

# Statistical Techniques in Business & Economics

Fifteenth Edition

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STATISTICAL TECHNIQUES IN BUSINESS & ECONOMICS INSTRUCTOR'S EDITION

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## Dedication

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*To Jane, my wife and best friend, and our sons, their wives, and our grandchildren: Mike and Sue (Steve and Courtney), Steve and Kathryn (Kennedy and Jake), and Mark and Sarah (Jared, Drew, and Nate).*

*Douglas A. Lind*

*To John Eric Mouser, his siblings, parents, and Granny.*

*William G. Marchal*

*To my wonderful family: Isaac, Hannah, and Barb.*

*Samuel A. Wathen*

# A Note from

Over the years, we have received many compliments on this text and understand that it's a favorite among students. We accept that as the highest compliment and continue to work very hard to maintain that status.

The objective of *Statistical Techniques in Business and Economics* is to provide students majoring in management, marketing, finance, accounting, economics, and other fields of business administration with an introductory survey of the many applications of descriptive and inferential statistics. We focus on business applications, but we also use many exercises and examples that relate to the current world of the college student. A previous course in statistics is not necessary, and the mathematical requirement is first-year algebra.

In this text, we show beginning students every step needed to be successful in a basic statistics course. This step-by-step approach enhances performance, accelerates preparedness, and significantly improves motivation. Understanding the concepts, seeing and doing plenty of examples and exercises, and comprehending the application of statistical methods in business and economics are the focus of this book.

The first edition of this text was published in 1967. At that time, locating relevant business data was difficult. That has changed! Today, locating data is not a problem. The number of items you purchase at the grocery store is automatically recorded at the checkout counter. Phone companies track the time of our calls, the length of calls, and the identity of the person called. Credit card companies maintain information on the number, time and date, and amount of our purchases. Medical devices automatically monitor our heart rate, blood pressure, and temperature from remote locations. A large amount of business information is recorded and reported almost instantly. CNN, USA Today, and MSNBC, for example, all have websites that track stock prices with a delay of less than 20 minutes.

Today, skills are needed to deal with a large volume of numerical information. First, we need to be critical consumers of information presented by others. Second, we need to be able to reduce large amounts of information into a concise and meaningful form to enable us to make effective interpretations, judgments, and decisions. All students have calculators and most have either personal computers or access to personal computers in a campus lab. Statistical software, such as Microsoft Excel and Minitab, is available on these computers. The commands necessary to achieve the software results are available in a special section at the end of each chapter. We use screen captures within the chapters, so the student becomes familiar with the nature of the software output.

Because of the availability of computers and software, it is no longer necessary to dwell on calculations. We have replaced many of the calculation examples with interpretative ones, to assist the student in understanding and interpreting the statistical results. In addition, we now place more emphasis on the conceptual nature of the statistical topics. While making these changes, we still continue to present, as best we can, the key concepts, along with supporting interesting and relevant examples.

## What's New in This Fifteenth Edition?

We have made changes to this edition that we think you and your students will find useful and timely.

- We have revised the learning objectives so they are more specific, added new ones, identified them in the margin, and keyed them directly to sections within the chapter.
- We have replaced the key example in Chapters 1 to 4. The new example includes more variables and more observations. It presents a realistic business situation. It is also used later in the text in Chapter 13.
- We have added or revised several new sections in various chapters:
  - Chapter 7 now includes a discussion of the exponential distribution.
  - Chapter 9 has been reorganized to make it more teachable and improve the flow of the topics.
  - Chapter 13 has been reorganized and includes a test of hypothesis for the slope of the regression coefficient.
  - Chapter 17 now includes a graphic test for normality and the chi-square test for normality.
- New exercises and examples use Excel 2007 screenshots and the latest version of Minitab. We have also increased the size and clarity of these screenshots.
- There are new Excel 2007 software commands and updated Minitab commands at the ends of chapters.
- We have carefully reviewed the exercises within the chapters, those at the ends of chapters, and in the Review Section. We have added many new or revised exercises throughout. You can still find and assign your favorites that have worked well, or you can introduce fresh examples.
- Section numbers have been added to more clearly identify topics and more easily reference them.
- The exercises that contain data files are identified by an icon for easy identification.
- The Data Exercises at the end of each chapter have been revised. The baseball data has been updated to the most current completed season, 2009. A new business application has been added that refers to the use and maintenance of the school bus fleet of the Buena School District.
- There are many new photos throughout, with updated exercises in the chapter openers.

# How Are Chapters Organized to

## Chapter Learning Objectives

Each chapter begins with a set of learning objectives designed to provide focus for the chapter and motivate student learning. These objectives, located in the margins next to the topic, indicate what the student should be able to do after completing the chapter.

## Chapter Opening Exercise

A representative exercise opens the chapter and shows how the chapter content can be applied to a real-world situation.

# 3

## Describing Data:

Numerical Measures



The Kentucky Derby is held the first Saturday in May at Churchill Downs in Louisville, Kentucky. The race track is one and one-quarter miles. The table in Exercise 82 shows the winners since 1980, their margin of victory, the winning time, and the payoff on a \$2 bet. Determine the mean and median for the variables winning time and payoff on a \$2 bet. (See Exercise 82 and L02 and L04.)

