Using Microsoft® Excel and MINITAB

Introduction To Business Statistics

FIFTH EDITION

A Computer Integrated, Data Analysis Approach

ALAN H. KVANLI, ROBERT J. PAVUR, C. STEPHEN GUYNES

5TH EDITION

INTRODUCTION TO BUSINESS STATISTICS

A COMPUTER INTEGRATED, DATA ANALYSIS APPROACH

ALAN H. KVANLI
ROBERT J. PAVUR
C. STEPHEN GUYNES
UNIVERSITY OF NORTH TEXAS

South-Western College Publishing
Thomson Learning™

Australia • Canada • Denmark • Japan • Mexico • New Zealand • Philippines
Puerto Rico • Singapore • South Africa • Spain • United Kingdom • United States

Introduction to Business Statistics: A Computer Integrated, Data Analysis Approach, 5e,
by Alan H. Kvanli, Robert J. Pavur, and C. Stephen Guynes

Publisher: Dave Shaut
Acquisitions Editor: Charles McCormick, Jr.
Developmental Editor: Atietie O. Tonwe
Marketing Manager: Joseph A. Sabatino
Production Editor: Kara ZumBahlen
Manufacturing Coordinator: Dana Began Schwartz
Internal Design: Jennifer Martin-Lambert
Cover Design: Michael H. Stratton
Cover Photo: FPG International LLC
Photography Manager: Cary Benbow
Production House: Shepherd, Inc.
Compositor: Shepherd, Inc.
Printer: WestGroup

COPYRIGHT © 2000 by South-Western College Publishing, a division of Thomson Learning.
The Thomson Learning logo is a registered trademark used herein under license.

All Rights Reserved. No part of this work covered by the copyright hereon may be reproduced or used in any form or by any means—graphic, electronic, or mechanical, including photocopying, recording, taping, or information storage and retrieval systems—without the written permission of the publisher.

Printed in the United States of America
1 2 3 4 5 02 01 00 99

For more information contact South-Western College Publishing, 5101 Madison Road, Cincinnati, Ohio, 45227 or find us on the Internet at http://www.swcollege.com

For permission to use material from this text or product, contact us by
- **telephone: 1-800-730-2214**
- **fax: 1-800-730-2215**
- **web: http://www.thomsonrights.com**

Library of Congress Cataloging-in-Publication Data

Kvanli, Alan H.
Introduction to business statistics : a computer integrated approach / Alan H. Kvanli, Robert J. Pavur, C. Stephen Guynes. — 5th ed.
p. cm.
Includes index.
ISBN 0–324–01207–1 (package)
ISBN 0–324–01308–6 (text only)
ISBN 0–324–01309–4 (CD only)
1. Commercial statistics—Data processing. 2. Statistics—Data processing. I. Pavur, Robert J. II. Guynes, C. Stephen (Carl Stephen) III. Title.
HF1017.K83 2000 99-24430
519.5'0285—dc21

About the Authors

ALAN H. KVANLI

Dr. Alan H. Kvanli is Associate Professor of Management Science. His research is primarily in the areas of statistical auditing, operations research techniques applied to multi-year financial planning, and product pricing/cost analysis. His current research examines issues resulting from highly skewed audit populations. For the past ten years he has served as statistical consultant for the audit staff within the Department of Health and Human Services (Washington, D. C.). While employed in industry, Dr. Kvanli was a systems analyst at Rockwell International and was involved in the analysis of a mainframe computer system. He also held a staff position in corporate financial planning within Texas Instruments, Inc. He has a doctorate in Mathematical Statistics from Southern Methodist University and a Master's degree in Mathematics from the University of Kansas.

ROBERT J. PAVUR

Dr. Robert J. Pavur is Full Professor of Management Science. His specializations are multiple regression analysis and experimental design. Research interests include alternate test procedures in multivariate analysis of variance designs when standard assumptions do not hold. His current research project is investigating the behavior of multivariate discriminant analysis procedures. He has served as the President of the Southwest Decision Sciences Institute. He received a doctorate degree in Mathematical and Applied Statistics and a Master of Science degree from Texas Tech University.

