

SECOND EDITION

Applied Statistics for Business and Economics

ALLEN L. WEBSTER

APPLIED STATISTICS FOR BUSINESS AND ECONOMICS

Second Edition

Instructor's Edition

ALLEN L. WEBSTER

Bradley University

IRWIN

Chicago • Bogotá • Boston • Buenos Aires • Caracas
London • Madrid • Mexico City • Sydney • Toronto

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Senior sponsoring editor: Richard T. Hercher, Jr.

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Designer: Mercedes Santos

Art coordinator: Mark Malloy

Compositor: Better Graphics, Inc.

Typeface: 10/12 Times Roman

Printer: Von Hoffman Press, Inc.

Library of Congress Cataloging-in-Publication Data

Webster, Allen.

Applied statistics for business and finance / Allen L. Webster. —
2nd ed.

p. cm.—(The Irwin series in statistics)

Rev. ed. of: Applied statistics for business and economics. 1992.

Includes index.

ISBN 0-256-14022-7. — ISBN 0-256-17683-3 (instructor's ed.)

1. Commercial statistics. 2. Economics—Statistical methods.

I. Webster, Allen. Applied statistics for business and economics.

II. Title. III. Series.

HF1017.W433 1995

519.5'02433—dc20

94-17704

Printed in the United States of America

2 3 4 5 6 7 8 9 0 VH 1 0 9 8 7 6 5

Preface

Two pedagogical principles were continuously pursued in the writing of this text. The first is the need to demonstrate how useful statistics can be in finding solutions to the many common problems in actual business situations. The text emphasizes that in today's competitive business world, it is no longer possible to make decisions on the basis of mere conjecture or what has worked in the past. Instead, it is only after deliberate consideration and scientific inquiry that well-informed and intelligent decisions can be realized. By demonstrating to your students that statistics has an important role to play in their forthcoming professional endeavors, the relevance and application of statistical analysis is revealed. This realization will place statistics in a new and different light and at the same time, make teaching statistics much more productive and rewarding.

The second fundamental axiom that guided the writing of this text is the need to properly interpret the results of all statistical tests. The need to properly *interpret* the results of all statistical tests cannot be overemphasized. It is not enough to merely "crunch numbers" and derive an answer. Without the ability to interpret that answer, its meaning and usefulness are lost.

To promote these objectives, this text contains certain special features which distinguish it from others. These unique characteristics include:



A PREVIEW OF THINGS TO LOOK FOR

Each chapter begins with a short list of the most important concepts and techniques that students should be looking for as they read the chapter. By knowing this in advance your students can be better prepared to learn.

■ Chapter Blueprint

This feature is also designed to prepare students for the coming chapter. In the blueprint, the order, flow, and dependency of all of the major topics are laid out. This should help in organizing how the concepts relate to each other.

■ Three-Part Examples

Each of the more than 115 examples in the text, which illustrate the use of statistical analysis, consists of three parts. The first is the *Statement*, which describes the problem that must be addressed. The second is a complete and coherent *Solution*, including explanations along the way. The final segment of each example offers an *Interpretation* of the results. This third part is the key to understanding the meaning and use of statistics. These are intended to focus on the problem or application rather than the numerical answer.

■ Quick Checks

A series of short exercises that test comprehension of the basics before moving on to the next topic is included in each chapter. Approximately 120 miniproblems provide assurance; yet they are brief enough to prevent any interruption in the flow and continuity of the material.

■ Statistical Applications

Placed throughout the text are more than 40 short narratives taken directly from popular business and news publications that describe how statistics was actually used by a business to make decisions and solve a real-world problem. These short, anecdotal sketches contain no numbers or formulas of any sort but are simply brief accounts of how a business relied on statistics to solve a dilemma. This provides a bridge to reality by illustrating how statistics can be applied.

