

# Statistics *for* Managers

4th Edition

Using Microsoft® Excel

Descriptive Statistics By Risk Category			
A	B	C	D
	Very Low	Low	Average
1			
2	13.45	12.23421	11.20854
3 Mean	1.103555	0.411009	0.46118
4 Standard Error	12.2	11.75	7.10.55
5 Median	#N/A	9.4	10.5
6 Mode	2.703146	3.583092	4.178977
7 Standard Deviation	7.307	12.82895	17.46196
8 Sample Variance	1.118103	1.411879	4.178977
9 Kurtosis	1.365864	1.017377	0.983274
10 Skewness	7.2	19.34	
11 Range	11		
12 Minimum			
13 Maximum			

LEVINE STEPHAN KREHBIEL BERENSON

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# STATISTICS FOR MANAGERS USING MICROSOFT® EXCEL

FOURTH EDITION

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*To our wives,  
Marilyn L., Mary N., Patti K., and Rhoda B.  
and to our children,  
Sharyn, Mark, Ed, Rudy, Rhonda, Kathy, and Lori*

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# PREFACE

## Educational Philosophy

In our many years of teaching introductory statistics courses, we have continually searched for ways to improve the teaching of these courses. Our vision for teaching these introductory business statistics courses has been shaped by active participation in a series of Making Statistics More Effective in Schools of Business, Decision Sciences Institute, and American Statistical Association conferences as well as by the reality of serving a diverse group of students at large universities. Over the years, our vision has come to include these principles:

1. Students need a frame of reference when learning statistics, especially since statistics is not their major. That frame of reference for business students should be the functional areas of business—that is, accounting, economics and finance, information systems, management, and marketing. Each statistical topic needs to be presented in an applied context related to at least one of these functional areas.
2. Virtually all the students taking introductory business statistics courses are majoring in areas other than statistics. Introductory courses should focus on underlying principles that nonstatistics majors will find useful.
3. The use of spreadsheet and/or statistical software should be integrated into all aspects of an introductory statistics course. In the workplace, spreadsheet software (and sometimes statistical software) is usually available on a decision-maker's desktop. Our teaching approach needs to recognize this reality, and we need to make our courses more consistent with the workplace environment.
4. Textbooks that use software must provide enough instructions so that students can effectively use the software, without the software (and instruction) dominating the course.
5. The focus in teaching each topic should be on the application of the topic to a functional area of business, the interpretation of results, the presentation of assumptions, the evaluation of the assumptions, and the discussion of what should be done if the assumptions are violated. These points are particularly important in regression and forecasting, and in hypothesis testing. Although the illustration of some computations is inevitable, the focus on computations should be minimized.
6. Both classroom examples and homework exercises should relate to actual or realistic data as much as possible. Students should work with data sets, both small and large, and be encouraged to look beyond the statistical analysis of data to the interpretation of results in a managerial context.
7. Introductory courses should avoid an overconcentration on one topic area (such as hypothesis testing) and instead provide breadth of coverage of a variety of statistical topics. This will help student avoid the “I can't see the forest from the trees” syndrome.

## New to This Edition

This new fourth edition of *Statistics for Managers Using Microsoft Excel* has been improved in a number of important areas.

- **Reorganization of the hypothesis testing chapters** so that all tests involving the normal and  $t$  distribution are discussed *prior to* coverage of the  $F$  test for differences in two variances. This  $F$  test is now covered at the end of Chapter 9, “Two Sample Tests.” In addition, the nonparametric tests have been relocated into a new chapter, “Chi-Square Tests and Nonparametric Tests” (Chapter 11). The reorganization of these chapters allows instructors to cover all the normal and  $t$  distribution tests in the same chapter and without loss of continuity.
- **The Excel presentation has been revised so that this popular software package can be used in your class with or without the PHStat add-in.** The revision retains its use of Excel output within the chapters for the purpose of interpreting results. The vast majority of this output is from standard Excel. The presentation of Excel dialog boxes and instructions has been

streamlined and now clearly shows how to do statistical analysis using Microsoft Excel **with or without our add-in PHStat2**. This fourth edition of *Statistics for Managers Using Microsoft Excel* is now the only introductory business statistics book that allows you to integrate the use of Microsoft Excel with or without an add-in.

