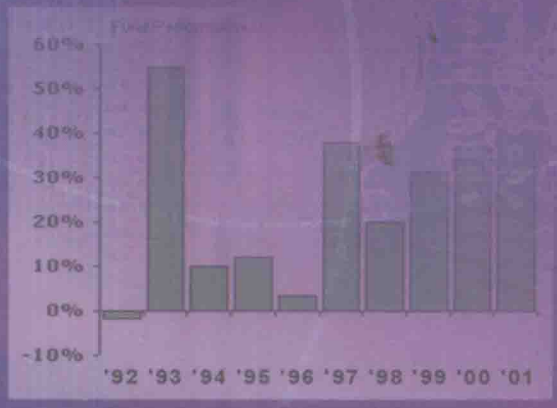
STATISTICS FOR MANAGERS

USING MICROSOFT® EXCEL

Third Edition

	A	B
1	*3-Yr. Return*	
2		
3	Mean	19.29
4	Standard Error	2.06
5	Median	18.42
6	Mode	#N/A
7	Standard Deviation	7.71
8	Sample Variance	59.42
9	Kurtosis	1.86
10	Skewness	1.31
11	Range	28.39
12	Minimum	9.77
13	Maximum	38.16
14	Sum	270.12
15	Count	14
16	Largest(1)	38.16
17	Smallest(1)	9.77



LEVINE STEPHAN KREHBIEL BERENSON

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Software
CD INCLUDED

Statistics for Managers Using Microsoft® Excel

THIRD EDITION

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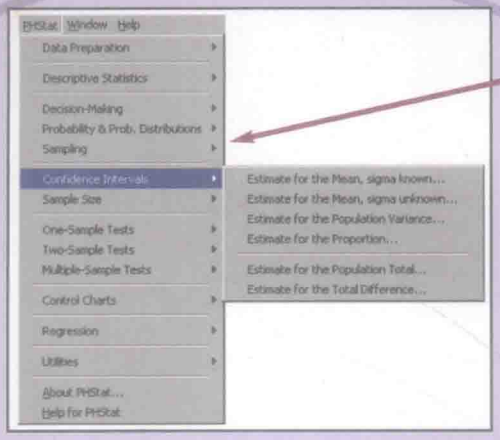
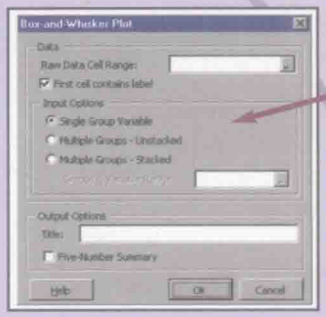
STATISTICAL SOFTWARE...PHStat2

PHStat2 is a statistical add-in for Microsoft® Excel provided free with Levine/Stephan/Krehbiel/Berenson, ***Statistics for Managers Using Microsoft® Excel*, Third Edition**. This powerful add-in is included free on the Student CD-ROM.



PHStat2 provides a custom menu of topics which supplement the Data Analysis Add-in Tools already included in Microsoft Excel®. Between these two, the user is able to perform statistical analysis for most of the topics that would be covered in a two-term business statistics course at the introductory level.



Easy-to-use Dialog boxes allow the user to make entries and select the options they want, expanding the capabilities of Excel to a wide range of statistical topics.

BELOW IS A FULL LISTING OF THE MENU CHOICES FOR PHStat2:

Data Preparation
- Stack Data
- Unstack Data

Descriptive Statistics
- Box-and-Whisker Plot *(enhanced)*
- Dot Scale Diagram *(new)*
- Frequency Distribution *(new)*
- Histogram & Polygons *(new)*
- Stem-and-Leaf Display
- One-Way Tables & Charts *(enhanced)*
- Two-Way Tables & Charts

Decision-Making
- Covariance and Portfolio Analysis
- Expected Monetary Value
- Expected Opportunity Loss
- Opportunity Loss

Probability & Probability Distributions
- Simple & Joint Probabilities
- Normal
- Normal Probability Plot
- Binomial
- Exponential
- Hypergeometric
- Poisson