■ Procedure for Business Report Writing

Appendix I describes and illustrates the manner in which the results of a statistical study should be prepared in written form. Without effective communications skills chances for business success are reduced. Two types of business studies, statistical reports and statistical abstracts, are discussed. This provides students with the skills needed to properly report the results of a statistical study. In the minicases throughout the text, questions are provided which require reporting the results of the case studies as statistical reports or statistical abstracts.

■ Figures

Graphs and pictorial displays are an important part of how information is analyzed and communicated in statistics and in the business world. There are over 250 figures and graphs in the text exhibiting the concepts, calculations, and their interpretations.

■ Solved Problems

Each chapter concludes with problems and elaborately worked-out solutions which demonstrate and reinforce each statistical tool covered in the chapter.

■ Chapter Checklist

After studying the chapter, as a check point, your students should have a basic understanding of the material provided in the checklist.

Computer Applications

This text provides a brief introduction to several popular statistical programs. In a short section in each chapter, SAS, SPSS-PC, Minitab and CBS by Hall are used to demonstrate how modern computers and software simplify statistical analysis. The input commands for one or more of the programs are shown along with plenty of sample output.

List of Symbols and Terms

Although I have attempted to keep notation and formulas to a minimum, they are a necessary part of any statistics text. In order to help students organize and review notation and terminology introduced in each chapter, these lists are included for their convenience.

List of Formulas

Each formula found in the text is referenced in this section by the appropriate number. This provides quick access for finding the appropriate formula.

Chapter Exercises

An ample supply of exercises (over 950) with a varying degree of difficulty follow each chapter and provide your students with an opportunity to sharpen their statistical skills. These exercises are grouped according to which type of skills they test.

YOU MAKE THE DECISION Many sets of Chapter Exercises begin with these exercises, which do not involve any numerical calculations but allow students to identify what particular statistical tool would be needed to solve a specific type of problem. This practice develops the much needed ability to recognize when and how statistics can be brought into play to aid in determining solutions to common problem situations.

CONCEPTUAL QUESTIONS Like the You Make the Decision exercises, these questions do not involve any numerical calculations. As the name implies, they are designed to reinforce your students' knowledge of key concepts introduced in the chapter.

PROBLEMS These are the core of the Chapter Exercises. These questions involve calculations and often require interpretation, much like the Examples and Solved Problems. The text contains, in an appendix, answers to the even-numbered Problems. Answers and brief explanations to the odd-numbered Problems are printed, where space permits, in the margins of the *Instructor's Edition*.

EMPIRICAL EXERCISES A further sense of reality can be introduced through the use of empirical exercises, which offer the opportunity for students to devise and implement their own simple statistical exercises. These exercises are much like the Problems in their brevity and concise nature. However, they will acquire a more complete appreciation for a statistical study by devising a simple statistical exercise of their own and collecting the data on their own without specific guidance or direction normally provided by the Problems.

COMPUTER EXERCISES The Chapter Exercises provide special exercises designed to be solved with the aid of computers. These exercises show how the computer can be used to solve common business problems with your choice of computer software.

MINI-CASE CASE APPLICATIONS These are questions that permit students to apply the statistical tools they learn in the chapter to solve a more complex problem situation and provide an interpretation of the solution. In many instances, these tools must be applied in combination in order to devise a complete and adequate solution.

SUPPLEMENTS

The *Instructor's Edition* of the text contains all of the answers to the Problems, with the odd-numbered answers appearing as annotations in the margins on the text pages and a data disk.

The *Instructor's Solution Manual* contains detailed solutions to all Problems and Quick Checks. It also provides a categorized list of all Chapter Exercises to facilitate assigning these problems to your students.

The *Test Bank and CompuTest IV Manual* provides an ample supply of questions grouped by chapter and section that you may use as test or quiz questions. This *Test Bank* is also available on Irwin's computerized testing software. You may use it to create a wide variety of tests from the existing questions or from questions of your own, which can be easily added. Irwin's computerized testing software will create multiple versions of the same test with answer keys. It will also choose questions to create similar but different tests based on level of difficulty, question type, and other selection criteria. Tests can also be generated by our *TeleTest* service. You should see the *Test Bank and CompuTest IV Manual* for details on this convenient service.

