ABBREVIATED FOURTH EDITION

STATISTICS

FOR MANAGEMENT AND ECONOMICS

KELLER | WARRACK

Includes Data Analysis® Plus
Statistical Add-Ins for Microsoft® Excel!

STATISTICS
FOR MANAGEMENT AND ECONOMICS

ABBREVIATED FOURTH EDITION

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DEDICATION

Gita, Barbara, Jeffery, and Jonathan
G.K.

Cynthia and Karen
B.W.

The cover illustrator, Cary Henrie, has translated our sense of the power of statistics into unique visual images. Like prisms converting light into a color spectrum, statistical techniques can shape apparently unconnected numbers into a lightning bolt—a statistical summary or chart—of useful information that can be applied to make timely decisions in the worlds of business and economics.

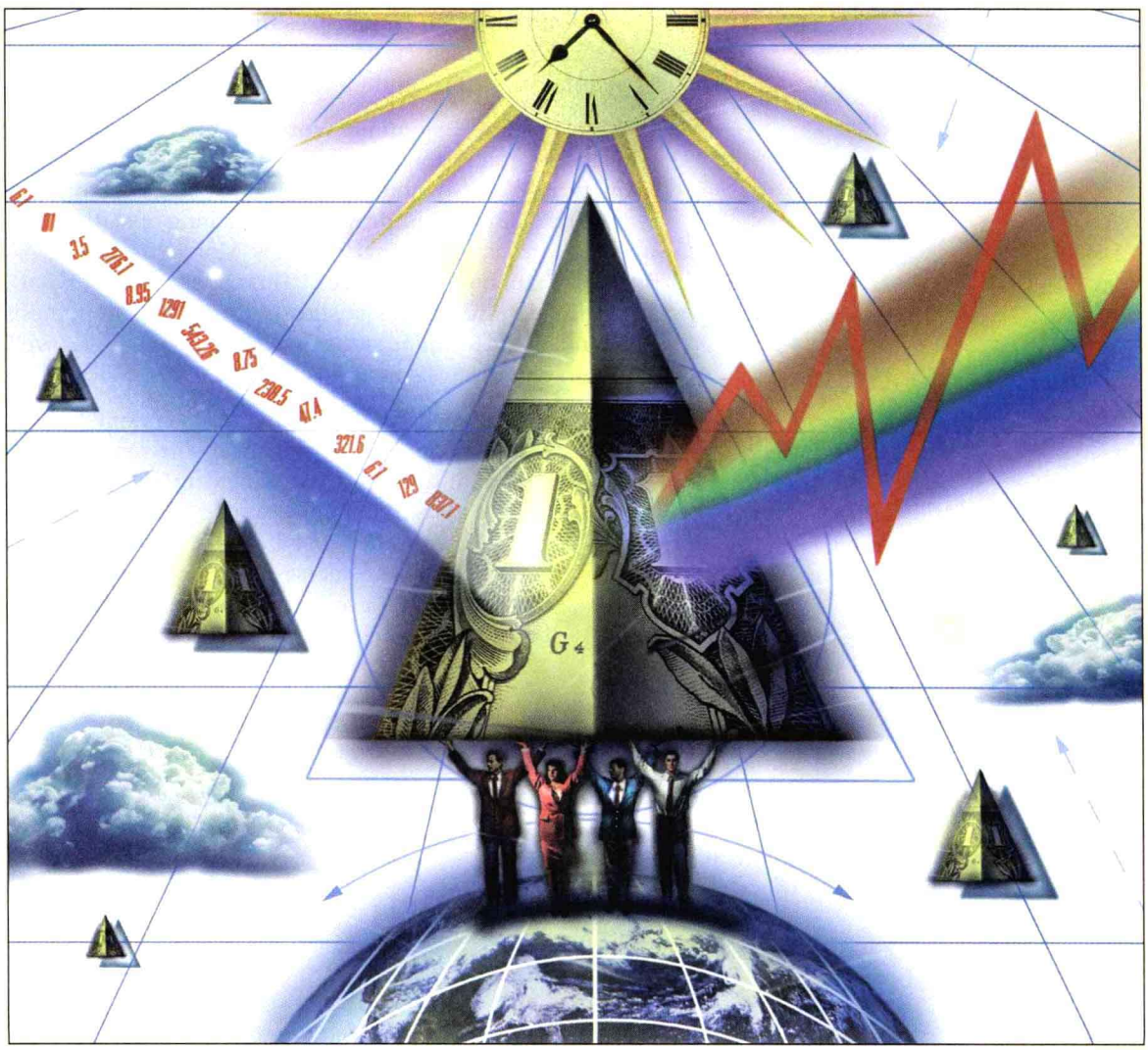
—G.K. AND B.W

Editor's Note: Mr. Henrie's work has appeared in such publications as *Time, Sports Illustrated, Business Week,* and *Esquire.* He works exclusively on a Macintosh computer but strives for a warm, natural look, as if each piece were a painting.