**Learning Objectives**  
When you have completed this chapter, you will be able to:

- L01 Explain the concept of central tendency.
- L02 Identify and compute the arithmetic mean.
- L03 Compute and interpret the weighted mean.
- L04 Determine the median.
- L05 Identify the mode.
- L06 Calculate the geometric mean.
- L07 Explain and apply measures of dispersion.
- L08 Compute and explain the variance and the standard deviation.
- L09 Explain Chebyshev's Theorem and the Empirical Rule.
- L10 Compute the mean and standard deviation of grouped data.

## Introduction to the Topic

Each chapter starts with a review of the important concepts of the previous chapter and provides a link to the material in the current chapter. This step-by-step approach increases comprehension by providing continuity across the concepts.

### 2.1 Introduction

The highly competitive automobile retailing industry in the United States has changed dramatically in recent years. These changes spurred events such as the:


- bankruptcies of General Motors and Chrysler in 2009.
- elimination of well-known brands such as Pontiac and Saturn.
- closing of over 1,500 local dealerships.
- collapse of consumer credit availability.
- consolidation dealership groups.

Traditionally, a local family owned and operated the community dealership, which might have included one or two manufacturers or brands, like Pontiac and GMC Trucks or Chrysler and the popular Jeep line. Recently, however, skillfully managed and well-financed companies have been acquiring local dealer-

## Example/Solution

After important concepts are introduced, a solved example is given to provide a how-to illustration for students and to show a relevant business or economics-based application that helps answer the question, “What will I use this for?” All examples provide a realistic scenario or application and make the math size and scale reasonable for introductory students.

Example



Layton Tire and Rubber Company wishes to set a minimum mileage guarantee on its new MX100 tire. Tests reveal the mean mileage is 67,900 with a standard deviation of 2,050 miles and that the distribution of miles follows the normal probability distribution. Layton wants to set the minimum guaranteed mileage so that no more than 4 percent of the tires will have to be replaced. What minimum guaranteed mileage should Layton announce?


Solution

The facets of this case are shown in the following diagram, where  $X$  represents the minimum guaranteed mileage.

## Self-Reviews

Self-Reviews are interspersed throughout each chapter and closely patterned after the preceding Examples. They help students monitor their progress and provide immediate reinforcement for that particular technique.

**Self-Review 3-6** The weights of containers being shipped to Ireland are (in thousands of pounds):




95 103 105 110 104 105 112 90

- (a) What is the range of the weights?
- (b) Compute the arithmetic mean weight.
- (c) Compute the mean deviation of the weights.

# Engage Students and Promote Learning?

## Statistics in Action

Statistics in Action articles are scattered throughout the text, usually about two per chapter. They provide unique and interesting applications and historical insights in the field of statistics.

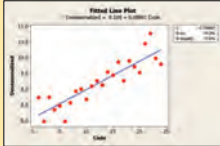


**Statistics in Action**

Forecasts are not always correct. The reality is that a forecast may just be a best guess as to what will happen. What are the reasons forecasts are not correct? One expert lists eight common errors.

$\hat{Y} = 8.109 + .08991t$

The slope of the trend line is .08991. This shows that over the 24 quarters the deseasonalized sales increased at a rate of 0.08991 (\$ million) per quarter, or \$89,910 per quarter. The value of 8.109 is the intercept of the trend line on the Y-axis (i.e., for  $t = 0$ ).



## Margin Notes

There are more than 300 concise notes in the margin. Each is aimed at reemphasizing the key concepts presented immediately adjacent to it.

The variance is non-negative and is zero only if all observations are the same.

**STANDARD DEVIATION** The square root of the variance.

Variance and standard deviation are based on squared deviations from the mean.

**Population Variance** The formulas for the population variance and the sample variance are slightly different. The population variance is considered first. (Recall that a population is the totality of all observations being studied.) The **population variance** is found by:

## Definitions

Definitions of new terms or terms unique to the study of statistics are set apart from the text and highlighted for easy reference and review.

## Formulas

Formulas that are used for the first time are boxed and numbered for reference. In addition, a formula card is bound into the back of the text, which lists all the key formulas.

**POPULATION VARIANCE**

$$\sigma^2 = \frac{\sum(X - \mu)^2}{N}$$


**[3-8]**


## Exercises

Exercises are included after sections within the chapter and at the end of the chapter. Section exercises cover the material studied in the section.

**Exercises**

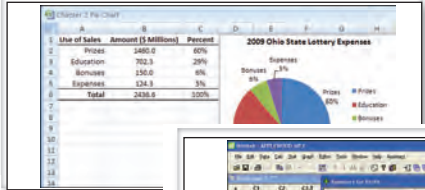
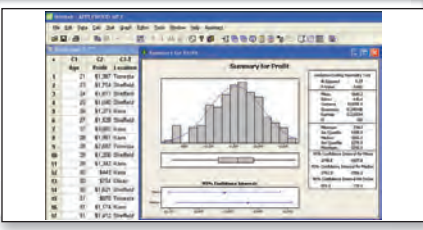
**connect** For Exercises 35–38, calculate the (a) range, (b) arithmetic mean, (c) mean deviation, and (d) interpret the values.

