Douglas A. Lind
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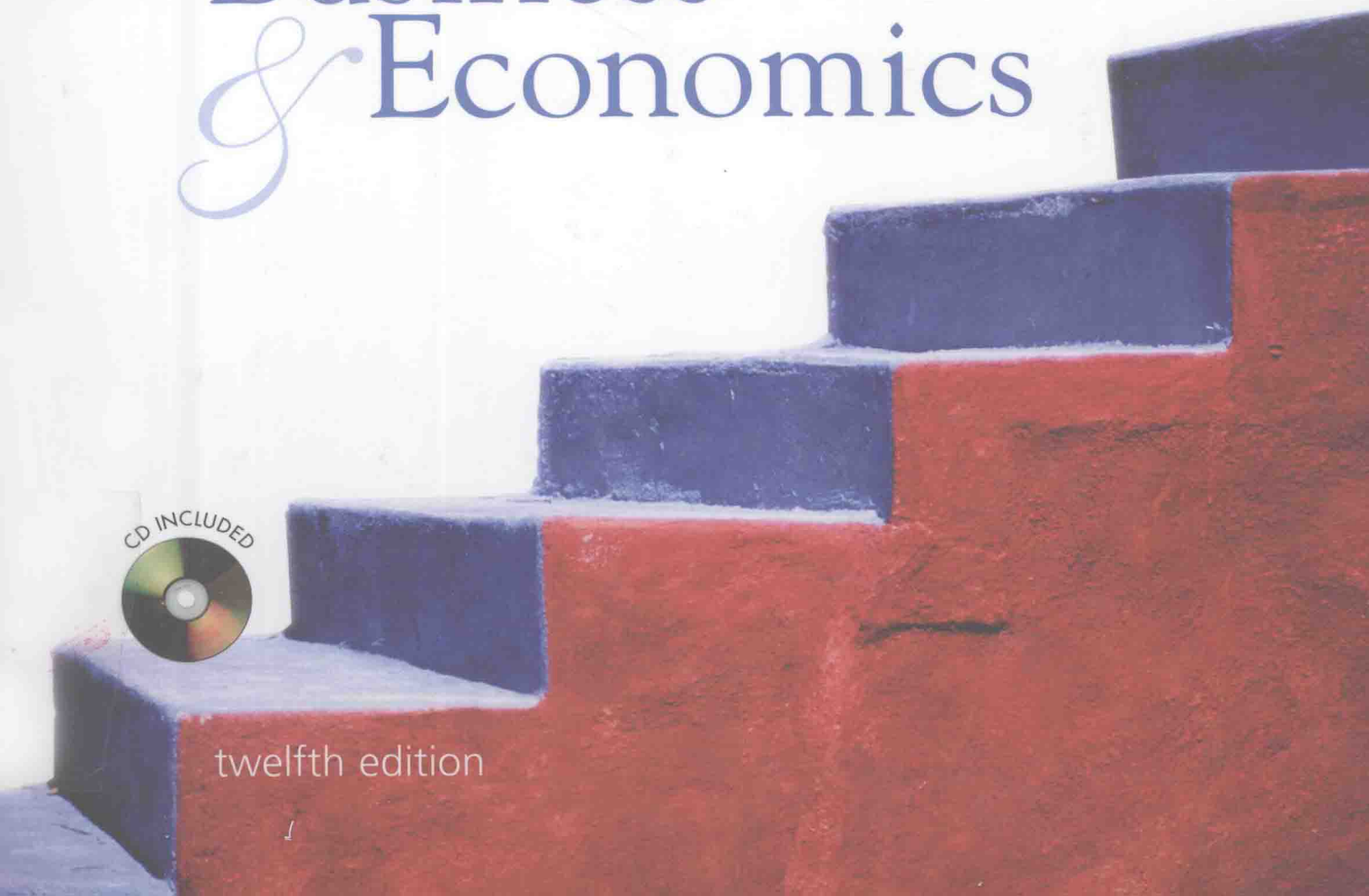
Statistical Techniques in Business & Economics



twelfth edition

Statistical Techniques in Business & Economics

Twelfth Edition

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To Jane, my wife and best friend, and our sons and their wives, Mike (Sue), Steve (Kathryn), and Mark (Sarah).

Douglas A. Lind

To Andrea, my heart and the mother of our children: Rachel Anne (and Eric), Joseph Andrew, Sarah Louise, Christopher Brophy, and Mary Bridget.

William G. Marchal

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

Samuel A. Wathen

Preface

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. While we focus on business applications, we also use many problems and examples that are student oriented and do not require previous courses.

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 number 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. A large amount of business information is recorded and reported almost instantly. CNN, *USA Today*, and MSNBC, for example, all have websites where you can track stock prices with a delay of less than twenty minutes.

Today, skills are needed to deal with the 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 have not moved away from presenting, as best we can, the key concepts, along with supporting examples.

The twelfth 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 reviewers:

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We also wish to thank the staff at McGraw-Hill/Irwin. This includes Richard T. Hercher, Jr., Executive Editor; Christina Sanders, Developmental Editor; Douglas Reiner, Marketing Manager; James Labeots, Project Manager, and others we do not know personally, but who made valuable contributions.

Brief Contents

Contents

1

What Is Statistics?

High speed conveyor belts and state-of-the-art technology efficiently move merchandise through Wal-Mart's distribution centers to keep its nearly 3,000 stores in stock.

In 2003, the four largest American companies ranked by sales were Wal-Mart, Exxon Mobil, General Motors, and Ford Motor Company. (See Goal 5 and Statistics in Action box, page 4.)

GOALS

When you have completed this chapter you will be able to:

1. **Understand why we study statistics.**
2. **Explain what is meant by *descriptive statistics* and *inferential statistics.***
3. **Distinguish between a *qualitative variable* and a *quantitative variable.***
4. **Distinguish between a *discrete variable* and a *continuous variable.***
5. **Distinguish among the *nominal, ordinal, interval,* and *ratio* levels of measurement.**
6. **Define the terms *mutually exclusive* and *exhaustive.***