- **Hundreds of new applied examples and exercises** with data from the *Wall Street Journal*, *USA Today*, *Consumer Reports*, and other sources have been added to the text.
- **Updated version of PHStat2**—PHStat2 version 2.5, the newest version of Prentice Hall's supplemental add-in program for Microsoft Excel, is bundled with the text. This updated version includes enhancements such as the ability to work with recent Microsoft Office security updates, multiple regression with independent variables in noncontiguous columns, improved stem-and-leaf displays and box-and-whisker plots, the *Z* test for the difference in two means, Levene's test for the homogeneity of variance, and the Marascuilo multiple comparison procedure for proportions. Version 2.5 is fully supported by the enhanced PHStat2 Web site located at [www.prenhall.com/phstat](http://www.prenhall.com/phstat).
- **Reorganized and rewritten Excel Handbook sections** for those not using an add-in (or those who are, but want more understanding of the worksheets that PHStat2 produces), these end-of-chapter sections provide detailed instructions for creating worksheets that perform statistical analysis using Microsoft Excel.
- **Web cases**—These cases emphasize the application of statistics in uncovering underlying data patterns and proving claims about business performance. In these Web cases, students are asked to visit Web sites of companies mentioned in the Using Statistics scenario that starts each chapter. Unlike traditional case studies, but much like real-world situations, not all of the information encountered is relevant to the task. Often, conflicting information is provided that needs to be resolved in order to complete the case. These cases involve critical thinking by the student while at the same time provide some levity to stimulate interest. The cases are ideal for group projects and in-depth class discussion.
- **An Appendix, "Preparing Data for Reports and Presentations Using Microsoft Office"** explains techniques for integrating Microsoft Excel results in Microsoft Word documents and Microsoft PowerPoint presentations and for using Internet Explorer to retrieve data from the World Wide Web for use by Microsoft Excel.
- **More comprehensive coverage of topics**—Additional topics including Six Sigma® management, Levene's test for the homogeneity of variance, and the Uniform distribution are included in the text. Topics such as computations from frequency distributions, counting rules, the Poisson approximation to the binomial distribution, the normal approximation to the binomial and the Poisson distributions, using the standardized normal tables, power of the test, the randomized block design, the chi-square test for a variance, and the chi-square goodness of fit test are now included on the CD-ROM that accompanies the text.
- **Expanded Springville Herald cases**—the running case, Managing the *Springville Herald*, now appears in 13 chapters in the text.

## Hallmark Features

We have continued many of the traditions of past editions. We've highlighted some of those features below.

- **Using Statistics business scenarios**—Each chapter begins with a *Using Statistics* example that shows how statistics can be used in one of the functional areas of business—accounting, finance, management, or marketing. This scenario is used throughout the chapter to provide an applied context for the concepts.
- **Emphasis on data analysis and interpretation of computer output**—We take the position that the use of computer software such as Microsoft Excel is an integral part of learning statistics. Our focus emphasizes analyzing data, interpreting the output from Microsoft Excel, and explaining how to use this software while reducing emphasis on doing computations. Therefore, we have included a great deal of computer output and integrated this output into the fabric of the text. For example, in the coverage of tables and charts in Chapter 2, the focus is on the interpretation of various charts, not on their construction by hand. In our coverage of hypothesis testing in Chapters 8–11, extensive computer output has been included so that the *p*-value approach can be used. In the coverage of simple linear regression in

Chapter 12, it is assumed that Microsoft Excel will be used and thus the focus is on the interpretation of the output not on hand calculations (which have been placed in a separate section of the chapter).

- **PHStat2**, a supplemental add-in program for Microsoft Excel, enhances the statistical capabilities of Microsoft Excel and executes the low-level menu selection and worksheet entry tasks for you that are associated with implementing statistical analysis in Excel. When combined with Microsoft Excel's own Data Analysis ToolPak add-in, virtually all statistical methods taught in an introductory statistics course can be illustrated in Microsoft Excel.
- **Pedagogical aides**, such as an active, conversational writing style, exhibit boxes to highlight important concepts, boxed numbered equations, set-off examples to provide reinforcement for learning concepts, boxes that focus on the assumptions of statistical methods, chapter summary charts, problems divided into Learning the Basics and Applying the Concepts, and key terms are included.
- **Answers** to most of the even-numbered exercises are provided at the end of the book.
- **Report Writing** exercises allow students to place the results of an analysis in a business context by incorporating Microsoft Office techniques such as pasting Microsoft Excel tables and charts into a Microsoft Word document and PowerPoint presentation
- **Internet Exercises** located on the text Web site ([www.prenhall.com/levine](http://www.prenhall.com/levine)) allow students to explore data sources available on the World Wide Web.
- **Case Studies and Team Projects**—Detailed case studies are included at the end of numerous chapters. The *Springville Herald* case is included at the end of most chapters as an integrating theme. A Team Project relating to mutual funds is included at the end of many chapters as an integrating theme.
- **Visual Explorations**—provided on the free student CD-ROM—allow students to interactively explore important statistical concepts in descriptive statistics, probability, the normal distribution, and regression analysis. For example, in descriptive statistics, students observe the effect of changes in the data on the average, median, quartiles, and standard deviation. In basic probability, students use simulation to explore the effect of sample size on a probability distribution. With the normal distribution, students get to see the effect of changes in the mean and standard deviation on the areas under the normal curve. In regression analysis, students have the opportunity of fitting a line and observing how changes in the slope and intercept affect the goodness of fit of the fitted line.

