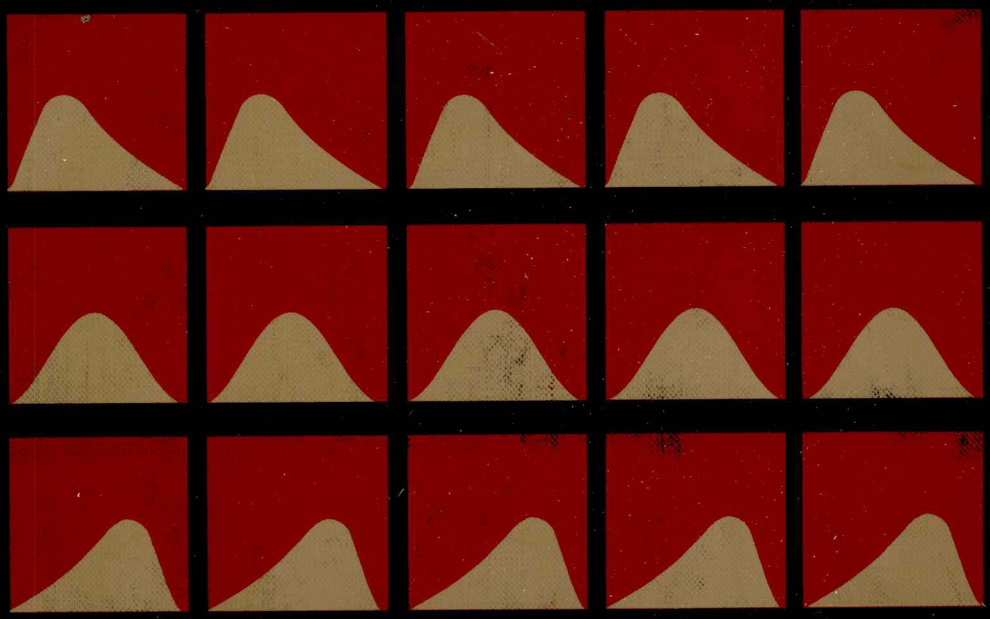
Statistical Techniques in Business and Economics

Mason



Statistical Techniques In Business and Economics Fifth Edition

Robert D. Mason
The University of Toledo

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Preface

This text is designed primarily for a first course in business and economic statistics. However, students majoring in any of the social sciences will find the illustrative material quite familiar. The mathematics can be handled by students who do not have an extensive mathematical background.

The book is divided into 24 chapters, and 16 appendixes are included. There is ample material for a one-year course, but considerable latitude is possible in the selection of topics for shorter courses. A one-semester course, for example, could include Chapters 1–5, 9–15, and 20. The primary objective of this fifth edition remains the same as that of the previous editions. Both descriptive statistics and inferential statistics are covered, but the main emphasis is on inferential statistics. In addition, there are a number of special-interest topics such as quality control, time series analysis, and index numbers.

The text includes a number of new special features.

It is now oriented to the example—solution approach.

At various points in each section there are *self-reviews* designed to give students an opportunity to work problems similar to the examples. Answers and methods of solution are given in the margin adjacent to the self-review problems. This work serves to reinforce the student's understanding of the preceding material.

A *chapter self-review examination* at the end of each chapter covers all the material in the chapter. This test allows the student to evaluate his or her overall comprehension of the subject matter.

A number of applications presented use the Statistical Package for the Social Sciences, Minitab, and Basic to illustrate the computer's potential for problem solving.

Both a *chapter summary* and a *chapter outline* are presented at the end of each chapter. Students can use them to pull together the ideas of the chapter.

New material in this fifth edition also includes exponential smoothing, the moving-average method of smoothing time series, and the normal approximation to the binomial. The material on probability and probability distributions has been revised and expanded to three chapters. The presentation of tests of hypotheses has also been revised and is now contained in three chapters.

A new, 200-page Study Guide now accompanies the text. The chapter

organization of this comprehensive study guide is the same as the text's. For each chapter there are:

Chapter objectives.

An extensive summary.

A glossary of terms.

Problems with detailed solutions.

Student practice exercises, with answers.

A two- or four-page tear-out chapter assignment.