C. STEPHEN GUYNES

Dr. C. Stephen Guynes is Full Professor of Business Computer Information Systems. His prior research topics included an empirical investigation of computer security practices and an investigation of privacy issues in a computer-based environment. His most recent research efforts have been directed in the areas of data administration and database management. He has consulted with many of the largest banks in the country in the area of trust performance systems. He is currently consulting with the Internal Revenue Service in the areas of information systems training and software evaluation. He received a doctorate in Quantitative Analysis from Texas Tech University.

PREFACE

In the previous edition of this textbook, our goal was to make the text more data interactive with additional emphasis placed on the interpretation of data and statistical graphs. With this edition, we are reacting to the increased emphasis of late on the use of spreadsheet statistics. We approached this concept rather hesitantly at first (after all, a spreadsheet package, such as Microsoft® Excel, is *not* a statistical package) but as the project began to take form, we became quite enthusiastic about the ability to truly teach the application of statistics using such an approach. We were able to overcome any statistical shortcomings of Microsoft Excel by constructing a number of Excel macros that allow the user to perform a complex statistical task on a very large set of data with the click of a mouse button. What we did *not* want was a textbook that contained an endless stream of Enter this in cell . . . , Drag this cell down through cell . . . , Enter this formula in cell. . . . In short, we wanted this textbook to provide an understanding of statistics, not serve as an Excel manual.

With the textbook is an accompanying CD containing this set of Excel macros, some 150 data sets, and the two databases at the end of the text. The flavor of the previous edition was maintained in the chapter exercises, whereby students could first learn the mechanics of a new technique, see their application, and finally apply this procedure to several large data sets using the revised set of computer exercises. We have kept the Minitab statistical package in this edition but the within-chapter illustrations are now carried out using Excel and the steps necessary to carry out a windows-based Minitab analysis are explained at the end of each chapter.

As mentioned in the preface to the earlier editions, we feel that a statistics text that *fully* integrates the use of computers with statistics is a necessity in today's marketplace. This edition has retained the "non-intimidating" approach to describing the concepts and applications of statistics while giving students the opportunity to observe and actually carry out computer-generated solutions using a spreadsheet or statistical package. The text has once again been designed so that those requiring or desiring a more traditional calculator-based approach will find an abundance of exercises and examples that can be solved in this manner.

The text is intended to be an undergraduate or M.B.A. introduction to basic statistics. We assume that the student has a good understanding of basic algebra. Reference is made on a few occasions to calculus applications, but no calculus background is required to read the material. The reading level is interesting and easy-to-understand without sacrificing any credibility in the descriptive material. It is a non-mathematical, but not a "black box," approach to teaching the appreciation and application of statistics. We've included a large number of new examples to better guide the student to an understanding of statistical concepts and applications. These examples include more realistic illustrations, many taken from the process/quality improvement area.

TO THE INSTRUCTOR

This text can be used for either a one- or two-semester introduction to business statistics. Suggested material to be covered in the first semester would be chapters 1 through 8, in order, which concludes with an introduction to hypothesis testing. Chapters 9 and 10 could

此为试读,需要完整PDF请访问: www.ertongbook.com

be included in a second-semester course, along with those remaining chapters that you feel are particularly relevant and of interest to your students. We have found that the chapter on Quality Improvement (Chapter 12) and the chapter on time series decomposition and index numbers (Chapter 16) can be included in either the first or second semester since they are largely descriptive in nature.

The text has intentionally been written in somewhat of a conversational style to make it less intimidating to the student. Our intent was for the student to read the text; not just use it as a source of homework exercises.

The text fully integrates the use of Microsoft Excel (a spreadsheet package) and Minitab (an easy to use, but very powerful statistical package). The featured package throughout all of the chapter examples and many of the exercises is Excel and corresponding Minitab descriptions are contained at the ends of chapters—a feature unique to this text. We have fully integrated Excel and Minitab throughout the text, making it possible for you to include computer usage as part of your course without having to spend a great deal of time explaining the mechanics of either package. For instructors who wish to avoid computer usage, the text allows for a calculator-based approach—most of the exercises do not require a computer package and contain reasonably sized data sets.