Sampling
- Random Sample Generation
- Sampling Distributions Simulation

Confidence Intervals
- Estimate for the Mean, Sigma Known
- Estimate for the Mean, Sigma Unknown
- Estimate for the Population Variance *(new)*
- Estimate for the Proportion
- Estimate for the Population Total
- Estimate for the Total Difference

Sample Size
- Determination for the Mean
- Determination for the Proportion

One-Sample Tests
- *Z* Test for the Mean, sigma known
- *t* Test for the Mean, sigma unknown
- Chi-Square Test for the Variance *(new)*
- *Z* Test for the Proportion

Two-Sample Tests
- *t* Test for the Differences in Two Means
- *F* Test for the Differences in Two Variances
- Wilcoxon Rank Sum Test
- Chi-Square Test for Differences in Two Proportions
- *Z* Test for Differences in Two Proportions

Multiple-Sample Tests
- Chi-Square Test
- Kruskal-Wallis Rank Test
- Tukey-Kramer Procedure *(enhanced)*

Control Charts
- *p* Chart
- *R* & XBar Charts

Regression
- Simple Linear Regression
- Multiple Regression
- Best Subsets
- Stepwise Regression *(new)*

Utilities
- Fix Up Chart *(new)*
- Remove Worksheet Cell Tints *(new)*

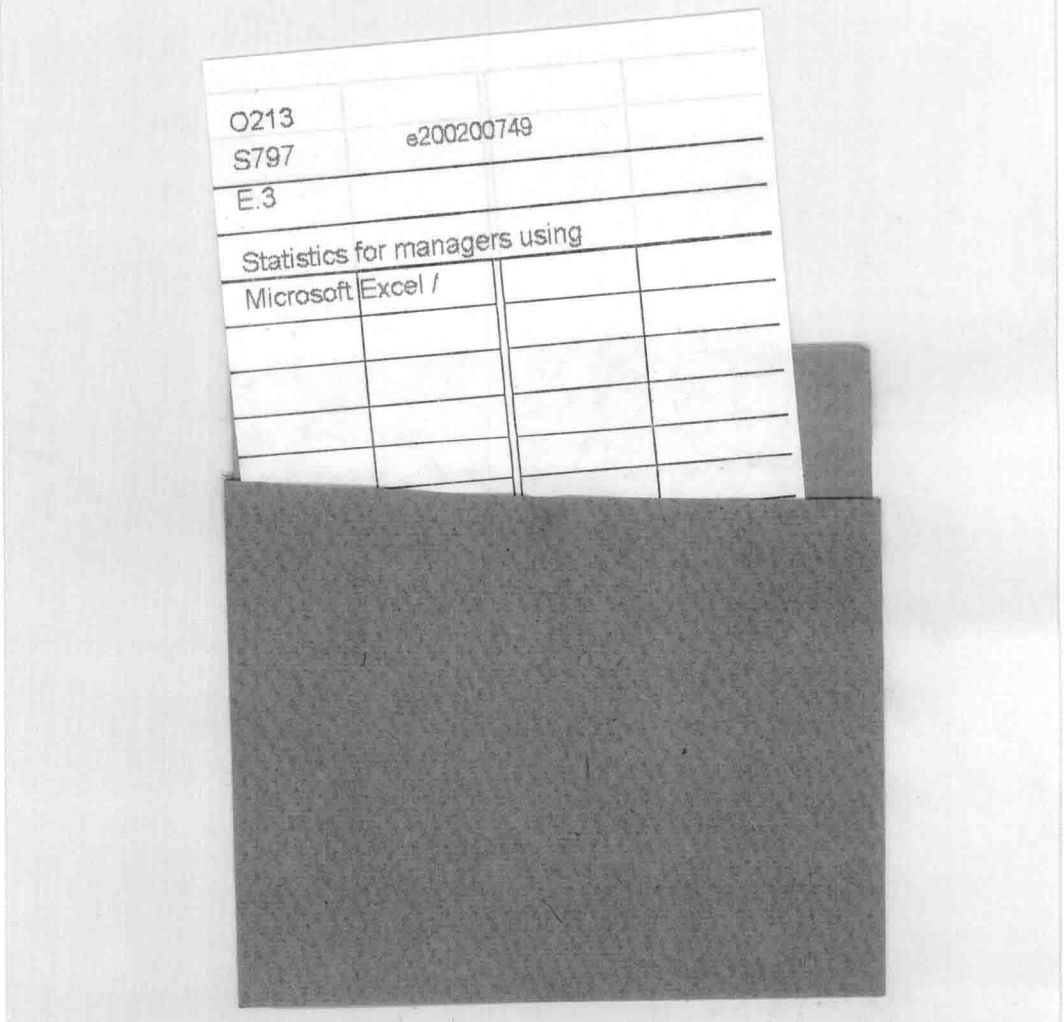
About PHStat

Help for PHStat (new)