A Teacher's Manual contains the full solutions to all the exercises in the textbook and all the chapter assignments in the Study Guide.

I wish to express special thanks to colleagues William G. Marchal and Douglas A. Lind for their many helpful comments in organizing this fifth edition. Special acknowledgment is given to Jeff Hooper, Mesa Community College; Charles N. Keppler, Miami Dade Community College; Charles E. Leitle, Missouri Southern State College; William G. Marchal, University of Toledo; Douglas W. Morrill, Centenary College of Louisiana; John C. Shannon, Suffolk University, Boston, Massachusetts; and Lee C. Wilson, Mason Community College; who made many valuable comments and criticisms in their reviews of the manuscript. I am indebted to the Literary Executor of the late Sir Ronald A. Fisher, F.R.S. Cambridge; to Dr. Frank Yates, F.R.S. Rothamsted; and to Messrs. Oliver and Boyd, Ltd., for permission to reprint Tables III and IV of their book *Statistical Tables for Biological, Agriculture and Medical Research.*

Robert D. Mason

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A note to the student

This textbook is constructed to aid you in your study by presenting the subject matter in small, easy-to-take steps with frequent checks to determine whether you fully understood the preceding material.

As you progress through each chapter you will be asked to solve a problem and interpret your findings. The answer to each *self-review* is always given on the left side adjacent to the problem. Cover the answer before starting work. Following is an example.

SELF-REVIEW

a. The range is 54.3, found by

b. Highest value − Lowest value
= 297.9 − 243.6
= 54.3.

(Cover the answers in the left hand column.)

The consumer price indexes for May in selected cities are: Cleveland, 285.1; Buffalo, 297.9; Denver, 256.7; Atlanta, 284.7; Chicago, 243.6; Dallas, 277.2.

a. What is the range?

b. *Now verify your answer against the one given in the margin.*

There are *exercises* after each section, if you need additional practice. The answers to selected exercises and the methods of solution are given in Appendix A.

Another distinctive feature of this text is the *Chapter Self-Review Examination* with answers and method of solution given in Appendix A. By completing this test you can better evaluate your comprehension of all the material in the chapter.

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1

INTRODUCTION

Many television viewers visualize a **statistician** as one who records each yard gained by rushing in the Dallas Cowboys-Denver Broncos Monday night football game, or who records each foul shot attempted and points made in the Boston Celtics-Detroit Piston game. We are constantly bombarded during and after the game with **statistics**: Larry Bird of the Celtics scored a career high of 28 points in the first half, Tony Dorsett gained 103 yards before retiring in the third quarter, Chris Evert Lloyd beat Virginia Ruzici of Romania 7-5 and 6-1, and Gorman Thomas of the Brewers scored two runs, and had one hit in three times at bat.

Likewise, reference to *The Wall Street Journal, Business Week,* annual reports of industry, and other sources of business data revealed that Arvida Realty Sales, Inc.,[1] is handling the sale of a four-bedroom home in the harbor section, priced at $547,500; the average hourly earnings in contract construction are $10.35,[2] Connecticut produced 4,950,000 pounds of tobacco in 1981;[3] and IBM has 341,279 employees, 737,230 stockholders, and an annual gross income from sales, rentals, and services of $26,213,000,000.[4] Fifty-one percent of the millionaires in the United States are women, and 95 percent of the money in the United States is managed by women. A final statistic from Norton Simon: the total compensation of the chairman of the board, David J. Mahoney, was $2,037,000 in 1981.

Statistics has a more precise meaning, however. It is defined as the *science of collecting, organizing, presenting, analyzing, and interpreting numerical data for the purpose of making better decisions in the face of uncertainty.*

Just as lawyers have "rules of evidence" and accountants have "commonly accepted practices," statisticians follow some standard guidelines when dealing with data. The basic techniques employed by statisticians are discussed in the following chapters.

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[1] *The Sarasota* (Florida) *Herald-Tribune,* April 12, 1981, p. 11D.

[2] *Survey of Current Business,* February 1981, p. S-13.

[3] Department of Agriculture.

[4] 1980 Annual Report, International Business Machines Corporation, p. 1.

What is statistics?

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