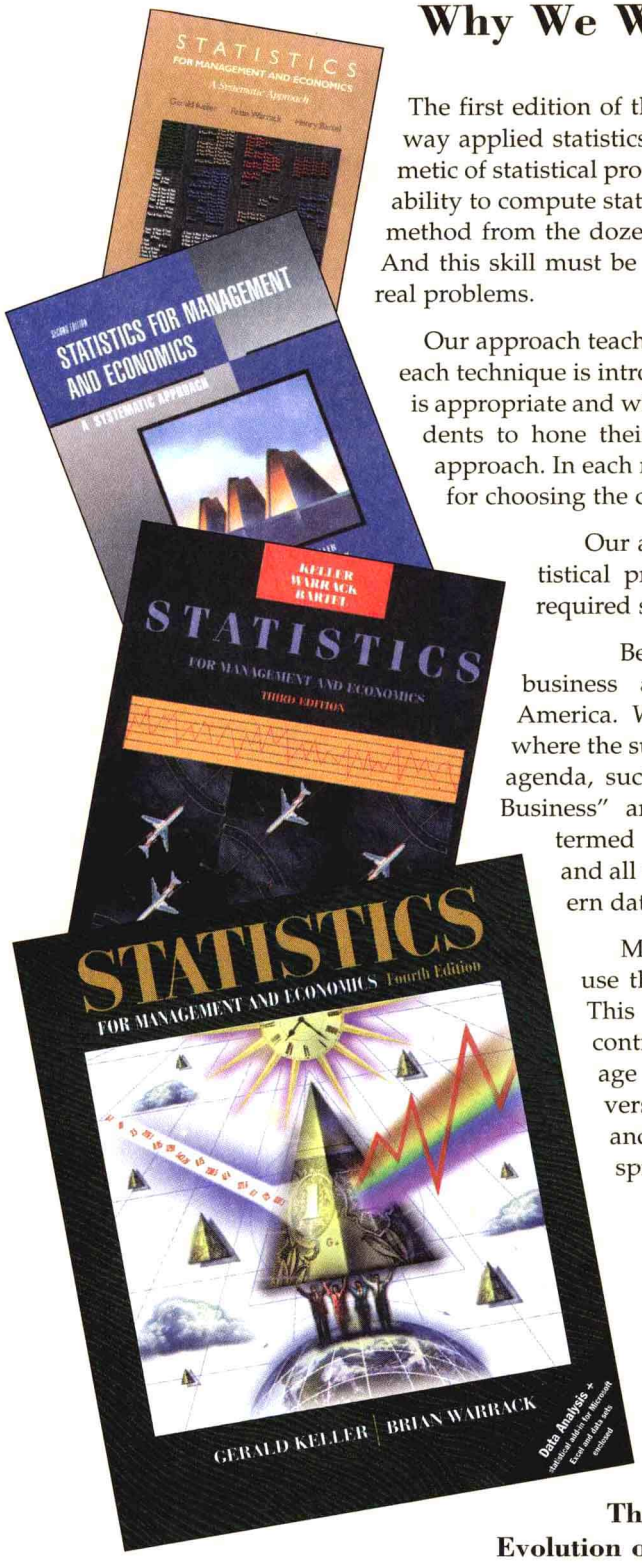
Visual Preface to Statistics for Management and Economics

ABBREVIATED FOURTH EDITION

Statistics for Management and Economics, Abbreviated Fourth Edition, is about using statistical techniques and converting data into information. We emphasize real problems and data, the use of computers, Microsoft Excel and Minitab software, and the correct interpretation of statistical printouts.



Why We Wrote This Book



The Evolution of *Statistics for Management and Economics*

The first edition of this book (1988) attempted to remedy a problem in the way applied statistics was taught: The existing literature stressed the arithmetic of statistical procedures. However, we feel students need more than the ability to compute statistics—they also need the skill to select the appropriate method from the dozens of techniques taught in most introductory courses. And this skill must be taught if students are to eventually apply statistics to real problems.

Our approach teaches students how to recognize the correct procedure. As each technique is introduced, we demonstrate how to recognize when its use is appropriate and when it is not. Review chapters (13 and 19) that allow students to hone their technique-selection skills are also a feature of this approach. In each review chapter a flowchart develops the logical process for choosing the correct technique.

Our approach emphasizes three steps to the solution of statistical problems: (1) identify the technique, (2) compute the required statistics, and (3) interpret the results.

Before beginning work on this edition, we consulted business and economics statistics professors across North America. We also noted the findings of academic conferences where the subject of improving the teaching of statistics was on the agenda, such as "Making Statistics More Effective in Schools of Business" annual conferences. This book covers what may be termed "traditional statistics"—estimation, hypothesis testing, and all the techniques that are based on them—as well as modern data analysis methods.

Most teachers of business and economic statistics now use the computer with statistical software or spreadsheets. This edition makes it convenient to use the computer. We continue to use Minitab because of its simplicity and coverage and because it is used extensively in colleges and universities. Since an increasing number of business schools and industries use spreadsheets, we use the popular spreadsheet Microsoft Excel for Windows.

Rationale for the Abbreviated Fourth Edition

Differences Between the Abbreviated Fourth Edition and the Fourth Edition

While we are very gratified with the success of the fourth edition of this book, we recognize that success in any endeavor requires attention to customer needs. We have received suggestions that we provide a shorter version, which could be more easily covered in one semester. Moreover, adopters have requested that we offer additional Excel add-in macros.

The fourth edition of *Statistics for Management and Economics*, on which this abbreviated edition is based, made several significant pedagogical advances. It was the first text to integrate Microsoft Excel output, instructions and data sets. It integrated computer solving methods with their "by-hand," or manual calculation, counterparts, and it included 475 data sets and computer-based exercises. While these features have been widely accepted, there are several refinements that are included in this abbreviated edition.

This abbreviated fourth edition omits the two chapters on nonparametric statistics (nonparametric techniques are briefly described in two chapter appendixes), one review chapter, the chapter on model building (some of that material was moved to the chapter on multiple regression), and the time series and forecasting chapter.

By emphasizing the use of one of the software packages and omitting most manual calculations, instructors can easily cover the material in this edition in one semester.

This abbreviated fourth edition, like the edition on which it is based, includes Data Analysis Plus® 2.0, a suite of Excel add-ins that greatly extends the menu capabilities of Excel. Data Analysis Plus® 2.0 now includes add-ins for stepwise regression and prediction intervals in regression.

A Practical Approach

Our approach emphasizes the complete process of data analysis, including the skills needed before any calculations are performed, the skills needed to perform the calculations, and the knowledge to properly interpret the statistical results. All appropriate examples throughout the text contain the following pedagogical features. We find that students gain a greater appreciation for methods and a clearer understanding of their application with the following three-step problem-solving approach.

