Survey are presented in the various chapters.
- Detailed ***Case Studies*** are included at the end of each of ten chapters.

These student problems, projects and case studies provide many benefits. The teacher has the opportunity to assign individual "stand alone" problems as well as continuation problems to point out topic connections. For more in-depth assignments, the detailed case studies may be used. Furthermore, the teacher has the opportunity to make assignments from the Survey/Database Projects which serve as an integrated "case study" throughout the text.

Main Feature: Collaborative Learning Mini-Case Projects

Two major pedagagical approaches have begun to filter into the college classroom over the past decade—active and collaborative learning. Interestingly, these two pedagogical approaches are in agreement with the principles expressed in the "management by process" philosophy developed by W. Edwards Deming whose approach to continuous quality improvement is among the major industrial advances of the decade. The adaptation of the TQM philos-

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ophy throughout an organization results in a cultural transformation that includes facilitative management, workforce empowerment, and problem solving through the use of cross-functional teams. In a similar vein, if we as teachers employ the principles of active and collaborative learning, we can reduce our lecturing and empower the students to learn more on their own and through teamwork. We must develop the students' critical thinking skills so that we can manage our classrooms more effectively by acting as coaches and facilitators. More importantly, with such developments, future graduates will not only be better prepared to take their place as citizens of their communities but they also will be more prepared to experience a lifetime of self-learning in a dynamic world.

Collaboration enhances learning and collaboration builds teamwork skills needed for participation in business and society. Throughout this text, a series of Collaborative Learning Mini-Case Projects, pertaining to four large data sets (dealing with colleges and universities, cereals, fragrances, and cameras) found in Appendix D, are presented at the end of most chapters. In addition, other Collaborative Learning Projects designed for the classroom are included where appropriate. Thus, a teacher interested in active and collaborative learning now has the opportunity to apply these pedagogical approaches in and out of the classroom by creating student teams and by selecting from the Collaborative Learning Mini-Case Projects and/or the other Colloborative Learning Projects given in the text.

Main Feature: Action (ACTION) and Light Bulb (💡) Problems

Statistics is a living, breathing subject. It is not mere numbers crunching! Emphasis must be placed on understanding and interpretation, and it is essential that students be able to express what they have learned. *Action* ACTION problems enhance literacy by asking the student to write letters, memos, and reports, and to prepare talks. *Light Bulb* 💡 problems are particularly thought provoking or have no "exact" answer. Together, *Action* and *light bulb* problems allow the students to think and better enable them to understand the utility of statistical analysis as an aid to the solution of real problems in an organizational setting.

Main Feature: Thought-Provoking Summary Sections Dealing with (Exploratory and Confirmatory) Data Analysis

We feel that observation is the key to understanding. Observation, then, is paramount to developing critical thinking and data-analytical skills. The Berenson–Levine text emphasizes the four components of good data analysis—plotting, observing, computing, and describing—and stresses the importance of meeting assumptions in employing statistical inference techniques. This

offers much benefit to the student. Through careful observation of data, the student enhances critical thinking skills and data-analytic skills. Moreover, through careful evaluation of assumptions, the student is likely to select the appropriate statistical inference technique for a given situation.

Main Feature: Thought-Provoking Summary Sections Dealing with Ethical Issues

Ethical issues in business has become a subject of much importance over the years, and AACSB accreditation policy now specifically addresses this within the context of curriculum development. Thus, ethical issues in data analysis are described in all relevant chapters of this text. Through the development of critical thinking skills, the student will be in a good position to understand and appreciate the ramifications of the ethical issues involved in data analysis.

Main Feature: Emphasis on Statistical Software Packages

A major feature of our text is a discussion on the use of such statistical software packages as MINITAB, SAS, SPSS, and STATISTIX. Not only is output from these packages illustrated throughout the text, particularly when describing results from the Employee Satisfaction Survey, but the use of the computer as a tool for assisting in the decision-making process is interwoven in the various chapters. In addition, a data disk in ASCII format that contains almost 200 files pertaining to various problems, projects, and case studies given in the text can be provided to facilitate classroom and homework assignments. The files are identified when they first appear with a disk icon and the file name in the margin. Documentation for these data files is presented in Appendix F.