Other Features of the Text Include

- **An introductory case study at the start of each chapter.** The intent here is to describe an actual situation explaining WHAT type of problem this chapter addresses and WHY this chapter is important. The case study questions at the end of each chapter return to the case study scenario and ask in-depth questions that require an understanding beyond the number crunching level. All case studies have been revised in this edition.
- **A Look Back/Introduction at the start of each chapter to tie the chapter to the relevant material from the preceding chapters.** Each chapter closes with a summary section containing the key words (in bold-face print) introduced in the chapter and a summary of the formulas.
- **An abundance of exercises (over 1,300) using realistic business situations.** The exercises within each section are split into UNDERSTANDING THE MECHANICS, APPLYING THE NEW CONCEPTS (using actual applications in a business setting), and USING THE COMPUTER (using data sets from the accompanying CD).
- **A full treatment of the use of p-values to make statistical decisions.** These are derived and discussed throughout the entire text.
- **Three continuous distributions** (normal, uniform, and exponential), along with four discrete distributions (uniform, binomial, hypergeometric, and Poisson).
- **Various sampling procedures** (including stratified and cluster sampling), along with corresponding sample estimators and confidence intervals, as separate sections in two of the earlier chapters. In this way, you are able to cover this often-neglected material without having to spend the time to cover an entire chapter.
- **Separate chapters for inference regarding normal parameters** (μ, σ) and inference on a binomial parameter (p). Chapters 7, 8, and 9 are strictly devoted to normal inference, both one population (Chapters 7 and 8) and two populations (Chapter 9). Binomial inference (one and two populations) is covered in Chapter 10.
- **An entire chapter devoted to forecasting using time series data (Chapter 17).** It includes several exponential smoothing models and discusses the pros and cons of using multiple regression versus time series modeling techniques for such data. The Excel macros supplied on the accompanying CD make time series decomposition (Chapter 16) and time series forecasting astonishingly simple while at the same time providing a great deal of numerical and graphical output.
- **An entire chapter on statistical decision theory.** This chapter is placed near the end of the text (Chapter 18) but can be covered at any time, including the first semester, if desired.

- **A revised database** (1,140 observations) containing data on family income, family size, total indebtedness, monthly utility expenditures, and other variables. There is also a second database containing 1,000 observations selected from companies listed in the Moody's Investor Service Industrial Manual. Both data sets are contained in the accompanying CD.
- **Appendices that provide an introduction to Microsoft Excel and Minitab.**

New to the 5th Edition Are

- **The use of Microsoft Excel as the featured package within each chapter.**
- **An extensive library of Excel add-ins (macros)** that perform *every* analytical technique discussed in the text. Microsoft's Excel's built-in toolbox and function set provide many standard statistical functions/procedures and so the add-in macros were intended to complement and enhance the standard Excel tools.
- **Larger emphasis on data and graphical interpretation within the chapter examples, exercises, and case studies.**
- **Examples within each chapter that allow the student to see how Excel can be used to analyze a problem and not merely crunch numbers that summarize the data.** These chapter examples contain the Excel output and discussion, but more importantly, the instructor and/or student can run this example using the data contained on the accompanying CD.
- **A discussion in Chapter 7 on constructing a confidence interval for a population mean using a bootstrap procedure.** An Excel macro was also written to carry out the rather extensive calculations using this procedure.
- **The chapter on Quality Improvement has been updated considerably,** including the revised scoring system for the Malcolm Baldrige National Quality Award and a discussion of ISO 9000 registration.
- **The construction of a regression line through the medians.** This alternative to the least squares linear regression line is included in the chapter on Nonparametric Statistics (Chapter 19).
- **All new case studies,** designed to develop an international perspective, and provide the student with more in-depth applications in the quality improvement area.
- **Finding areas under any probability curve using Microsoft Excel and Minitab.** This can easily eliminate the use of tables for homework assignments and allows for exact calculation of p-values.

Ancillary Teaching and Learning Materials

Prepared by Wilke English, the *Study Guide* (ISBN 0–324–01313–2) will provide the student with important supplementary study and review materials. It contains self-testing questions and answers and will guide the student through applications of the chapter material. To order, please contact your local bookstore or contact Thomson Learning directly at 800–347–7707.

The *Instructor's Resource CD-ROM* (ISBN 0–324–01311–6) is available to adopters from the Thomson Learning Academic Resource Center at 800–423–0663 or through www.swcollege.com. The *Instructor's Resource CD-ROM* includes:

- **Instructor's Manual**—The Instructor's Manual contains solutions to all exercises and case studies presented within the text.
- **PowerPoint Presentation Slides**—The PowerPoint slides contain the important concepts introduced within each chapter and are designed to assist instructors in creating even more visually stimulating lectures.
- **Test Bank and Thomson Learning Testing Tools™**—The test bank includes true/false, completion exercises, and additional application problems. Thomson Learning Testing Tools™ is an easy-to-use test creation software compatible with Microsoft® Windows. Instructors can add, edit, store, and print materials. Instructors can also create and administer tests online—using the Internet, a local-area network (LAN), or a wide-area network (WAN).