"USING STATISTICS" APPLICATIONS
(APPLYING STATISTICS TO THE FUNCTIONAL AREAS OF BUSINESS)

CHAPTER TITLE	"*USING STATISTICS*" SCENARIO	FUNCTIONAL AREA
1. Introduction and Data Collection	*Good Tunes,* an e-commerce Web site	E-Marketing
2. Presenting Data in Tables and Charts	Comparing the performance of Mutual Funds	Finance
3. Numerical Descriptive Measures	Comparing the performance of Mutual Funds	Finance
4. Basic Probability and Discrete Probability Distribution	Consumer Electronics Company	Marketing
5. The Normal Distribution and Sampling Distributions	Downloading time for a Web site	Information Systems
6. Confidence Interval Estimation	Auditing sales invoices	Accounting
7. Fundamentals of Hypothesis Management Testing: One-Sample Tests	Cereal-fill packaging process	Operations Management
8. Two Sample Tests with Numerical Data	Comparing end-aisle and normal displays in a supermarket	Marketing
9. Analysis of Variance	Evaluating strength of parachutes	Operations Management
10. Tests for Two or More Samples with Categorical Data	Guest satisfaction at hotel properties	Quality Management
11. Simple Linear Regression	Forecasting sales at a women's clothing store franchise	Management
12. Multiple Regression	Predicting sales of test market data	Management
13. Time-Series Analysis	Forecasting revenues of companies	Finance
14. Decision Making	Making investment decisions	Finance
15. Statistical Applications in Quality and Productivity Management	Service quality at a hotel	Quality Management

Statistics for Managers Using Microsoft® Excel



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

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 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 non-statistics 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 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 students avoid the "I can't see the forest from the trees" syndrome.

Features of This Text

When planning this textbook, we focused on how desktop productivity tools, such as spreadsheets, have altered managers' decision-making processes. Whereas managers once had to turn to a Management Information Systems Department to obtain customized summaries of corporate data, today an increasing number of managers use spreadsheet applications as the means to retrieve and directly analyze the data they need. In this context, employers now are beginning to desire, if not demand, that their college-educated,

entry-level employees have more than just a cursory awareness of spreadsheet applications. These changes, along with the realization that current spreadsheet applications can assist in performing the types of analyses once done only by specialized statistical software packages, led us to develop *Statistics for Managers Using Microsoft Excel.*

Therefore, we take the position that using Microsoft Excel can play a valuable role in learning statistics. Our focus emphasizes analyzing data, interpreting the output from Microsoft Excel, and explaining how to use this software while reducing the emphasis on doing computations. Therefore, we have included a great deal of Excel 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 7 through 10, extensive Excel output has been included so that the *p*-value approach can be used. In our coverage of simple linear regression in Chapter 11, we assume that Microsoft Excel will be used, and thus the focus is on the interpretation of the output, and not on hand calculations (which have been placed in a separate section of the chapter).

New to This Edition

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

Coverage of Excel

A major thrust of this revision is to refine the presentation of the Microsoft Excel-related material. To that end, this edition contains the following enhancements:

- **Excel output for interpretation has been integrated directly into the examples.** Results for many of the examples are now presented as screen shots from actual Excel worksheets.
- **Simple-to-use Excel instructions are conveniently located after the discussion of a statistical topic.** These instructions allow readers to generate statistical results quickly through the extensive use of PHStat2 (see below) and the wizards and add-ins that comprise Microsoft Excel. Sets of instructions are highlighted with a color tint for easy reference and are typically a page or less in length.
- **Detailed instructions for implementing worksheet solutions are presented in end of chapter "Excel Handbook" sections.** Those who want to learn about Microsoft Excel or those who cannot or choose not to use PHStat2 can use these instructions to generate statistical results. This way, the detailed instructions are there for those who want them, but those who do not can easily skip the instructions. (All will find the Handbooks helpful for understanding how PHStat2 generates its results.)
- **New or streamlined Excel instructions for a variety of methods including producing dot scale diagrams, histograms, multiple polygons, and stepwise regression.**
- **PHStat2, the latest version of PHStat, Prentice Hall's statistical add-in for Microsoft Excel for Windows.** PHStat2 contains a number of new or enhanced procedures and now includes a full help system for easy reference.