35. There were five customer service representatives on duty at the Electronic Super Store during last weekend's sale. The numbers of HDTVs these representatives sold are: 5, 8, 4, 10, and 3. 

36. The Department of Statistics at Western State University offers eight sections of basic statistics. Following are the numbers of students enrolled in these sections: 34, 46, 52, 29, 41, 38, 36, and 28. 

## Computer Output

The text includes many software examples, using Excel, MegaStat®, and Minitab.

# How Does This Text

## BY CHAPTER

### Chapter Summary

Each chapter contains a brief summary of the chapter material, including the vocabulary and the critical formulas.

#### Chapter Summary

I. A dot plot shows the range of values on the horizontal axis and the number of observations for each value on the vertical axis.

A. Dot plots report the details of each observation.  
B. They are useful for comparing two or more data sets.

II. A stem-and-leaf display is an alternative to a histogram.

A. The leading digit is the stem and the trailing digit the leaf.  
B. The advantages of a stem-and-leaf display over a histogram include:

### Pronunciation Key

This tool lists the mathematical symbol, its meaning, and how to pronounce it. We believe this will help the student retain the meaning of the symbol and generally enhance course communications.

#### Pronunciation Key

SYMBOL	MEANING	PRONUNCIATION
$L_p$	Location of percentile	L sub p
$Q_1$	First quartile	Q sub 1
$Q_3$	Third quartile	Q sub 3

### Chapter Exercises

Generally, the end-of-chapter exercises are the most challenging and integrate the chapter concepts. The answers and worked-out solutions for all odd-numbered exercises appear at the end of the text. For exercises with more than 20 observations, the data can be found on the text's website. These files are in Excel and Minitab formats.

#### Chapter Exercises

27. A sample of students attending Southeast Florida University is asked the number of social activities in which they participated last week. The chart below was prepared from the sample data.

Activities	Number of Students
0	3
1	2
2	4
3	1
4	1

### Data Set Exercises

The last several exercises at the end of each chapter are based on three large data sets. These data sets are printed in Appendix A in the text and are also on the text's website. These data sets present the students with real-world and more complex applications.

#### Data Set Exercises

44. Refer to the Real Estate data, which reports information on homes sold in the Goodyear, Arizona, area during the last year. Prepare a report on the selling prices of the homes. Be sure to answer the following questions in your report.

a. Develop a box plot. Estimate the first and the third quartiles. Are there any outliers?

b. Develop a scatter diagram with price on the vertical axis and the size of the home on the horizontal. Does there seem to be a relationship between these variables? Is the relationship direct or inverse?

c. Develop a scatter diagram with price on the vertical axis and distance from the center of the city on the horizontal axis. Does there seem to be a relationship between these variables? Is the relationship direct or inverse?

45. Refer to the Baseball 2009 data, which reports information on the 30 Major League Baseball teams for the 2009 season. Refer to the variable team salary.

a. Select the variable that refers to the year in which the stadium was built. (Hint: Subtract the year in which the stadium was built from the current year to find the age of the stadium and work this variable.) Develop a box plot. Are there any outliers? Which stadiums are outliers?

b. Select the variable team salary and draw a box plot. Are there any outliers? What are the quartiles? Write a brief summary of your analysis. How do the salaries of the New York Yankees compare with the other teams?

### Software Commands

Software examples using Excel, MegaStat®, and Minitab are included throughout the text, but the explanations of the computer input commands for each program are placed at the end of the chapter. This allows students to focus on the statistical techniques rather than on how to input data.

#### Software Commands

1. The Excel Commands for the descriptive statistics on page 69 are:

2. The Minitab commands for the descriptive summary on page 84 are:

a. From the CD, retrieve the Applewood data.  
b. From the menu bar, select **Data** and then **Data Analysis**. Select **Descriptive Statistics** and then click **OK**.

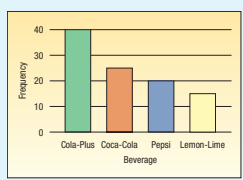
# Reinforce Student Learning?

## Answers to Self-Review

The worked-out solutions to the Self-Reviews are provided at the end of each chapter.

**Chapter 2 Answers to Self-Review**

**2-1**

- Qualitative data, because the customers' response to the taste test is the name of a beverage.
- Frequency table. It shows the number of people who prefer each beverage.
- 
- Class frequencies.
- The largest concentration of commissions is \$1,500 up to \$1,600. The smallest commission is about \$1,400 and the largest is about \$1,800. The typical amount earned is \$15,500.

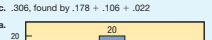
**2-3**

- $2^6 = 64 < 73 < 128 = 2^7$ . So seven classes are recommended.
- The interval width should be at least  $(488 - 320)/7 = 24$ . Class intervals of 25 or 30 feet are both reasonable.
- If we use a class interval of 25 feet and begin with a lower limit of 300 feet, eight classes would be necessary. A class interval of 30 feet beginning with 300 feet is also reasonable. This alternative requires only seven classes.