The *Student Study Guide* contains worked-out solutions to approximately one-third of the odd-numbered chapter exercises. It also contains detailed solutions to every Quick Check in the text. Each chapter in the *Study Guide* begins with a short overview of the corresponding text chapter. It also has short examples to reinforce the use of the definitions and formulas in the chapter. For convenience, all of the chapter formulas are repeated here.

Three *Computer Guides* are available for use with this text. The *Irwin Statistical Software Series* contains three guides that are available for SPSS-PC, SAS-PC, and Minitab, the computer programs discussed in the text. These manuals detail in easy-to-follow steps exactly what commands should be entered to obtain the desired output. Many examples in these manuals use data and questions from the examples and solved problems in the text.

The microcomputer package Computerized Business Statistics (CBS), a statistical software package runs on IBM and IBM-compatible microcomputers. It consists of an instructional text and a 3.5-inch disk. An overview of each statistical model plus illustrative examples appear in the text.

A computer data disk is also available, which provides the data files referred to in the text Computer Exercises. This disk contains the data in formats for all of the computer packages cited above.

ACKNOWLEDGMENTS

Writing a text is a major undertaking which could not be accomplished without the help of many others. I would be remiss if I did not thank the many reviewers who examined one or more of the several drafts of the manuscript for this text over the last two years. These reviewers made substantial contributions to the form and substance of the finished product:

Peter Baker
Butler University

James Baldwin
Nassau Community College

Lloyd Blackwell
University of North Dakota

Carolyn Bodkin
Charleston Southern University

John P. Briscoe
Indiana University Southeast

Sharad Chitgopekar
Illinois State University

Doris Cost
Metropolitan State College of Denver

Bernard Cunningham
University of Dallas

Rex Cutshall
Vincennes University

George Dery
University of Massachusetts, Lowell

Kamvar Farahbod
California State University, San Bernardino

Frank Forst
Loyola University of Chicago

Donald Goldschen
University of the District of Columbia

Steve Grahm
Vincennes University

Joel Greenman
East Los Angeles College

Robert Hannum
University of Denver

Edwin Hawkins
Mesa State College

Framarz Khoushab
Mercer College

Charles Lienert
Metropolitan State College

Barbara McKinney
Western Michigan University

Matthew Marlin
Duquesne University

Joe Megeath
Metropolitan State College of Denver

Robert J. Miller
Missouri Southern State College

William Sanders
Clarion University

Patricia Setlick
William Rainey Harper College

Marsha Shelburn
University of South Carolina at Aiken

Andrew Welki
John Carroll University

Roy Williams
Memphis State University

With the large number of examples, exercises, and other numerical computations in this text, it would be impossible for any one person to correctly calculate and record every one of them. However, a team of dedicated statisticians has a much better chance to produce an error-free text. To this end, Kamvar Farahbod and Patricia Setlick independently resolved every numerical calculation in the text. Without their superb dedication to this project, this text could not have been published. Kamvar Farahbod also solved all of the Chapter Exercises to recheck the answers and solutions.

Writing the supplements is a task unto itself, and these authors deserve a round of applause: Barbara McKinney co-authored the *Student Study Guide*. She has written a superb *Study Guide* that will be valuable to every student taking this course. Kilman Shin authored all of the computer guides. With his in-depth knowledge of many statistical software packages and of applied statistics, he was able to write these guides, which will be of great benefit to anyone using, or learning to use, one of these three statistical packages.

I wish to extend a special thanks to Kristin Smith, one of the many fine students we have here at Bradley University, for her ceaseless effort and diligence in helping find and eliminate errors.

Finally, the fine professionals at Richard D. Irwin, Inc. contributed their expertise to this project. Special thanks go to Richard T. Hercher, Jr., senior sponsoring editor, and Colleen Tuscher, associate editor.

Allen Webster

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