Before the Calculations: Technique Identification

Before performing any calculations on real applications, professionals must determine which method to employ, likely the most daunting challenge facing students. Most introductory courses introduce 30 to 40 statistical procedures. Ironically, technique-identification skills are seldom taught. And yet, without the ability to choose the right procedure, all else is meaningless.

When a technique is first introduced we show how statisticians decide when its use is warranted and how that decision is made. Further, students are provided the opportunity to practice identifying techniques with two review chapters, each containing examples, exercises, and cases requiring the use of techniques presented in the previous chapters. Additionally, each review chapter contains a flowchart asking the questions whose answers guide the student to the appropriate statistical method.

EXAMPLE 13.2

In most cities a municipal agency regulates the amounts charged by taxis. As you're probably aware, total taxi fares are determined by distance traveled as well as the amount of time taken for the trip. In preparing to apply for a rate increase, the general manager of a fleet of taxis wanted to know the distance customers travel by taxis on the average trip. She organized a survey wherein she asked taxi drivers to record the number of miles (to the nearest tenth) traveled by randomly selected customers. A sample of 41 customers was produced. The results appear below (and are stored in file XM11-02). The general manager wants to estimate the mean distance traveled with 95% confidence.

IDENTIFYING THE TECHNIQUE

The problem objective is to describe a single population, the distance traveled by taxi customers. The data are quantitative (miles traveled). The parameter to be estimated is the population mean μ. The confidence interval estimator is

$$\bar{x} \pm t_{\alpha/2}\frac{s}{\sqrt{n}}$$

SOLVING BY HAND

From the sample of 41 observations, we find

$$\sum x_i = 315.6 \quad \text{and} \quad \sum x_i^2 = 2{,}772.0$$

$$\bar{x} = \frac{\sum x_i}{n} = \frac{315.6}{41} = 7.70$$

$$s^2 = \frac{\sum x_i^2 - \frac{(\sum x_i)^2}{n}}{n-1} = \frac{2{,}772.0 - \frac{(315.6)^2}{41}}{40} = 8.57$$

$$s = \sqrt{s^2} = \sqrt{8.57} = 2.93$$

Because we want a 95% confidence interval estimate,

$$1 - \alpha = .95$$

Thus,

$$\alpha = .05 \quad \text{and} \quad \alpha/2 = .025$$

$$t_{\alpha/2,n-1} = t_{.025,40} = 2.021$$

The 95% confidence interval estimate of μ is

$$\bar{x} \pm t_{\alpha/2}\frac{s}{\sqrt{n}} = 7.70 \pm 2.021\frac{2.93}{\sqrt{41}} = 7.70 \pm .92$$

or

LCL = 6.78 and UCL = 8.62

The Calculations

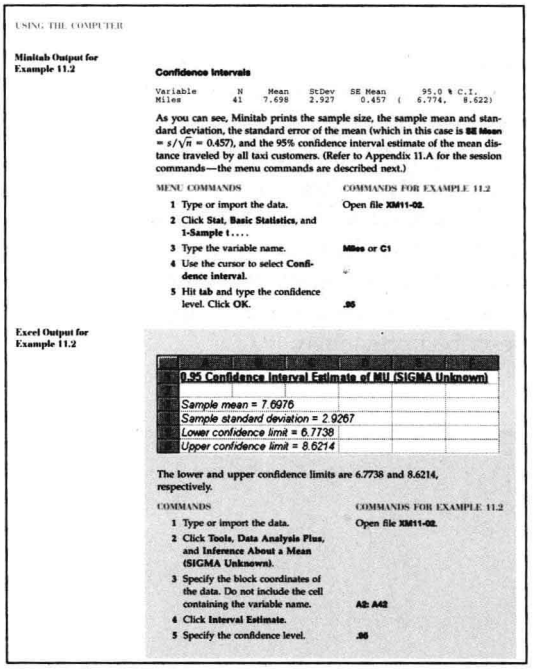
We offer three ways to solve most problems, *by hand*, *using Minitab*, and using *Microsoft Excel*.

Solving by Hand. All but the most complicated techniques are solved manually. We offer this approach for those instructors who want to teach their students how the techniques and concepts work. Instructors who so choose may completely omit this mode of solution.

Using Minitab. Throughout the book, we use Minitab (Release 11 for Windows). We provide the actual output as well as step-by-step instructions. We chose Minitab because it continues to be one of the simplest and least expensive statistical software packages. A student version of the software is available from the publisher at a discount when packaged with this text.

Using Microsoft Excel. As we do with Minitab we offer Excel output and instruction. We chose Excel because it is now, and is likely to remain, the most popular spreadsheet software. We believe that the use of spreadsheets for statistics is an excellent choice because most business and economics students already know how to use them and may already have them on their computer. And if they don't, they might as well learn how because they will ultimately have to learn about them in their jobs.

Each approach is color-coded, making it easy to focus on the mode of calculation that is preferred.


USING THE COMPUTER

Minitab Output for Example 11.2

Confidence Intervals

Variable	N	Mean	StDev	SE Mean	95.0 % C.I.
Miles	41	7.698	2.927	0.457	(6.774, 8.622)

As you can see, Minitab prints the sample size, the sample mean and standard deviation, the standard error of the mean (which in this case is **SE Mean** $= s/\sqrt{n} = 0.457$), and the 95% confidence interval estimate of the mean distance traveled by all taxi customers. (Refer to Appendix 11.A for the session commands—the menu commands are described next.)

MENU COMMANDS	COMMANDS FOR EXAMPLE 11.2
1 Type or import the data.	Open file **XM11-02**.
2 Click **Stat**, **Basic Statistics**, and **1-Sample t....**	
3 Type the variable name.	**Miles** or **C1**
4 Use the cursor to select **Confidence interval.**	
5 Hit **tab** and type the confidence level. Click OK.	**.95**

Excel Output for Example 11.2

0.95 Confidence Interval Estimate of MU (SIGMA Unknown)	
Sample mean = 7.6976	
Sample standard deviation = 2.9267	
Lower confidence limit = 6.7738	
Upper confidence limit = 8.6214	

The lower and upper confidence limits are 6.7738 and 8.6214, respectively.