**2-4**

- 45
- 250
- .306, found by  $.178 + .106 + .022$

**2-5**

- 

## BY SECTION

### Section Reviews

After selected groups of chapters (1–4, 5–7, 8 and 9, 10–12, 13 and 14, 15 and 16, and 17 and 18), a Section Review is included. Much like a review before an exam, these include a brief **overview** of the chapters, a **glossary** of key terms, and **problems for review**.

### A Review of Chapters 1–4

This section is a review of the major concepts and terms introduced in Chapters 1–4. Chapter 1 began by describing the meaning and purpose of statistics. Next we described the different types of variables and the four levels of measurement. Chapter 2 was concerned with describing a set of observations by organizing it into a frequency distribution and then portraying the frequency distribution as a histogram or a frequency polygon. Chapter 3 began by describing measures of location, such as the mean, weighted mean, median, geometric mean, and mode. This chapter also included measures of dispersion, or spread. Discussed in this section were the range, mean deviation, variance, and standard deviation. Chapter 4 included several graphing techniques such as dot plots, box plots, and scatter diagrams. We also discussed the coefficient of skewness, which reports the lack of symmetry in a set of data.

Throughout this section we stressed the importance of statistical software, such as Excel and Minitab. Many computer outputs in these chapters demonstrated how quickly and effectively a large data set can be organized into a frequency distribution, several of the measures of location or measures of variation calculated, and the information presented in graphical form.

#### Glossary

##### Chapter 1

**Descriptive statistics** The techniques used to describe the important characteristics of a set of data. This includes organizing the data values into a frequency distribution, computing measures of location, and computing mea-

90 degrees is 10 degrees more than a temperature of 80 degrees, and so on.

**Nominal measurement** The "lowest" level of measurement. If data are classified into categories and the order of those categories is not important, it is the nominal level of

## Cases

The review also includes continuing cases and several small cases that let students make decisions using tools and techniques from a variety of chapters.

### Cases

#### A. Century National Bank

The following case will appear in subsequent review sections. Assume that you work in the Planning Department of the Century National Bank and report to Ms. Lamberg. You will need to do some data analysis and prepare a short written report. Remember, Mr. Selig is the president of the bank, so you will want to ensure that your report is complete and accurate. A copy of the data appears in Appendix A.6.

Century National Bank has offices in several cities in the Midwest and the southeastern part of the United States. Mr. Dan Selig, president and CEO, would like to know the characteristics of his checking account customers. What is the balance of a typical customer?

How many other bank services do the checking account customers use? Do the customers use the ATM service and, if so, how often? What about debit cards? Who uses them, and how often are they used?

To better understand the customers, Mr. Selig asked Ms. Wendy Lamberg, director of planning, to select a sample of customers and prepare a report. To begin, she has appointed a team from her staff. You are the head of the team and responsible for preparing the report. You select a random sample of 60 customers. In addition to the balance in each account at the end of last month, you determine: (1) the number of ATM (auto-

median balances for the four branches. Is there a difference among the branches? Be sure to explain the difference between the mean and the median in your report.

3. Determine the range and the standard deviation of the checking account balances. What do the first and third quartiles show? Determine the coefficient of skewness and indicate what it shows. Because Mr. Selig does not deal with statistics daily, include a brief description and interpretation of the standard deviation and other measures.

#### B. Wildcat Plumbing Supply Inc.: Do We Have Gender Differences?

Wildcat Plumbing Supply has served the plumbing needs of Southwest Arizona for more than 40 years. The company was founded by Mr. Terrence St. Julian and is run today by his son Cory. The company has grown from a handful of employees to more than 500 today. Cory is concerned about several positions within the company where he has men and women doing essentially the same job but at different pay. To investigate, he collected the information below. Suppose you are a student intern in the Accounting Department and have been given the task to write a report.

## Practice Test

The Practice Test is intended to give students an idea of content that might appear on a test and how the test might be structured. The Practice Test includes both objective questions and problems covering the material studied in the section.

### Practice Test

There is a practice test at the end of each review section. The tests are in two parts. The first part contains several objective questions, usually in a fill-in-the-blank format. The second part is problems. In most cases, it should take 30 to 45 minutes to complete the test. The problems require a calculator. Check the answers in the Answer Section in the back of the book.

#### Part 1—Objective

- The science of collecting, organizing, presenting, analyzing, and interpreting data to assist in making effective decisions is called \_\_\_\_\_.
- Methods of organizing, summarizing, and presenting data in an informative way is called \_\_\_\_\_.
- The entire set of individuals or objects of interest or the measurements obtained from all individuals or objects of interest is called the \_\_\_\_\_.
- List the two types of variables. \_\_\_\_\_
- The number of bedrooms in a house is an example of a \_\_\_\_\_ (discrete variable, continuous variable, qualitative variable—pick one).
- The jersey numbers of Major League Baseball players is an example of what level of measurement? \_\_\_\_\_.
- The classification of students by eye color is an example of what level of measurement? \_\_\_\_\_.
- The sum of the differences between each value and the mean is always equal to what value? \_\_\_\_\_.
- A set of data contained 70 observations. How many classes would you suggest in order to construct a frequency distribution? \_\_\_\_\_.
- What percent of the values in a data set are always larger than the median? \_\_\_\_\_.
- The square of the standard deviation is the \_\_\_\_\_.
- The standard deviation assumes a negative value when \_\_\_\_\_. (All the values are negative, when at least half the values are negative, or never—pick one.) \_\_\_\_\_.
- Which of the following is least affected by an outlier? (mean, median, or range—pick one) \_\_\_\_\_.