Demonstrating a variety of statistical software packages is beneficial. Students learn how to interpret output from a variety of packages that they may be using. Moreover, by providing an easily referenced data disk, faculty have the opportunity to assign large-scale, real data problems and projects using statistical software without requiring tedious data entry.

Main Feature: The Deming Philosophy for Quality and Productivity

Over the years, our writing and teaching endeavors have been stimulated by an exchange of ideas at the annual conferences on *Making Statistics More Effective in Schools of Business*. These conferences have dealt with many pedagogical issues, including the importance of real data applications, the use of statistical software, active learning, teamwork, quantitative literacy and statistical thinking. However, the distinguishing thrust of these conferences has been to expound on the impact and importance of the subject of statistics in an organization practicing total quality management (TQM).

The importance of organizational focus on quality is amply demonstrated in Chapter 16 of this text through the presentation of managerial planning (that is, process flow diagrams and Fishbone diagrams) and statistical tools (that is, process control charts) which pinpoint the utility of statistical analysis in an organization practicing total quality management (TQM). Moreover, this text provides detailed coverage of the conceptual basis of total quality management (TQM) with a discussion of the fourteen points of the "management by process" philosophy of W. Edwards Deming. Additional topics on this subject that are presented include operational definitions, statistical thinking, enumerative versus analytic studies, Pareto diagrams, digidot plots, and the parable of the red beads—an experiment intended to demonstrate the concepts of common versus special cause variation.

Main Feature: Modern Statistical Methods

Another important feature of this edition is the inclusion of methodology that, over the past few years, has gained wide-spread usage. As examples, exploratory data analysis (EDA) techniques are presented (Chapters 3 and 4); dot charts, Pareto diagrams, and supertables are discussed (Chapter 5); normal probability plots are described for evaluating the assumption of normality (Chapter 8); bootstrapping estimation methods and prediction intervals for an individual value are developed (Chapter 10); the subject of meta-analysis is introduced (Chapter 11); a p-value approach to hypothesis testing is used (Chapters 11–15); logistic regression is introduced (Chapter 18); residual and influence analysis and model-building in regression are covered (Chapters 17 and 18); and various business forecasting methods are considered (Chapter 19).

A major benefit of the broad coverage of topics in the Berenson-Levine text is flexibility in course development. Our text incorporates relevant, up-to-date methodology in sufficient depth and breadth to be used for either one-semester or two-semester introductory courses at the undergraduate or graduate level, and it also serves as an ample reference for fundamental statistical techniques.

Main Feature: Pedagogical Aids

Our text contains numerous pedagogical aids aimed at enhancing the learning of business statistics.

- **Writing Style** Our basic philosophy is to write for the student, not for the professor. To reduce anxiety, our writing style is as conversational as possible.

- **Real Applications** To provide a sense of realism for the subject matter, we use actual data throughout the text in a variety of examples, problems, projects, and case studies.

- **Reading and Interpreting Statistical Tables** Each of the statistical tables given in Appendix E is examined in depth when it is first presented. We provide detailed explanations and illustrations in order to aid the student in

learning how to use the tables. In addition, we present the standard normal distribution on the inside front cover to facilitate its use.

- **Chapter Introductions and Summaries** In the introductory section of each chapter, we provide a list emphasizing what the student is expected to learn. The final section of each chapter reviews what was covered and presents a series of key conceptual questions pertaining to what was learned.

- **Chapter Ending Summary Chart** We end each chapter with a summary chart highlighting significant coverage of material.

- **Key Terms** We provide a listing of key terms with page references at the end of each chapter.

- **Data Diskette and List of Data Files** A data diskette containing almost *200* files is available. The list of data files appears in Appendix F.

It is our hope and anticipation that the pedagogical aids along with the features and unique approaches taken in this textbook will make the study of basic business statistics more meaningful, rewarding, and comprehensible for all readers.

Acknowledgements

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MARK L. BERENSON
DAVID M. LEVINE

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