COMMANDS	COMMANDS FOR EXAMPLE 11.2
1 Type or import the data.	Open file **XM11-02**.
2 Click **Tools**, **Data Analysis Plus**, and **Inference About a Mean (SIGMA Unknown).**	
3 Specify the block coordinates of the data. Do not include the cell containing the variable name.	**A2: A42**
4 Click **Interval Estimate.**	
5 Specify the confidence level.	**.95**

Self-contained software instructions appear following most examples and at the end of most chapters. Beige is Minitab, blue is Excel.

After the Calculations: Interpreting Results

Statistical analyses are conducted because the manager needs the information. A critical part of the process is to correctly interpret the calculations or the computer printout. In addition to showing how to identify the correct technique and calculate, we also interpret the meaning of the statistics and show how managers use this information to make decisions. Further integrating the results relates the statistical results to the objectives of the study. We develop this competence by presenting the concepts that underlie statistics.

INTERPRETING THE RESULTS	We estimate that the mean distance traveled by taxi lies between 6.77 and 8.62 miles. The general manager can use the estimate to determine the effect on her company of different pricing policies. With the interval estimate she could determine upper and lower bounds on revenues generated from the new rates. She also may be able to use the results to judge the performance and honesty of individual drivers. We remind you that the accuracy of the interval estimate is dependent upon the validity of the sampling process and the distribution of the distances (they are required to be normal). If the distribution is extremely nonnormal, the inference may be invalid.

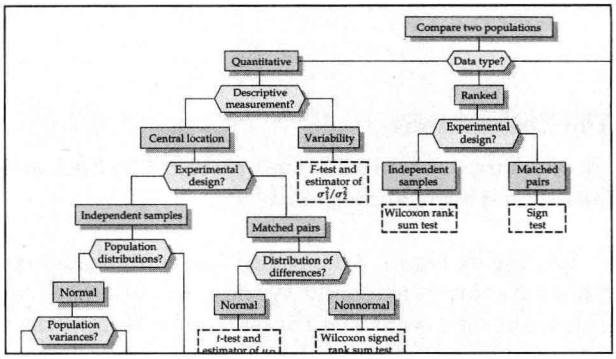
Key Features of Our Approach

We believe that the success of this book is based on three factors.

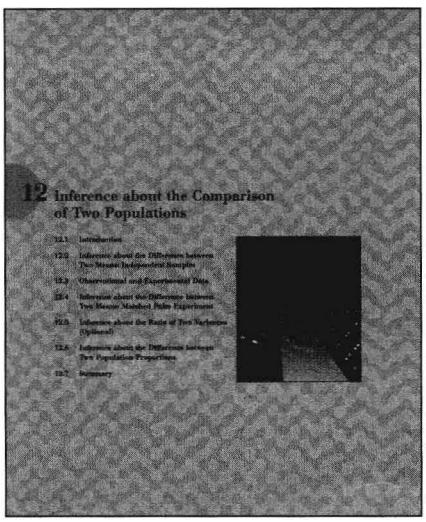
Relevance

Historically, statistics books and courses focused on the arithmetic of statistical procedures. They devoted much time and effort to showing students how to perform the calculations manually (often teaching a variety of shortcut methods). However, arithmetic skills have little relevance to applied statistics.

We focus our attention on how statisticians actually employ statistical techniques. In one form or another, they use the three-step approach that we described previously.



- **Teaches technique-identification skills.** Guides (see inside front cover), flowcharts, and review chapters develop this critical skill.



Exercises and cases that appear at the ends of chapters naturally require the use of the techniques introduced in those chapters. And, of course, choosing the correct techniques is not challenging. To help further develop technique-identification skills, two review chapters (12 and 19) contain exercises and cases that require the use of techniques previously introduced. Each review chapter features a flowchart that guides students in determining the correct problem-solving technique.

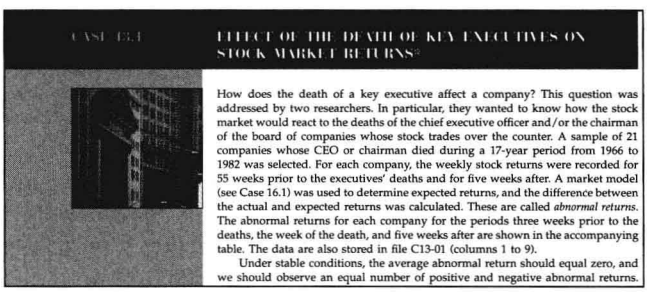
- **Uses real data in examples and exercises.** Using actual problems solved by statisticians demonstrates how statistics is practical and applies to every business and economics discipline.

13.9 Does caffeine consumption adversely affect heart rates? In an article in *Men's Health* (October 1992), scientists reported the results of an experiment involving caffeine consumption. The experiment used 64 men and women who drank two cups of coffee per day. For eight weeks, 32 subjects abstained from all caffeine-containing beverages, while the other 32 subjects drank six cups of coffee per day. The heart rates of the 64 volunteers were measured before and after the experiment. These data are stored in file XR13-09 using the following format.

Column 1: heart rate of caffeine-abstainers before experiment
Column 2: heart rate of caffeine-abstainers after experiment
Column 3: heart rate of caffeine-consumers before experiment
Column 4: heart rate of caffeine-consumers after experiment

a Can we conclude that abstaining from caffeine lowers the heart rate?
b Can we conclude from these data that increasing caffeine consumption increases the heart rate?

Textbooks that emphasize manual calculations by necessity must feature impractical examples and exercises. Typically, the problems provide summarized statistics (e.g., means and variances) and students are required to complete the calculations manually. Alternatively, examples and exercises list raw data, but the sample sizes must be small. Both approaches are unrealistic. We feature data sets, some of which are quite large. The data are stored on the CD-ROM that accompanies the book. Many of the examples, exercises, and cases are based on real studies drawn from journals, magazines, and newspapers.