#### Part 2—Problems

- The Russell 2000 index of stock prices increased by the following amounts over the last three years.

18%	4%	2%
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What is the geometric mean increase for the three years?

# What Technology Connects

## McGraw-Hill Connect™ Business Statistics



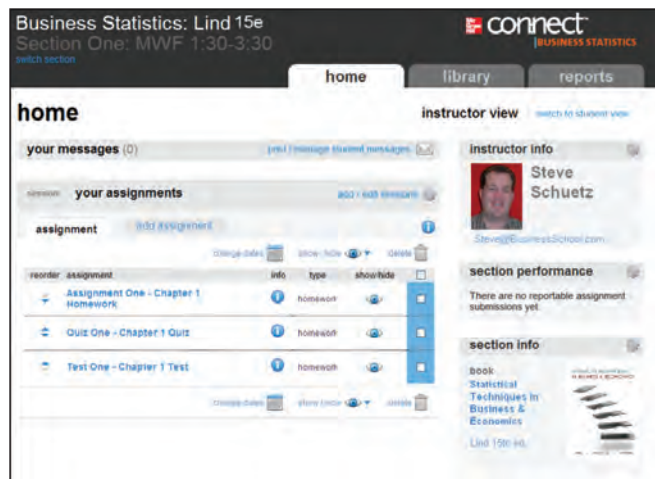
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**Integration of Excel Data Sets.** A convenient feature is the inclusion of an Excel data file link in many problems using data files in their calculation. This allows students to easily launch into Excel, work the problem, and return to *Connect* to key in the answer.

**Exercise 12.32**

A study of the effect of television commercials on 12-year-old children measured their attention span, in seconds. The commercials were for clothes, food, and toys.

Clothes	Food	Toys
26	45	60
21	48	51
43	43	43
35	53	54
28	47	63
31	42	53
17	34	48
31	43	58
20	57	47
	47	51
	44	51
	54	

[Click here for the Excel Data File](#)

**Excel Integrated Data File**

**Required:**

(a) Complete the ANOVA table. Use .05 significance level. (Round the SS and MS values to 1 decimal place and F value to 2 decimal places. Round the DF values to nearest whole number.)

Source	DF	SS	MS	F	P
Factor					
Error					
Total					

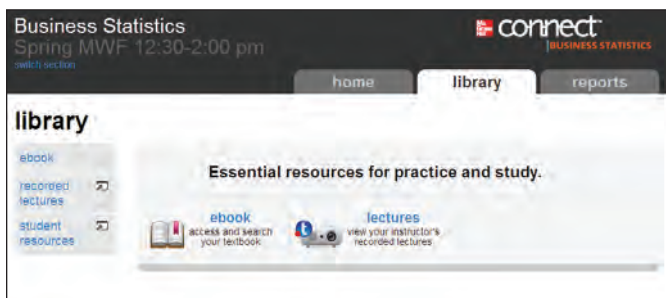
# Students to Business Statistics?

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- Provides instant practice material and study questions and is easily accessible on-the-go.

**Guided Examples.** These narrated video walkthroughs provide students with step-by-step guidelines for solving problems similar to those contained in the text. The student is given personalized instruction on how to solve a problem by applying the concepts presented in the chapter.

**Student Progress Tracking.** *Connect Business Statistics* keeps instructors informed about how each student, section, and class is performing, allowing for more productive use of lecture and office hours. The progress-tracking function enables you to:

- View scored work immediately and track individual or group performance with assignment and grade reports.
- Access an instant view of student or class performance relative to learning objectives.
- Collect data and generate reports required by many accreditation organizations, such as AACSB.

Section	Assignment 1	Assignment 2	Exam 1
<b>Total Value (Points)</b>	20	25	20
Townsend, Rachel <a href="#">Section One: MWF 1:30-3:30</a>	89%	91.50%	89%
Mann, Becky <a href="#">Section One: MWF 1:30-3:30</a>	85.33%	93%	85%
Dalo, Danielle <a href="#">Section One: MWF 1:30-3:30</a>	89%	91.50%	91%
Billows, Nancy <a href="#">Section One: MWF 1:30-3:30</a>	85.33%	93%	93%