We certainly hope that this text will meet your classroom needs. If you care to offer comments and suggestions, we would like to hear from you. Address any correspondence to Al Kvanli, College of Business Administration, University of North Texas, Denton, Texas 76203 (email: *kvanli@unt.edu).*

To the Student

We believe you will find this text to be a readable, easily understood treatment of business statistics. This textbook allows you to learn the application of statistics by letting the computer carry out the heavy number crunching, using either Microsoft Excel (a popular spreadsheet package) or Minitab (a windows-based and easy-to-use statistical package). Our intent is to carefully explain the various statistical concepts and strategies without getting bogged down in unnecessary mathematics. We have also provided you with a set of Excel add-in macros on the accompanying CD that you can easily store and use in your home or office version of Excel. These click-and-go procedures make using Excel to carry out statistical analyses extremely simple and maybe, even fun!

We have included many examples and Excel illustrations within each chapter that allow you to see how each procedure works. Each chapter opener will consist of an actual application of the chapter material illustrating what you'll be able to accomplish upon completion of the chapter and hopefully stimulating your interest a bit. Also at the beginning of each chapter you will find a Look Back/Introduction section which will set up the chapter and tie it in with the previous chapters. At the end of each chapter is a summary containing all of the key definitions and concepts introduced within the chapter, along with a summary of the formulas. At the end of the book you will find introductions to both Microsoft Excel and Minitab. There is a CD accompanying the textbook containing the set of Excel add-in macros, over 150 data sets, and two large databases listed at the end of the text (Appendices E and F).

As the old adage goes, "practice makes perfect," and mastering statistics is no exception. To this end, we have included a large number of exercises to help you along the road to perfection. Data entry for large data sets is never an enjoyable experience, so we have included all of the data sets for those exercises requiring a computer on the accompanying CD. Also, you will find the solutions to the odd-numbered exercises at the end of the text. A study guide, which contains additional examples along with their solutions, has also been prepared. These solutions take you step-by-step through the applications of the various statistical techniques with many blanks where you supply the missing number or word.

Acknowledgments

We are very much indebted to the people who helped in the production and preparation of this text. Ms. Kellie Keeling was extremely helpful in the preparation of the Excel macros and we would not have completed this project without her wonderful assistance. Mr. Ben Moore lent his expertise in the preparation and solution of many of the chapter exercises containing a quoted source (the real world exercises) and coming up with potential topics for the introductory and closing case studies. Beverly Kenney has once again done a superb job of putting her word processing skills to work on the *Instructor's Manual.*

Wilke English has once again authored a very helpful and entertaining study guide to accompany the text. We feel that his study guide has been (and will continue to be) a big plus for the textbook and we are most appreciative for having his time and talent. Many thanks to George Neimanis who put together a very complete (and accurate) test bank. George is a new member of the team and was a real pleasure to work with. We would have been unable to complete this project without the timely and highly professional help of Wade Jackson who prepared the set of PowerPoint presentations that accompany the textbook.

In this edition, we received exceptional editorial support from the folks at South-Western College Publishing. Charles McCormick was very instrumental in encouraging,

guiding, and assembling this entire project. Atietie Tonwe was most helpful in keeping track of the million and one details and lining up top-notch people to assist in our efforts. Kara ZumBahlen kept this (at times overwhelming) project on course and helped the authors keep a positive attitude as time and energy were dwindling.

Last, but certainly not least, we would like to thank the reviewers who had a multitude of excellent suggestions for this edition. We took every suggestion very seriously and we hope that you can see your contributions in this latest edition. The following list contains the names and affiliations of these individuals:

Stuart Warnock
University of Southern Colorado

Lee McClain
Western Washington University

Barbara McKiney
Western Michigan University

Steve Yourstone
University of New Mexico

John Charalambakis
Ashbury College

David Pentico
Duquesne University

Virginia Fisher
Albuquerque TVI Community College

Robert Carver
Stonehill College

Alan Humphrey
University of Rhode Island

Richard McGowan
Boston College

Jeff Jarrett
University of Rhode Island

Don Gren
Salt Lake Community College

David Tufte
University of New Orleans

Kenneth Lawrence
New Jersey Institute of Technology

Dedication

Elaine and Justin
(A. H. K.)