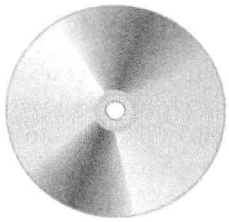
- **Provides case studies.** More extended applications based on real data suggest the wide variety of problems that require statistical solutions. Over 34 case studies are included throughout the text.

Focus on the Big Picture

In using and learning how to use statistics, organization of the material is vital. By focusing on the manual calculations, most books do not show students the power and applicability of statistics. And, in this information age, statistical techniques are more important than ever.

Today most courses use the computer and statistical software or spreadsheets. Since most instructors do not want to teach how to use the software, we provide step-by-step instructions in the use of Minitab for Windows and Microsoft Excel. These instructions appear in the book with the printouts. Therefore, it is not necessary for students to purchase separate software manuals. Additionally, most examples, exercises, and cases feature raw data stored on the disk that accompanies this book, so students do not have to spend time inputting data.

For students without access to a computer and statistical software (and to help learn concepts), we continue to teach how to calculate statistics manually (with the exception of the most complicated procedures), and most exercises can be solved in this way.



- **Includes a CD-ROM.** Raw data (in several formats, including Minitab, Excel, SAS, ASCII) rather than summary statistics for most examples, exercises, and cases increases student involvement and promotes active learning.

Confidence Intervals

```
Variable       N     Mean    StDev   SE Mean          95.0 % C.I.
Miles         41    7.698    2.927     0.457   (    6.774,    8.622)
```

As you can see, Minitab prints the sample size, the sample mean and sta
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$= s/\sqrt{n} = 0.457$), and the 95% confidence interval estimate of the mean di
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MENU COMMANDS	COMMANDS FOR EXAMPLE 11.2
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2 Click **Stat**, **Basic Statistics**, and **1-Sample t . . . .**	
3 Type the variable name.	**Miles** or **C1**
4 Use the cursor to select **Confidence interval**.	
5 Hit **tab** and type the confidence level. Click **OK**.	**.95**

	A	B	C	D	E	F
1	**0.95 Confidence Interval Estimate of MU (SIGMA Unknown)**					
2						
3	*Sample mean = 7.6976*					
4	*Sample standard deviation = 2.9267*					
5	*Lower confidence limit = 6.7738*					
6	*Upper confidence limit = 8.6214*					

The lower and upper confidence limits are 6.7738 and 8.6214, respectively.

COMMANDS	COMMANDS FOR EXAMPLE 11.2
1 Type or import the data.	Open file **XM11-02**.
2 Click **Tools**, **Data Analysis Plus**, and **Inference About a Mean (SIGMA Unknown)**.	
3 Specify the block coordinates of the data. Do not include the cell containing the variable name.	**A2: A42**
4 Click **Interval Estimate**.	
5 Specify the confidence level.	**.95**

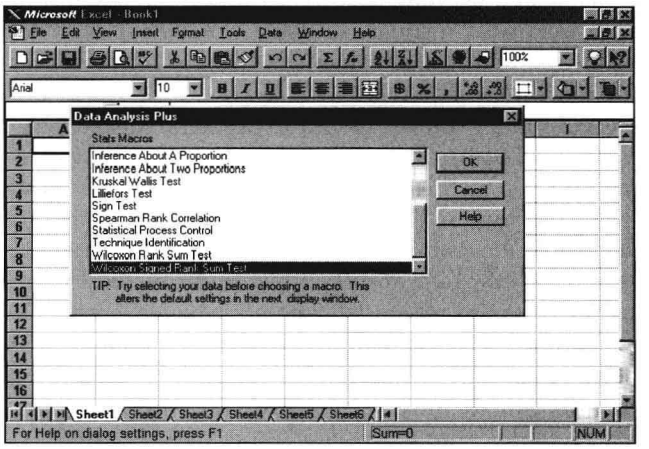
Self-contained software instructions appear following most examples and at the end of most chapters. Minitab is beige; Excel is blue.

Use of Tools Used By Managers

We are all aware that statistics courses that employ computers are more useful and interesting to our students. What has inhibited us from using the computer more fully until recently has been the lack of access to hardware and software. Fortunately, most colleges and universities now have computer facilities for students. Moreover, many students have their own computers. Software is also a problem. It is difficult to justify requiring students to learn how to use statistical software packages, such as SPSS or SAS, which are used by many statisticians, but are not widely employed by managers. Many students of business and economics learn Microsoft Excel, which is the foremost analytical software used in business. However, Excel has a serious drawback. Although it features several statistical functions, it is not as complete as a statistical software package. Excel does not perform many of the techniques that are taught in an introductory statistics course and some of its output is limited. As a result, we offer Data Analysis Plus®.

Since the Fourth Edition of This Text Was Published

Other statistics textbooks have appeared that feature Excel. To date, these texts have addressed the problem of Excel's statistical limitations by describing how Excel can be programmed to perform the missing techniques. Using this approach requires students to use the computer as if it were a calculator. The emphasis shifts back to the "how" of statistics rather than the "when" and the "why." In addition, we have found this approach requires considerable time to learn Excel procedures at the expense of learning statistics.



We provide an alternate approach by including Excel software add-ins that greatly expand Excel's statistical capacity. When installed, the add-ins appear in the Tools menu under Data Analyis Plus® and can be employed in exactly the same way as the techniques that Excel offers (Analysis ToolPak). Here is a list of the macros that are stored on the CD-ROM that accompanies this book.