## Content Changes in the Fourth Edition

- Chapter 1 has completely new sections, 1.1 through 1.7. The section “Types of Data” now follows “Types of Survey Sampling Methods.”
- The Excel Primer has been rewritten and reorganized.
- Chapter 2 has a new updated set of mutual fund returns for the period 1997–2001, and a Web case.
- Chapter 3 has a new updated set of mutual fund returns for the period 1997–2001, and a Web case. In addition, the section “Exploratory Data Analysis” is now section 3.4. The sample covariance is now included in section 3.5. The chapter now includes a CD-ROM section on obtaining descriptive summary measures from a frequency distribution.
- Chapter 4 has a Web case, and a CD-ROM section on “Counting Rules.”
- Chapter 5 has a Web case, and a CD-ROM section on “Using the Poisson Distribution to Approximate the Binomial Distribution.”
- Chapter 6 has a section on the uniform distribution, a Web case, and CD-ROM sections on “Using the Standardized Normal Distribution Table” and “The Normal Approximation to the Binomial and Poisson Distributions.”
- Chapter 7 has a Web case.
- Chapter 8 has a *Managing the Springville Herald* case, a Web case, and a CD-ROM section on the “Power of a Test.”
- Chapter 9 is reorganized so that two sample tests for means and proportions precede the  $F$  test for the difference between variances. The Wilcoxon rank sum test has been moved to Chapter 11. The chapter now includes a Web case.
- Chapter 10 has a Web case, has coverage of the Levene test for homogeneity of variance, and a CD-ROM section on the “Randomized Block Design.” The Kruskal-Wallis test has been moved to Chapter 11.



- Chapter 11 now includes chi-square tests and nonparametric tests. It includes a Web case, the Wilcoxon rank sum test, the Kruskal-Wallis test, and CD-ROM sections on the chi-square test for a variance and the chi-square goodness of fit test.
- Chapter 12 has simplified computations in the chapter example, and has a Web case.
- Chapter 13 contains the introduction to multiple regression including the section on dummy variables, additional coverage of interaction terms, a *Managing the Springville Herald* case, and a Web case.
- Chapter 14 is now “Multiple Regression Model Building.” It includes a Web case.
- Chapter 15 has new and updated data sets for the chapter examples, a section on index numbers, and a Web case.
- Chapter 16 has a Web case.
- Chapter 17 provides more concise coverage of the history of quality, a new section on Six Sigma® Management, and a new example with raw data for the range and mean charts.

## Supplement Package

The supplement package that accompanies this text includes the following:

- **Instructor’s Solution Manual**—This manual includes teaching tips for each chapter, solutions for the Web cases, the *Springville Herald* running case, other cases, extra detail in the problem solutions, and many Excel solutions.
- **Student Solutions Manual**—This manual provides detailed solutions to virtually all the even-numbered exercises.
- **Test Item File**—The Test Item File contains true/false, multiple choice, fill-in, and problem solving questions based on the definitions, concepts, and ideas developed in each chapter. Extra Excel-based questions are included.
- **TestGen testing software**—The printed test bank is designed for use with the TestGen-EQ test generating software. This computerized package allows instructors to custom design, save, and generate classroom tests. The test program permits instructors to edit, add, or delete questions from the test banks; edit existing graphics and create new graphics; analyze test results; and organize a database of tests and student results. This new software allows for greater flexibility and ease of use. It provides many options for organizing and displaying tests, along with a search and sort feature.
- **Instructor’s Resource CD-ROM**—The Instructor’s Resource CD-ROM contains the electronic files for the complete Instructor’s Solutions Manual (MSWord), the Test Item File (MS Word), the computerized Test Item File (TestGen) and PowerPoint presentations.
- **PH Grade Assist**—An online homework and assessment system that allows the instructor to create homework assignments for student practice, homework, or quizzes. The problems, taken directly from this text, are algorithmically generated, so each student gets a slightly different problem with a different answer. This feature allows students multiple attempts for more practice and improved competency. PH Grade Assist grades the results and can export them to your Excel worksheet.
- **Companion Web site**—This site contains additional problems, teaching tips, tips for student, current events exercises, practice exams, and links to other sites that contain statistical data.

## About the World Wide Web

The text has a home page on the World Wide Web at [www.prenhall.com/levine](http://www.prenhall.com/levine).

This site provides many resources for both faculty members and students. A partial list of the features includes:

- Links to other sites that provide data appropriate for statistics courses
- Student tips
- Sample exams
- Current event exercises
- Internet exercises

PHStat2 has a home page on the World Wide Web at [www.prenhall.com/phstat](http://www.prenhall.com/phstat).

An index page for the supporting material for all the Web cases included in the text can be found at [www.prenhall.com/Springville/Springvillecc.htm](http://www.prenhall.com/Springville/Springvillecc.htm).

## Acknowledgments

We are extremely grateful to the many organizations and companies that allowed us to use their data in developing problems and examples throughout the text. We would like to thank *The New York Times*, Consumers Union (publishers of *Consumer Reports*), Mergent's Investor Service (publishers of *Mergent's Handbook of Common Stocks*), and CEEPress.

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## Contacting the Authors

We have gone to great lengths to make this text both pedagogically sound and error-free. If you have any suggestions or require clarification about any of the material, or if you find any errors, please contact us at **David\_Levine@BARUCH.CUNY.EDU**, **DavidMLevine@msn.com**, or **KREHBITC@MUOHIO.EDU**. For questions and more information about PHStat2, see Appendix F and the PHStat Web site located at [www.prenhall.com/phstat](http://www.prenhall.com/phstat).

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