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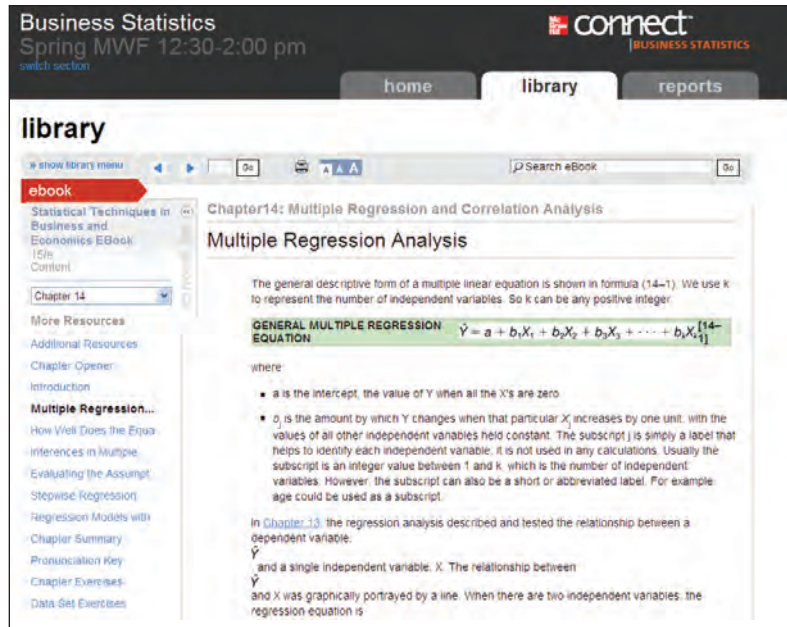
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report created: 09/09/2018 4:49PM CDT  
report date range: 01/01/2018 - 09/09/2018  
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Click a subcategory to view section details.

category	# questions	# times submitted	# students submitted	% submissions correct
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▶ AACSB Reflective Thinking	4	12	6/6	12.5
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▶ Block's Application	4	12	6/6	18.67
▶ Block's Comprehension	2	6	6/6	50.0

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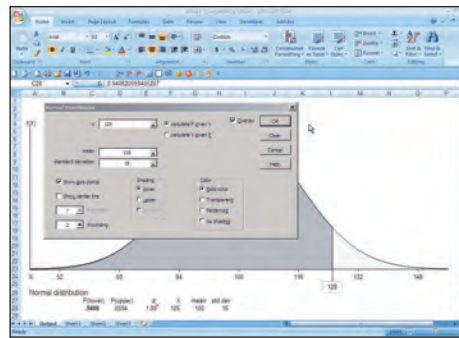
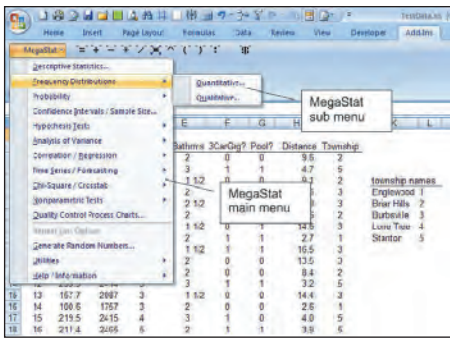
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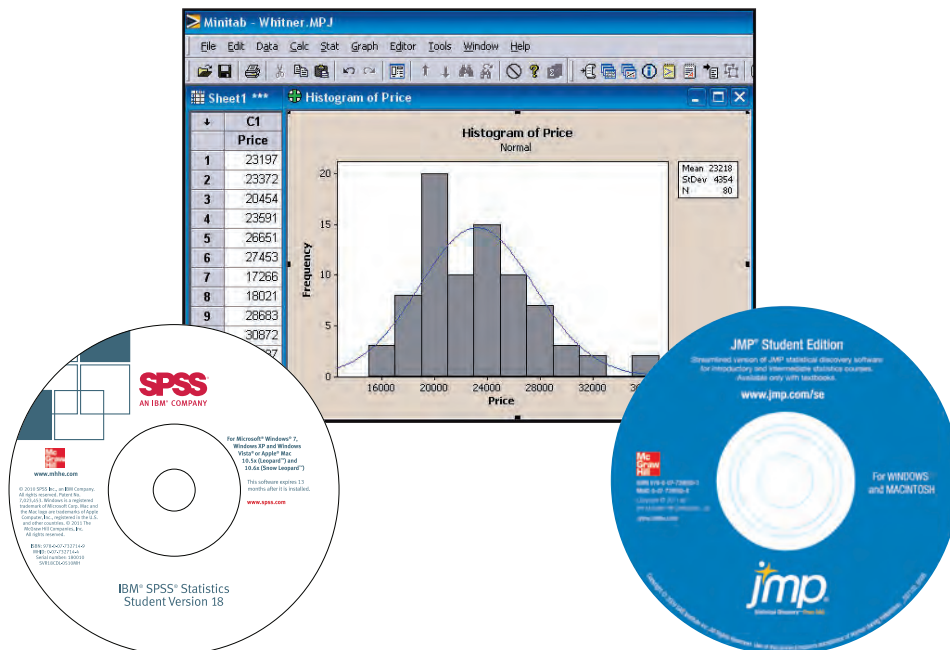
*MegaStat*<sup>®</sup> by J. B. Orris of Butler University is a full-featured Excel add-in that is available on CD and on the *MegaStat* website at [www.mhhe.com/megastat](http://www.mhhe.com/megastat). It works with Excel 2003, 2007, and 2010. On the website, students have 20 days to successfully download and install *MegaStat* on their local computer. Once installed, *MegaStat* will remain active in Excel with no expiration date or time limitations. The software performs statistical analyses within an Excel workbook. It does basic functions, such as descriptive statistics, frequency distributions, and probability calculations as well as hypothesis testing, ANOVA, and regression.