- Box plot
- Chi-squared test of a contingency table
- Durbin-Watson test
- Friedman test
- Inference about a mean with population variance known
- Inference about a mean with population variance unknown
- Inference about a proportion
- Inference about the difference between two proportions
- Kruskal-Wallis test
- Prediction interval for regression (new in this edition)
- Sign test
- Spearman rank correlation
- Statistical process control
  - chart (using R)
  - chart (using S)
  - S chart
  - R chart
  - p chart
- Stepwise regression (new in this edition)
- Wilcoxon rank sum test
- Wilcoxon signed rank sum test

Excel Output for Example 16.2

	A	B	C	D	E	F
1	SUMMARY OUTPUT					
2						
3	*Regression Statistics*					
4	Multiple R	0.806307604				
5	R Square	0.650131952				
6	Adjusted R Square	0.64656187				
7	Standard Error	151.5687515				
8	Observations	100				
9						
10	ANOVA					
11		*df*	*SS*	*MS*	*F*	*Significance F*
12	Regression	1	4183527.721	4183527.721	182.1056015	4.44346E-24
13	Residual	98	2251362.468	22973.08642		
14	Total	99	6434890.19			
15						
16		*Coefficients*	*Standard Error*	*t Stat*	*P-value*	
17	Intercept	6533.363035	84.51232199	77.30686936	1.22263E-89	
18	Odometer	-0.031157739	0.002308896	-13.49465095	4.44346E-24	

EXCEL 97

Excel 97 Users:
If you click **Line Fits**, the predicted values of y and the residuals will automatically be printed.

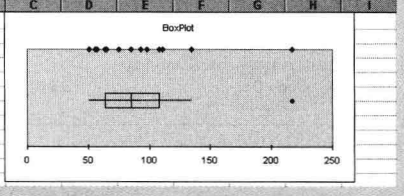
COMMANDS — **COMMANDS FOR EXAMPLE 16.2**

1. Type or import the data into two columns. — Open file **XM16-02.**
2. Click **Tools, Data Analysis . . .**, and **Regression.**
3. Specify **Input Y Range.** — **B1:B101**
4. Specify **Input X Range.** Click **OK.** Click **Labels** (if necessary). — **A1:A101**
5. To draw the scatter diagram click **Line Fit Plots** before clicking **OK.**

(You can also draw the scatter diagram using the commands described in Chapter 2.)

- **Excel 97 (in addition to previous release, 5.0 & 7.0) instructions are included.** Excel 97 instructions, when different, appear in the margins alongside their older counterparts.

	A	B	C	D	E	F	G	H	I
1	**Box Plot**								
2	*Smallest = 51*								
3	*Q1 = 64*								
4	*Median = 85*								
5	*Q3 = 108*								
6	*Largest = 217*								
7	*IQR = 44*								
8	*Outliers = (217)*								
9									
10									
11									
12									



COMMANDS — **COMMANDS FOR TABLE 4.2**

1. Type or import the data into one column. — Open file **TAB04-02.**
2. Click **Tools, Data Analysis Plus,** and **Box Plot.**
3. Specify the coordinates of the data. (Do not include cell containing variable name.) — **A2:A16**

- **Provides Data Analysis Plus® 2.0.** Excel spreadsheet macros work as a statistical add-in to make the spreadsheet capable of using all of the techniques and solving the problems in the book.
- **Presents computer instructions.** Detailed instructions for both Minitab and Microsoft Excel packages make it easy for both instructors and students to employ the computer. Most chapters contain appendices of detailed instructions for Minitab and Excel.

Additional Features

Developing an Understanding of the Statistical Concepts

In Chapters 9 and 10, we introduced the procedures used to estimate and test parameters. The examples we chose to illustrate the process were unrealistic, requiring that the population variance is known when the population mean is not. We chose those examples because of their linkage to Chapter 8 (sampling distribution of the mean) and Chapter 7 (normal distribution). The concept developed in this section is that to expand the application to more realistic situations, we must use another sampling distribution. The Student t distribution was derived by W. S. Gosset for this purpose.

Another important development in this section is the use of the term "degrees of freedom." We will encounter this term many times in this book, so a brief discussion of its meaning is warranted.

The Student t distribution is based on using the sample variance to estimate the unknown population variance. The sample variance is defined as

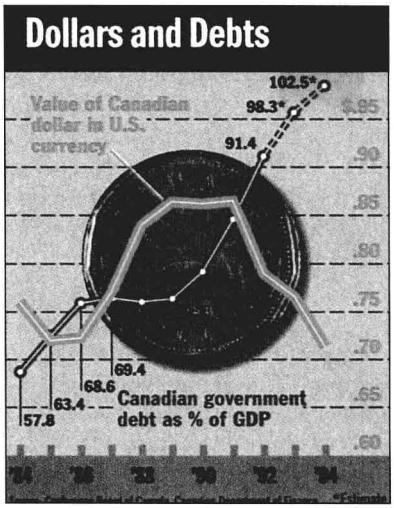
$$s^2 = \frac{\sum(x_i - \bar{x})^2}{n - 1}$$

To compute s^2, we must first determine $\bar{x}$. Recall that sampling distributions are derived by repeated sampling of size n from the same population. In order to repeatedly take samples to compute s^2, we can choose any numbers for the first $n - 1$ observations in the sample. However, we have no choice on the nth value because the sample mean must be calculated first. To illustrate, suppose that $n = 3$ and we find $\bar{x} = 10$. We can have x_1 and x_2 assume any values without restriction. However, x_3 must be such that $\bar{x} = 10$. For example, if $x_1 = 6$ and $x_2 = 8$, then x_3 must equal 16. Therefore, there are only two degrees of freedom in our selection of the sample. We say that we lose one degree of freedom because we had to calculate $\bar{x}$.

