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

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A COMPUTER INTEGRATED, DATA ANALYSIS APPROACH

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UNIVERSITY OF NORTH TEXAS

浙江理工大学图书馆
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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

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

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

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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

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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

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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
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Elana, Holly, Stephen, and Darin
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