Applications

- **Updated and improved *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, marketing or information systems. This scenario is used throughout the chapter to provide an applied context for the concepts. The following are the *Using Statistics* scenarios presented throughout the book:

CHAPTER TITLE	*"USING STATISTICS"* SCENARIO	FUNCTIONAL AREA
1. Introduction and Data Collection	*Good Tunes*, an e-commerce web site	E-marketing
2. Presenting Data in Tables and Charts	Comparing the performance of mutual funds	Finance
3. Numerical Descriptive Measures	Comparing the performance of mutual funds	Finance
4. Basic Probability and Discrete Probability Distributions	Accounting information systems	Accounting
5. The Normal Distribution and Sampling Distributions	Downloading time for a web site	Information Systems
6. Confidence Interval Estimation	Auditing sales invoices	Accounting
7. Fundamentals of Hypothesis Testing: One-Sample Tests	Cereal-fill packaging process	Operations Management
8. Two-Sample Tests with Numerical Data	Comparing end-aisle and normal displays in a supermarket	Marketing
9. Analysis of Variance	Evaluating strength of parachutes	Operations Management
10. Tests for Two or More Samples with Categorical Data	Guest satisfaction at hotel properties	Quality Management
11. Simple Linear Regression	Forecasting sales at a women's clothing store franchise	Management
12. Multiple Regression	Predicting sales of test market data	Marketing
13. Time-Series Analysis	Forecasting revenues of companies	Finance
14. Decision Making	Making investment decisions	Finance
15. Statistical Applications in Quality and Productivity Management	Service quality at a hotel	Quality Management

- **Hundreds of new applied examples and exercises with data from the *Wall Street Journal, USA Today,*** and other sources have been added to the text.
- ***Visual Explorations***—Included on the CD-ROM that accompanies this textbook. Visual Explorations in Statistics is a Microsoft Excel add-in that allows 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 sampling distributions, students use simulation to explore the effect of sample size on a probability distribution. With the normal distribution, students 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.
- **Using Microsoft Office sections.** Located at the end of selected chapters, this feature discusses ways in which users can share data between Microsoft Excel and other components of Microsoft Office, including Microsoft Word and Microsoft PowerPoint, and the web browser Internet Explorer. Detailed, step-by-step instructions explain how to incorporate an Excel worksheet or chart in a Word document or a PowerPoint presentation, as well as how to save Excel worksheets and charts as html World Wide Web pages and how to retrieve and import data from the World Wide Web using Internet Explorer.

Exercises

- **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 book's web site (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 ends of many 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 also included at the end of most chapters as an integrating theme.