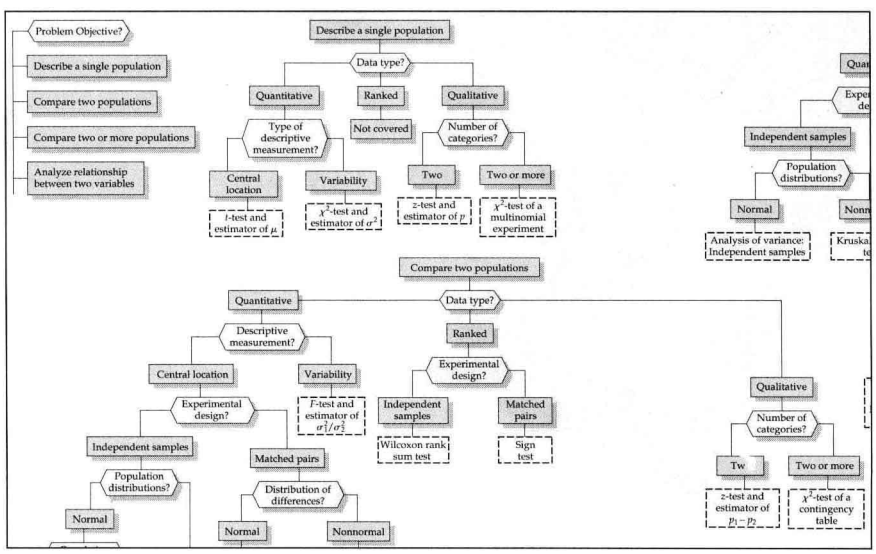
Notice that the denominator in the calculation of s^2 is equal to the number of degrees of freedom. This is not a coincidence and will be repeated throughout this book.

Let's complete this section with a review of how we identify this technique.

- **Conceptual development.** In most cases, when a new technique is introduced, we also describe how the new tool contributes to an understanding of statistical concepts.



- **Graphical excellence.** We have added a new Chapter 3 that discusses the best way of applying graphical techniques, based on the work of Edward Tufte. This has become especially important in this age of computer graphics. Good and bad uses of statistical graphics are discussed.
- **Data collection.** A new Chapter 5 describes sources and techniques of data collection, including questionnaire design.
- **Regression diagnostics.** Three sections present methods to diagnose and remedy violations of required conditions in regression analysis. Coverage of transformations, including examples and exercises, has been expanded.
- **Covariance, correlation, and scatter diagrams.** The graphical and numerical methods that describe the association between two variables are presented in the introductory chapters.

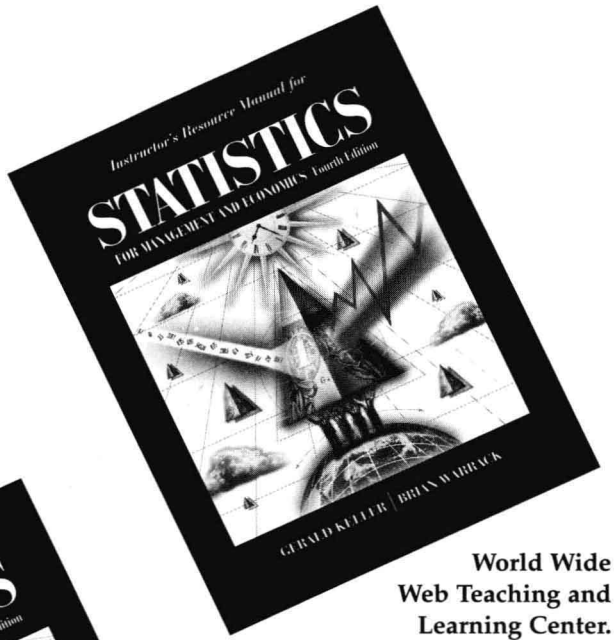


- **Capstone chapter.** The last chapter of the book provides exercises and cases that summarize all the techniques covered in the book. We also leave students with a list of the twelve most important things to remember from their statistics course.

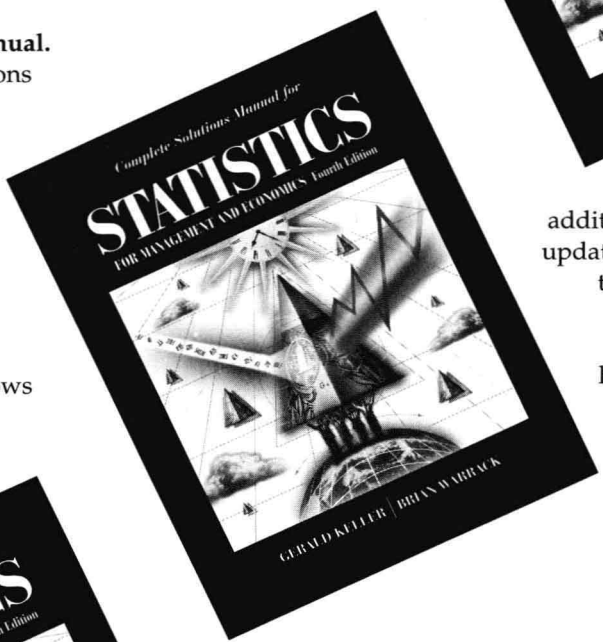
Teaching Aids

The following teaching aids are available from Duxbury Press.

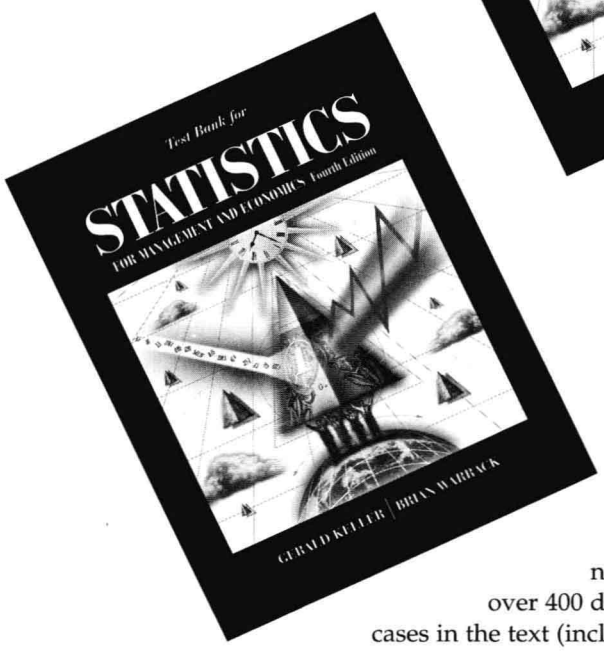
Instructor's Resource Manual. Includes suggestions about teaching from the book, transparency masters, teaching notes for each case, and supplementary topics that do not appear in the textbook but that some instructors may wish to cover (formatted for easy reproduction and distribution to students). Adopters of the text may freely copy these materials.