Gail, Robert, Michael, and Gregory
(R. J. P.)

Elana, Holly, Stephen, and Darin
(C. S. G.)

Brief Contents

Chapter 1	A First Look at Statistics and Data Collection	1
Chapter 2	Data Presentation Using Descriptive Graphs	29
Chapter 3	Data Summary Using Descriptive Measures	72
Chapter 4	Probability Concepts	119
Chapter 5	Discrete Probablity Distributions	164
Chapter 6	Continuous Probability Distributions	210
Chapter 7	Statistical Inference and Sampling	253
Chapter 8	Hypothesis Testing for the Mean and Variance of a Population	306
Chapter 9	Inference Procedures for Two Populations	358
Chapter 10	Estimation and Testing for Population Proportions	412
Chapter 11	Analysis of Variance	445
Chapter 12	Quality Improvement	514
Chapter 13	Applications of the Chi-Square Statistic	569
Chapter 14	Correlation and Simple Linear Regression	608
Chapter 15	Multiple Linear Regression	673
Chapter 16	Time Series Analysis and Index Numbers	746
Chapter 17	Quantitative Business Forecasting	808
Chapter 18	Decision Making Under Uncertainty	878
Chapter 19	Nonparametric Statistics	922
Appendixes	A Tables	A–2
	B Derivation of Minimum Total Sample Size	A–38
	C Introduction to Excel	A–40
	D Introduction to MINITAB	A–47
	E Database Using Household Financial Variables	A–56
	F Database Using Financial Variables of Companies	A–64
	G Answers to Odd-Numbered Exercises	A–74
	Index	I–1

CONTENTS

PREFACE xiii

CHAPTER 1
A FIRST LOOK AT STATISTICS AND DATA COLLECTION 1

1.1 USES OF STATISTICS IN BUSINESS 3
1.2 SOME BASIC DEFINITIONS 3
1.3 DISCRETE AND CONTINUOUS NUMERICAL DATA 4
1.4 LEVEL OF MEASUREMENT FOR NUMERICAL DATA 5
1.5 SOURCES OF DATA 7
1.6 BUSINESS RESEARCH QUESTIONS IN PRACTICE (OPTIONAL) 14
1.7 DESIGNING AND CODING A QUESTIONNAIRE (OPTIONAL) 16

Summary 22 • Review Exercises 23 • Computer Exercises Using the Databases 25 • Insights from Statistics in Action: Why So Many Polls? 25 • Chapter 1 Appendix: Data Analysis with MINITAB 26

CHAPTER 2
DATA PRESENTATION USING DESCRIPTIVE GRAPHS 29

2.1 FREQUENCY DISTRIBUTIONS 31
2.2 HISTOGRAMS AND STEM-AND-LEAF DIAGRAMS 36
2.3 FREQUENCY POLYGONS 43
2.4 CUMULATIVE FREQUENCIES (OGIVES) 45
2.5 BAR CHARTS 49
2.6 PIE CHARTS 50
2.7 DECEPTIVE GRAPHS 57
2.8 USING COMPUTER GRAPHICS 58

Summary 59 • Review Exercises 60 • Computer Exercises Using the Databases 64 • Insights from Statistics in Action: How Well Run Are the Top 100 Global Companies? 64 • Chapter 2 Appendix: Data Analysis with MINITAB 67

CHAPTER 3
DATA SUMMARY USING DESCRIPTIVE MEASURES 72

3.1 VARIOUS TYPES OF DESCRIPTIVE MEASURES 73
3.2 MEASURES OF CENTRAL TENDENCY 73
3.3 MEASURES OF VARIATION 80
3.4 MEASURES OF POSITION 88
3.5 MEASURES OF SHAPE 91

无锡轻工大学 图书馆藏书

此为试读，需要完整PDF请访问：www.ertongbook.com

3.6 Interpreting $\bar{x}$ and s 95
3.7 Grouped Data 99
3.8 Box Plots 102

Summary 108 • Summary of Formulas 109 • Review Exercises 110 • Computer Exercises Using the Databases 114 • Insights from Statistics in Action: Why Can't the Average Mutual Fund Beat the Standard & Poors 500 Index? 114 • Chapter 3 Appendix: Data Analysis with MINITAB 116