Content Changes in the Third Edition

- Chapter 1 ("Introduction and Data Collection") contains additional chapter review problems on accessing the Internet and a new *Using Statistics* example involving an Internet company.
- The Excel Primer has been reorganized and updated for Excel 2000.
- Chapter 2 ("Presenting Data in Tables and Charts") contains an updated *Using Statistics* example, new graphical excellence examples, a section on the scatter diagram, and a section on placing Microsoft Excel worksheet data and charts in Microsoft Word documents.
- Chapter 3 ("Descriptive Statistics") contains an updated *Using Statistics* example, additional integration of Excel output, coverage of the correlation coefficient, coverage of the geometric mean (which finance students especially need), a Visual Explorations module on descriptive statistics, and placing Microsoft Excel worksheet data and charts in PowerPoint presentations.
- Chapter 4 ("Basic Probability and Discrete Probability Distributions") changes the *Using Statistics* binomial example to an accounting information system, moves covariance so that it follows expected value, and uses an example with a negative covariance.
- Chapter 5 ("The Normal Distribution and Sampling Distributions") changes the *Using Statistics* example to an Internet example, uses only the cumulative normal table, integrates Excel output into the normal distribution section and contains Visual Explorations modules for the normal distribution and sampling distributions.
- Chapter 6 ("Confidence Interval Estimation") adds one-sided confidence intervals to the section on auditing and moves the finite population correction factor to the CD-ROM.
- Chapter 7 ("Fundamentals of Hypothesis Testing: One-Sample Tests") adds computer output to all sections and combines sections 7.2 and 7.3 so that *p*-values are not covered in a separate section.
- Chapter 8 ("Two-Sample Tests with Numerical Data") changes the *Using Statistics* example to one related to marketing and provides additional emphasis on *p*-values, adds the confidence interval estimate for the difference between two means, and discusses the *t* test for the difference between the means when the variances are not equal.
- Chapter 9 ("Analysis of Variance") changes the *Using Statistics* example, adds computer output, and provides additional emphasis on *p*-values.
- Chapter 10 ("Tests for Two or More Samples with Categorical Data") adds the confidence interval estimate for the difference between two proportions.

- Chapter 11 ("Simple Linear Regression") adds more coverage of PHStat, contains a Visual Explorations module on regression, and includes a section on saving Microsoft Excel worksheets and charts as web pages.
- Chapter 12 ("Multiple Regression") changes the *Using Statistics* example to a marketing problem, includes additional discussion of interaction terms in multiple regression, and adds new PHStat2 features to the section on stepwise regression and confidence intervals for the mean response.
- Chapter 13 ("Time-Series Analysis") changes the *Using Statistics* example, adds a section on index numbers that appears on the CD-ROM, and includes a section on how to retrieve and import data from the World Wide Web using Internet Explorer.
- Chapter 14 ("Decision Making") has been moved after the regression and time series forecasting chapters.
- Chapter 15 ("Statistical Applications in Quality and Productivity Management") has been moved after the regression and time series chapters and adds a section on process capability.

Supplement Package

The supplement package that accompanies this text includes the following:

- **Instructor's Solution Manual**—This manual includes 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**—This supplement includes extra Excel-based test questions.
- **Instructor's CD/ROM**—The instructor's CD-ROM contains PowerPoint slides, the Instructor's Solutions Manual and Test Item File, and Prentice Hall's Custom Test Manager.
- **PHStat2**—This is a statistical add-in for Microsoft Excel for Windows. The data files for the examples and exercises are contained on the CD-ROM that accompanies the text.
- **MyPHLIP Web site**—This site contains additional problems, teaching tips, tips for students, 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**.

This site incorporates the features of MyPHLIP (Prentice Hall's Learning on the Internet Partnership), a robust Web site that contains many resources for both faculty members and students. A partial list of the features includes:

- Teaching tips
- Links to other sites that provide data appropriate for statistics courses
- Student tips
- Sample Exams
- Current Event exercises
- Internet Exercises

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*), Moody's

Investor Service (publishers of *Moody's Handbook of Common Stocks*), CEEPress, and Gale Research.

In addition, we would like to thank the Biometrika Trustees, American Cyanimid Company, the Rand Corporation, the American Society (for Testing and Materials for their kind permission to publish various tables in Appendix E), and the American Statistical Association (for its permission to publish diagrams from the *American Statistician*). Finally we are grateful to Professors George A. Johnson and Joanne Tokle of Idaho State University and Ed Conn, Mountain States Potato Company, for their kind permission to incorporate parts of their work as our Mountain States Potato Company case in Chapter 15.

A Note of Thanks

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We would like to especially thank Tom Tucker, Debbie Clare, Rick DeLorenzo, and Jennifer Surich, of the editorial, marketing, and production teams at Prentice Hall. We would also like to thank our statistical reader, Brian Proffitt for his diligence in checking the accuracy of our work, Cynthia Proffitt for her proofreading, Kitty Jarrett for her copy editing, and Sandra Gormley of UG / GGS Information Services, Inc. for her work in the production of the text.

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Concluding Remarks

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 or KREHBITC @MUOHIO.EDU. For questions and more information about PHStat2, see Appendix G and the PHStat web site located at www.prenhall.com/phstat.

David M. Levine
David Stephan
Timothy C. Krehbiel
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