Complete Solutions Manual. Supplies complete solutions for every exercise and case study in the book.



Test Bank. Contains test items grouped by chapter and difficulty. Computerized testing is also available in a Windows platform.

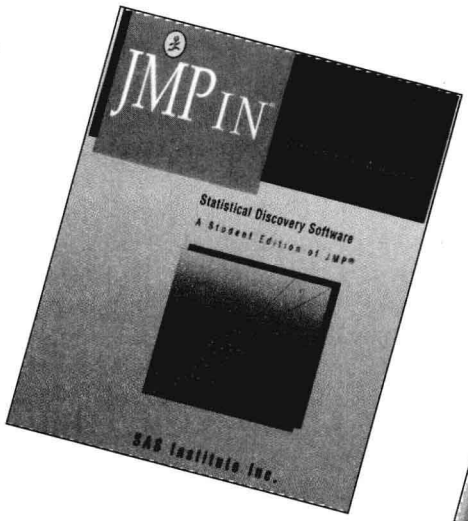


World Wide Web Teaching and Learning Center. Offers simulation experiments, additional exercises and case studies, updated information on software and the book, plus technical support. Keller and Warrack's *Statistics for Management and Economics* home page can be accessed from http://www.duxbury.com. Go to: "Online Book Companions."

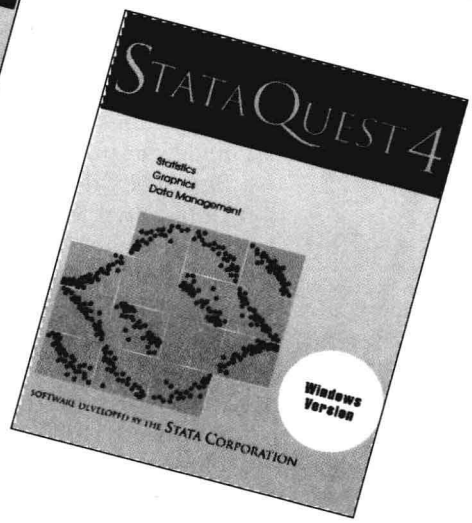
Powerpoint Slides. Figures from the text and concept outlines that can be customized for lecture presentations.

Data Analysis Plus® 2.0 and Data Disk. Provides Excel add-ins with statistical menu capability not contained in standard Excel, plus over 400 data sets for examples, exercises, and cases in the text (included in all new copies of the book).

JMP IN 3 for Windows (or Mac). Powerful statistical software (by SAS Institute) for sale to students.



StataQuest 4 for Windows. Low-cost, professionally developed statistical software that covers the breadth of techniques in this book, available at a nominal cost when purchased with this book (also available in DOS and Macintosh versions).



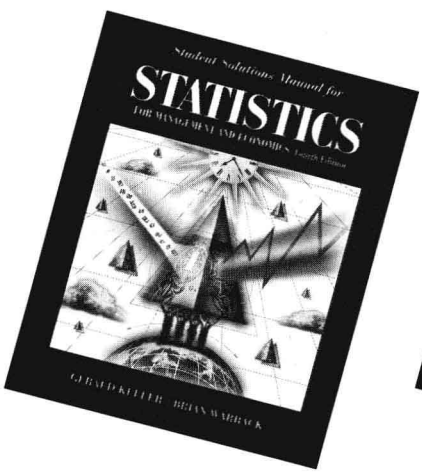
Learning Aids

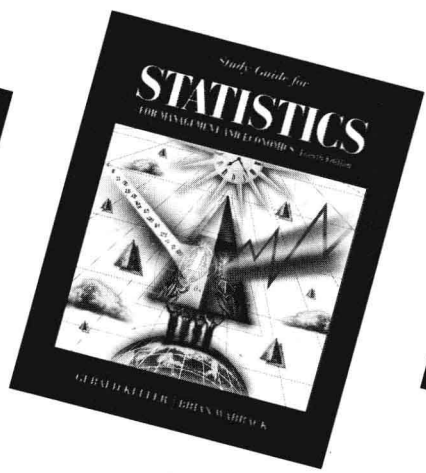
The following learning aids are also available.

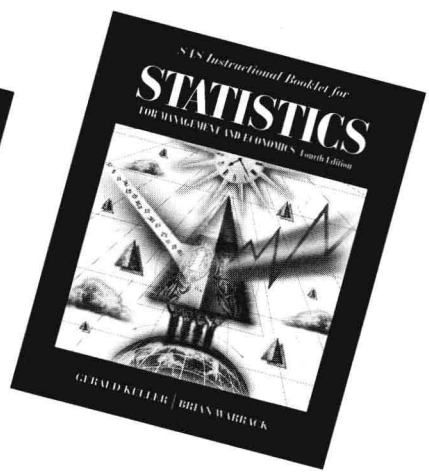
Student Solutions Manual. Furnishes detailed solutions for the textbook's even-numbered exercises. For sale to students.

Study Guide. Contains overviews of each text chapter, examples illustrating specific techniques, and exercises and their solutions. For sale to students.

SAS Instructions. Booklet that demonstrates how to use SAS with *Statistics for Management and Economics*. Available at no cost when packaged with a new copy of the book.







Just the Basics Please: A Quick Review of Math for Introductory Statistics. Reviews only those basic arithmetic and algebra skills needed with this book (by Ronald E. Shiffler and Arthur J. Adams).