Chapter 4 Probability Concepts 119

4.1 Events and Probability 120
4.2 Basic Concepts 122
4.3 Going Beyond the Contingency Table 128
4.4 Applying the Concepts 135
4.5 Tree Diagrams 142
4.6 Probabilities for More Than Two Events 146
4.7 Counting Rules (Optional) 148
4.8 Simple Random Samples (Optional) 152

Summary 154 • Summary of Formulas 155 • Review Exercises 155 • Computer Exercises Using the Databases 161 • Insights from Statistics in Action: Gaining Market Share in the Fruit Juice Industry 162 • Chapter 4 Appendix: Data Analysis with MINITAB 162

Chapter 5 Discrete Probability Distributions 164

5.1 Random Variables 165
5.2 Representing Probability Distributions for Discrete Random Variables 171
5.3 Mean and Variance of Discrete Random Variables 174
5.4 Binomial Random Variables 180
5.5 The Hypergeometric Distribution 190
5.6 The Poisson Distribution 194

Summary 200 • Summary of Formulas 201 • Review Exercises 201 • Computer Exercises Using the Databases 205 • Insights from Statistics in Action: Choosing a Good Variable Annuity for Retirement 206 • Chapter 5 Appendix: Data Analysis with MINITAB 207

Chapter 6 Continuous Probability Distributions 210

6.1 Continuous Random Variables 211
6.2 Normal Random Variables 212
6.3 Determining a Probability for a Normal Random Variable 215
6.4 Finding Areas Under a Normal Curve 215
6.5 Applications Where the Area Under a Normal Curve Is Provided 225

6.6 Another Look at the Empirical Rule 227

6.7 Using Excel to Determine Areas and Values Having a Specified Area for Normal Populations 228

6.8 Normal Approximation to the Binomial (Optional) 232

6.9 Other Continuous Distributions (Optional) 236

Summary 243 • Summary of Formulas 244 • Review Exercises 244 • Computer Exercises Using the Databases 248 • Insights from Statistics in Action: Changes in the Social Security System and Its Effect on the Distribution of Retirement Funds for Working Americans 249 • Chapter 6 Appendix: Data Analysis with MINITAB 250

Chapter 7 Statistical Inference and Sampling 253

7.1 Random Sampling and the Distribution of the Sample Mean 254

7.2 The Central Limit Theorem 260

7.3 Confidence Intervals for the Mean of a Normal Population (σ Known) 271

7.4 Confidence Intervals for the Mean of a Normal Population (σ Unknown) 278

7.5 Selecting the Necessary Sample Size 283

7.6 Bootstrap Confidence Intervals (Optional) 286

7.7 Other Sampling Procedures (Optional) 289

Summary 296 • Summary of Formulas 298 • Review Exercises 299 • Computer Exercises Using the Databases 302 • Insights from Statistics in Action: What Is the Average Gate-to-Takeoff Time At Airports? 303 • Chapter 7 Appendix: Data Analysis with MINITAB 304

Chapter 8 Hypothesis Testing for the Mean and Variance of a Population 306

8.1 Hypothesis Testing on the Mean of a Population: Large Sample 307

8.2 One-Tailed Test for the Mean of a Population: Large Sample 320

8.3 Reporting Testing Results Using a p-Value 327

8.4 Hypothesis Testing on the Mean of a Normal Population: Small Sample 334

8.5 Inference for the Variance and Standard Deviation of a Normal Population (Optional) 339

Summary 346 • Summary of Formulas 347 • Review Exercises 348 • Computer Exercises Using the Databases 354 • Insights from Statistics in Action: Dramatic Changes in the Radio Industry 355 • Chapter 8 Appendix: Data Analysis with MINITAB 355

CHAPTER 9 INFERENCE PROCEDURES FOR TWO POPULATIONS 358

9.1 INDEPENDENT VERSUS DEPENDENT SAMPLES 359
9.2 COMPARING TWO MEANS USING TWO LARGE, INDEPENDENT SAMPLES 361
9.3 COMPARING TWO NORMAL POPULATION MEANS USING TWO SMALL, INDEPENDENT SAMPLES 373
9.4 COMPARING THE VARIANCES OF TWO NORMAL POPULATIONS USING INDEPENDENT SAMPLES 384
9.5 COMPARING THE MEANS OF TWO NORMAL POPULATIONS USING PAIRED SAMPLES 393