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## Minitab<sup>®</sup>/SPSS<sup>®</sup>/JMP<sup>®</sup>

Minitab<sup>®</sup> Student Version 14, SPSS<sup>®</sup> Student Version 18.0, and JMP<sup>®</sup> Student Edition Version 8 are software tools that are available to help students solve the business statistics exercises in the text. Each can be packaged with any McGraw-Hill business statistics text.



# What Resources Are Available for Instructors?

## Instructor's Resources CD-ROM (ISBN: 0077327055)

This resource allows instructors to conveniently access the Instructor's Solutions Manual, Test Bank in Word and EZ Test formats, Instructor PowerPoint slides, data files, and data sets.

## Online Learning Center: [www.mhhe.com/lind15e](http://www.mhhe.com/lind15e)

The Online Learning Center (OLC) provides the instructor with a complete Instructor's Manual in Word format, the complete Test Bank in both Word files and computerized EZ Test format, Instructor PowerPoint slides, text art files, an introduction to ALEKS®, an introduction to McGraw-Hill Connect Business Statistics™, access to Visual Statistics, and more.



All test bank questions are available in an EZ Test electronic format. Included are a number of multiple-choice, true/false, and short-answer questions and problems. The answers to all questions are given, along with a rating of the level of difficulty, chapter goal the question tests, Bloom's taxonomy question type, and AACSB knowledge category.

## WebCT/Blackboard/eCollege

All of the material in the Online Learning Center is also available in portable WebCT, Blackboard, or eCollege content "cartridges" provided free to adopters of this text.



# What Resources Are Available for Students?

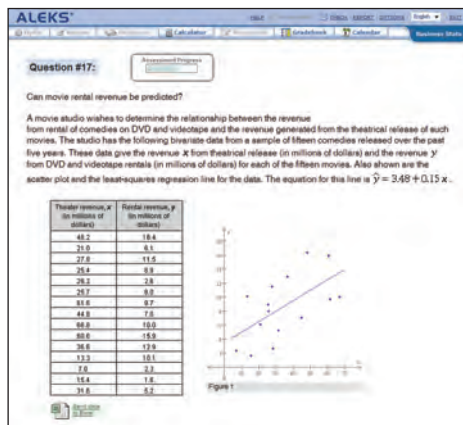
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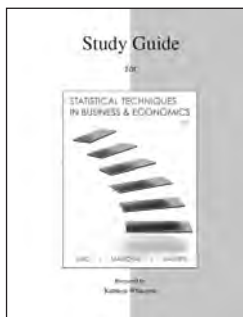
ALEKS also includes a new instructor module with powerful, assignment-driven features and extensive content flexibility. ALEKS simplifies course management and allows instructors to spend less time with administrative tasks and more time directing student learning. To learn more about ALEKS, visit [www.aleks.com](http://www.aleks.com).

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- \*Visual Statistics
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- Appendixes
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## Student Study Guide (ISBN: 007732711X)

This supplement helps students master the course content. It highlights the important ideas in the text and provides opportunities for students to review the worked-out solutions, review terms and concepts, and practice.

## Basic Statistics Using Excel 2007 (ISBN: 0077327020)

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## Business Statistics Center (BSC): [www.mhhe.com/bstat/](http://www.mhhe.com/bstat/)



The BSC contains links to statistical publications and resources, software downloads, learning aids, statistical websites and databases, and McGraw-Hill/Irwin product websites and online courses.

# Acknowledgments

This edition of *Statistical Techniques in Business and Economics* is the product of many people: students, colleagues, reviewers, and the staff at McGraw-Hill/Irwin. We thank them all. We wish to express our sincere gratitude to the survey and focus group participants, and the reviewers:

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We also wish to thank the staff at McGraw-Hill. This includes Steve Schuetz, Executive Editor; Wanda Zeman, Senior Development Editor; Diane Nowaczyk, Senior Project Manager; and others we do not know personally, but who have made valuable contributions.

# Enhancements to Statistical Techniques in Business & Economics, 15e

## Changes Made in All Chapters and Major Changes to Individual Chapters:

- Changed Goals to Learning Objectives and identified the location in the chapter where the learning objective is discussed.
- Added section numbering to each main heading.
- Identified exercises where the data file is included on the text website.
- Revised the Major League Baseball data set to reflect the latest complete season, 2009.
- Revised the Real Estate data to ensure the outcomes are more realistic to the current economy.
- Added a new data set regarding school buses in a public school system.
- Updated screens for Excel 2007, Minitab 14, and MegaStat.
- Revised the core example in Chapters 1–4 to reflect the current economic conditions as it relates to automobile dealers. This example is also discussed in Chapter 13 and 17.
- Added a new section in Chapter 7 describing the exponential distribution.
- Added a new section in Chapter 13 describing a test to determine whether the slope of the regression line differs from zero.
- Added updates and clarifications throughout.

## Chapter 1 What Is Statistics?

- New photo and chapter opening exercise on the “Nook” sold by Barnes and Nobel.
- Census updates on U.S. population, sales of Boeing aircraft, and *Forbes* data in “Statistics in Action” feature.
- New chapter exercises 17 (data on 2010 vehicle sales) and 19 (ExxonMobil sales prior to Gulf oil spill).