Summary 400 • Summary of Formulas 400 • Review Exercises 402 • Computer Exercises Using the Databases 408 • Insights from Statistics in Action: Collisions Involving Light Trucks and Sport Utility Vehicles with Cars: Assessing the Impact 409 • Chapter 9 Appendix: Data Analysis with MINITAB 409

CHAPTER 10 ESTIMATION AND TESTING FOR POPULATION PROPORTIONS 412

10.1 ESTIMATION AND CONFIDENCE INTERVALS FOR A POPULATION PROPORTION 413
10.2 HYPOTHESIS TESTING FOR A POPULATION PROPORTION 420
10.3 COMPARING TWO POPULATION PROPORTIONS (LARGE, INDEPENDENT SAMPLES) 426

Summary 436 • Summary of Formulas 436 • Review Exercises 437 • Computer Exercises Using the Databases 440 • Insights from Statistics in Action: Large Waste Managment Firms Are Shifting to a Management Strategy of "Waste Internalization" 441 • Chapter 10 Appendix: Data Analysis with MINITAB 442

CHAPTER 11 ANALYSIS OF VARIANCE 445

11.1 COMPARING TWO MEANS: ANOTHER LOOK 446
11.2 ONE-FACTOR ANOVA COMPARING MORE THAN TWO MEANS 454
11.3 DESIGNING AN EXPERIMENT 472
11.4 RANDOMIZED BLOCK DESIGN 475
11.5 THE TWO-WAY FACTORIAL DESIGN 489

Summary 498 • Summary of Formulas 499 • Review Exercises 500 • Computer Exercises Using the Databases 508 • Insights from Statistics in Action: Automotive Insurance Rates and Category of Driver 508 • Chapter 11 Appendix: Data Analysis with MINITAB 510

CHAPTER 12 QUALITY IMPROVEMENT 514

12.1 QUALITY IMPROVEMENT: CONCEPTS AND STRATEGIES 515
12.2 THE MALCOLM BALDRIGE NATIONAL QUALITY AWARD AND ISO 9000 REGISTRATION 519
12.3 QUALITY-IMPROVEMENT TOOLS 524
12.4 PROCESS VARIATION AND CONTROL CHARTS 529
12.5 CONTROL CHARTS FOR VARIABLES DATA: THE $\bar{X}$ AND R CHARTS 533
12.6 CONTROL CHARTS FOR ATTRIBUTE DATA: THE p AND c CHARTS 545
12.7 PROCESS CAPABILITY 552

Summary 560 • Summary of Formulas 561 • Review Exercises 562 • Insights from Statistics in Action: Six Sigma Means Being 99.9997% Perfect 566 • Chapter 12 Appendix: Data Analysis with MINITAB 566

CHAPTER 13 APPLICATIONS OF THE CHI-SQUARE STATISTIC 569

13.1 CHI-SQUARE GOODNESS-OF-FIT TESTS 570
13.2 CHI-SQUARE TESTS OF INDEPENDENCE 586

Summary 597 • Summary of Formulas 598 • Review Exercises 598 • Computer Exercises Using the Databases 604 • Insights from Statistics in Action: Buying and Selling Vacations in the Corporate Workplace 605 • Chapter 13 Appendix: Data Analysis with MINITAB 606

CHAPTER 14 CORRELATION AND SIMPLE LINEAR REGRESSION 608

14.1 BIVARIATE DATA AND CORRELATION 609
14.2 THE SIMPLE LINEAR REGRESSION MODEL 621
14.3 INFERENCE ON THE SLOPE, β_1 626
14.4 MEASURING THE STRENGTH OF THE MODEL 635
14.5 ESTIMATION AND PREDICTION USING THE SIMPLE LINEAR MODEL 641
14.6 EXAMINING THE RESIDUALS 645

Summary 659 • Summary of Formulas 660 • Review Exercises 661 • Computer Exercises Using the Databases 667 • Insights from Statistics in Action: Unemployment and Its Relationship to Public Social Expenditure as a Percentage of GDP: An International Concern 668 • Chapter 14 Appendix: Data Analysis with MINITAB 668

CHAPTER 15 MULTIPLE LINEAR REGRESSION 673

15.1 THE MULTIPLE LINEAR REGRESSION MODEL 674
15.2 HYPOTHESIS TESTING AND CONFIDENCE INTERVALS FOR THE β PARAMETERS 681
15.3 DETERMINING THE PREDICTIVE ABILITY OF CERTAIN INDEPENDENT VARIABLES 692

15.4 The Problem of Multicollinearity 702

15.5 Dummy Variables and Additional Topics in Multiple Linear Regression 709

15.6 Model Building 723

Summary 730 • Summary of Formulas 731 • Review Exercises 732 • Computer Exercises Using the Databases 741 • Insights from Statistics in Action: Personal Computer Prices Drop as Technology Improves 741 • Chapter 15 Appendix: Data Analysis with MINITAB 742

Chapter 16 Time Series Analysis and Index Numbers 746

16.1 Components of a Time Series 748

16.2 Measuring Trend: No Seasonality 755

16.3 Measuring Cyclical Activity: No Seasonality 763

16.4 Types of Seasonal Variation 767

16.5 Measuring Seasonality 773

16.6 A Time Series Containing Seasonality, Trend, and Cycles 781

16.7 Index Numbers 792

Summary 797 • Summary of Formulas 798 • Review Exercises 799 • Insights from Statistics in Action: Which Way Is the Employment Cost Index Headed? 804 • Chapter 16 Appendix: Data Analysis with MINITAB 805

Chapter 17 Quantitative Business Forecasting 808

17.1 Methods of Forecasting 810

17.2 The Naive Forecast 812

17.3 Projecting the Least Squares Trend Equation 815

17.4 Simple Exponential Smoothing 819

17.5 Exponential Smoothing for a Time Series Containing Trend 825

17.6 Exponential Smoothing Method for Trend and Seasonality 829

17.7 Choosing the Appropriate Forecasting Procedure 835

17.8 Autoregressive Forecasting Techniques 841

17.9 The Other Side of Forecasting: Linear Regression Using Time Series Data 852

17.10 The Problem of Autocorrelation: The Durbin-Watson Statistic 860

Summary 865 • Summary of Formulas 866 • Review Exercises 867 • Insights from Statistics in Action: The Consumer Price Index: Due for a Change? 871 • Chapter 17 Appendix: Data Analysis with MINITAB 872

CHAPTER 18 DECISION MAKING UNDER UNCERTAINTY 878

18.1 DEFINING THE DECISION PROBLEM 880
18.2 DECISION STRATEGIES 883
18.3 THE CONCEPT OF UTILITY 899
18.4 DECISION TREES AND BAYES' RULE 906

Summary 918 • Summary of Formulas 919 • Review Exercises 919 • Insights from Statistics in Action: Challenging Decisions for CEOs of the Tobacco Industry 921

CHAPTER 19 NONPARAMETRIC STATISTICS 922

19.1 A TEST FOR RANDOMNESS: THE RUNS TEST 924
19.2 NONPARAMETRIC TESTS OF CENTRAL TENDENCY: TWO POPULATIONS 933
19.3 COMPARING MORE THAN TWO POPULATIONS: THE KRUSKAL-WALLIS TEST AND THE FRIEDMAN TEST 950
19.4 A MEASURE OF ASSOCIATION: SPEARMAN'S RANK CORRELATION 959
19.5 AN ALTERNATIVE TO THE LEAST SQUARES REGRESSION LINE: A NONPARAMETRIC APPROACH 967

Summary 972 • Summary of Formulas 973 • Review Exercises 974 • Insights from Statistics in Action: Marketing Athleisure Shoes—Dealing with Fickle Consumers 982 • Computer Exercises Using the Databases 983 • Chapter 19 Appendix: Data Analysis with MINITAB 983

APPENDIXES A–1

A TABLES A–2
B DERIVATION OF MINIMUM TOTAL SAMPLE SIZE A–38
C INTRODUCTION TO EXCEL A–40
D INTRODUCTION TO MINITAB A–47
E DATABASE USING HOUSEHOLD FINANCIAL VARIABLES A–56
F DATABASE USING FINANCIAL VARIABLES OF COMPANIES A–64
G ANSWERS TO ODD-NUMBERED EXCERCISES A–74

INDEX I–1

此为试读,需要完整PDF请访问: www.ertongbook.com