## Chapter 2 Describing Data: Frequency Tables, Frequency Distributions, and Graphic Presentation

- New data on Ohio State Lottery expenses for 2009 with new Excel 2007 screenshot.
- New exercises 45 (brides picking their wedding site) and 45 (revenue in the state of Georgia).

## Chapter 3 Describing Data: Numerical Measures

- New data on averages in the introduction: average number of TV sets per home, average spending on a wedding, and the average price of a theater ticket.

- A new description of the calculation and interpretation of the population mean using the distance between exits on I-75 through Kentucky.
- A new description of the median using the time managing Facebook accounts.
- Updated example/solution on the population in Las Vegas.
- Update “Statistics in Action” on the highest batting average in Major League Baseball for 2009. It was Joe Mauer of the Minnesota Twins, with an average of .365.
- New chapter exercises 22 (real estate commissions), 67 (laundry habits), 77 (public universities in Ohio), 72 (blood sugar numbers), and 82 (Kentucky Derby payoffs). Exercises 30 to 34 were revised to include the most recent data.

## Chapter 4 Describing Data: Displaying and Exploring Data

- New exercise 22 with 2010 salary data for the New York Yankees.
- New chapter exercise 36 (American Society of Peri-Anesthesia nurses component membership).

## Chapter 5 A Survey of Probability Concepts

- New exercise 58 (number of hits in a Major League Baseball game), 59 (winning a tournament), and 60 (winning *Jeopardy*).

## Chapter 6 Discrete Probability Distributions

- No changes.

## Chapter 7 Continuous Probability Distributions

- New Self-Review 7–4 and 7–5 involving coffee temperature.
- New exercise 26 (SAT Reasoning Test).
- New exercise 29 (Hurdle Rate for economic investment).
- New section and corresponding problems on the exponential probability distribution.
- Several glossary updates and clarifications.

## Chapter 8 Sampling Methods and the Central Limit Theorem

- No changes.

## Chapter 9 Estimation and Confidence Intervals

- A new Statistics in Action describing EPA fuel economy.
- New separate section on point estimates.
- Integration and application of the central limit theorem.

# Enhancements to Statistical Techniques in Business & Economics, 15e

- A revised discussion of determining the confidence interval for the population mean.
- Expanded section on calculating sample size.
- New exercise 12 (milk consumption), 33 (cost of apartments in Milwaukee), 47 (drug testing in the fashion industry), and 48 (survey of small-business owners regarding healthcare).
- The discussion of the finite correction factor has been relocated in the chapter.

## Chapter 10 One-Sample Tests of Hypothesis

- New exercises 17 (daily water consumption), 19 (number of text messages by teenagers), 35 (household size in the United States), 49 (Super Bowl coin flip results), 54 (failure of gaming industry slot machines), 57 (study of the percentage of Americans that do not eat breakfast), and 69 (daily water usage).

## Chapter 11 Two-Sample Tests of Hypothesis

- New exercises 15 (2010 New York Yankee salaries), 37 (Consumer Confidence Survey), and 39 (pets as listeners).

## Chapter 12 Analysis of Variance

- Revised the names of airlines in the one-way ANOVA example.
- New exercise 30 (flight times between Los Angeles and San Francisco).

## Chapter 13 Correlation and Linear Regression

- Rewrote the introduction section to the chapter.
- Added a new section using the Applewood Auto Group data from chapters 1 to 4.
- Added a section on testing the slope of a regression line.
- Added discussion of the regression ANOVA table with Excel examples.
- Rewrote and relocated the section on the coefficient of determination.
- Updated exercise 60 (movie box office amounts).

## Chapter 14 Multiple Regression Analysis

- Rewrote the section on evaluating the multiple regression equation.
- More emphasis on the regression ANOVA table.

- Enhanced the discussion of the  $p$ -value in decision making.
- Added a separate section on qualitative variables in regression analysis.
- Moved the “Stepwise Regression” section to improve the sequence of topics.
- Added a summary problem at the end of the chapter to review the major concepts.

## Chapter 15 Index Numbers

- Updated census and economic data.

## Chapter 16 Time Series and Forecasting

- Updated economic data.

## Chapter 17 Nonparametric Methods: Goodness-of-Fit Tests

- Reworked the Example/Solution on the chi-square goodness-of-fit test with equal cell frequencies (favorite meals of adults).
- Added a section and corresponding examples describing the goodness-of-fit test for testing whether sample data are from a normal population.
- Added a section and corresponding examples using graphical methods for testing whether sample data are from a normal population.

## Chapter 18 Nonparametric Methods: Analysis of Ranked Data

- Revised the Example/Solution for the Kruskal-Wallis test (waiting times in the emergency room).
- Revised the Example/Solution for the Spearman coefficient of rank correlation (comparison of recruiter and plant scores for trainees).

## Chapter 19 Statistical Process Control and Quality Management

- Updated the section on the Malcolm Baldrige National Quality Award.
- Reworked and updated the section on Six Sigma.

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