# Statistics for Business and Economics Second Edition

David R. Anderson Dennis J. Sweeney Thomas A. Williams

INTERNATIONAL EDITION

# Preface

The purpose of this book is to provide students, primarily in the fields of business administration and economics, with a sound conceptual introduction to the field of statistics and its many applications. The text is applications oriented and has been written with the needs of the nonmathematician in mind.

The mathematical prerequisite is a course in college algebra. All of the text material end problems have been developed with this prerequisite in mind. The one exception is that a knowledge of differential calculus is necessary to understand the derivation of the normal equations for linear regression in the appendices to Chapters

# APPLICATIONS AND METHODOLOGY INTEGRATED

Applications of the statistical methodology are an integral part of the organization and presentation of material. Statistical techniques are introduced in conjunction with problem scenarios where the techniques are helpful. The discussion and development of each technique is thus centered around an application setting with the statistical results providing insights to decisions and solutions to problems.

Although the book is applications oriented, we have taken care to provide a sound methodological development. Throughout the text we have utilized notation that is generally accepted for the topic being covered. Thus, students will find that the text provides good preparation for the study of more advanced statistical material. A bibliography that should prove useful as a guide to further study has been included as an appendix. an appendix.

## CHANGES IN SECOND EDITION

The first edition of this text was entitled Introduction to Statistics; the title of this edition has been changed to Statistics for Business and Economics. We feel this title better reflects the orientation of the material and the types of applications presented. The current edition contains several new features.

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## **Chapter-Ending Applications**

To further emphasize the applications of statistics, cases supplied by practitioners from business and government have been added at the end of each chapter. Each application describes an actual organization and its current usage of the statistical methodology introduced in the chapter. We feel these applications help motivate the student to learn the material and provide an appreciation for some of the ways statistical methods are used in practice. The table that follows provides a guide to the companies and types of applications included.

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# An Overview of Chapter-Ending Applications Chapter Chapter Title

	Chapter Title	Organization	Application
	I Introduction	Kings Island Inc	<i>application</i>
2	2 Descriptive Statistics Tabular and Graphi Approaches	I. The Colgate Palmoli cal Company	ve Quality Assurance for Heavy Duty Datas
4	Descriptive Statistics I Measures of Locatio and Dispersion	I. St. Luke's Hospital	gents Time Spent in Hospice Program
5	ity	il- Morton Thiokol Inc.	Evaluation of Customer Service Tecting De-
5	Probability Distribution	8 Xerox Corporation	gram Performance Test of an On-Line Computer
6 7	Special Probability Dis- tributions Sampling and Sampling Distributions	The Burroughs Corpora tion Mead Corporation	<ul> <li>ized Publication System</li> <li>Credit Cards for Banking</li> <li>Estimating the Value of</li> </ul>
8	Interval Estimation	Thriftway Inc.	Mead Forest Owner- ship Sampling for East
9	Hypothesis Testing	Harris Corporation	of LIFO Inventory
10	Statistical Inference About Means and Pro- portions with Two Population	Pennwalt Corporation	Plating Plating Evaluation of New Drugs
11 12	Inferences About Popula- tion Variances Tests of Goodness of Fit and Independence	U.S. General Accounting Office United Way	Water Pollution Control Determining Community
13 14	Experimental Design and Analysis of Variance Simple Linear Regres- sion and Correlation	Burke Marketing Ser- vices Inc. Monsanto Company	Perceptions of Chari- ties New Product Design Estimation of Effect of
15	Multiple Regression	Champion L	Feed Additive on Poul- try Weight Gain
16	Time Series Analysis and	Corporation The Circle	Control of Pulp Bleach- ing Process
17	Forecasting Indexes and Index Num- bers	Electric Company State of New York De- partment of Com-	Forecasting Demand for Electricity Index of Business Activ-
18	Nonparametric Methods	merce West Shell Realtors	Comparison of P
19	Decision Theory	Ohio Edison Company	tate Prices across Neighborhoods Choice of Best Type of
			Particulate Control

Equipment

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## **Major Revisions**

The two chapters on REGRESSION AND CORRELATION ANALYSIS have been substantially revised and now include discussions of residual analysis, the concept of multicollinearity, adding and deleting variables, and the general linear model. The role of computer packages in performing regression analysis is also highlighted.

The chapter on ANALYSIS OF VARIANCE has been expanded with an experimental design emphasis and now includes the completely randomized, randomized block, and factorial experimental designs.

The chapters on SAMPLING DISTRIBUTIONS AND HYPOTHESIS TEST-ING have been revised to provide better coverage of the central limit theorem and to describe the use of "p-values" in hypothesis testing. The chapter on BASIC PROBABILITY has been revised and now includes

additional examples and illustrations.

## **New Problems**

Over 200 new problems have been added.

## CHAPTER PEDAGOGY

What you will learn in this chapter is a note to students at the beginning of each chapter. On this page the concepts the student is expected to master are presented as a guide to the student's study of the material.

A summary of the Key Formulas has been provided at the end of each chapter. This along with the chapter summary and glossary is designed to aid the student in review and to provide a quick reference.

## FLEXIBILITY

There is a reasonable amount of instructor flexibility possible in selecting material to satisfy specific course needs. As an illustration, a possible outline for a two-quarter sequence in introductory statistics is given below:

### Possible Two-Quarter Course Outline

First Quarter	Second Quarter
Introduction (Chapter 1)	Hypothesis Testing (Chapter 9)
Descriptive Statistics (Chapters 2 and	Two Population Cases (Chapter 10)
3)	Inferences About Population Vari-
Introduction to Probability (Chapter	ances (Chapter 11)
4)	Tests of Goodness of Fit and Indepen-
Probability Distributions (Chapter 5)	dence (Sections 12.1 and 12.2 of
Special Probability Distributions	Chapter 12)
(Chapter 6)	Analysis of Variance (Chapter 13)
Sampling and Sampling Distributions	Regression and Correlation (Chapters
(Chapter 7)	14 and 15)
Interval Estimation (Chapter 8)	

Other possibilities exist for such a course, depending upon the time available and the

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background of the students. However, it is probably not possible to cover all the material in one semester or in two quarters unless some of the topics have been previously studied.

## ANCILLARIES

Accompanying the text is a complete package of support materials. These include an

## INSTRUCTOR'S MANUAL STUDY GUIDE TEST BANK DEMONSTRATION PROBLEMS AND LECTURE NOTES

The instructor's manual, prepared by the authors, includes learning objectives and completely worked solutions to all the problems. The study guide, developed by Mohammad Ahmadi (University of Tennessee at Chattanooga), provides an additional source of problems and explanations for the students. The test bank, prepared by Edward Fagerlund (Wichita State University), provides a series of multiple choice questions and problems that will aid in the preparation of exams. Finally, the set of demonstration problems and lecture notes, prepared by the authors, can be used as a complete set of transparency masters and/or lecture notes. All of these demonstration problems are new illustrations of the material in the text.

We believe that the applications orientation of the text, combined with the package of support materials, provides an ideal basis for introducing students to statistics and statistical applications.

## ACKNOWLEDGMENT

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Our associates from business and industry who supplied the applications made a major contribution. They are recognized individually by a credit line on the first page of each application.

We are also indebted to our editor, Mary C. Schiller, and others at West Publishing Company for their editorial counsel and support during the preparation of this text. Finally, we would like to express our appreciation to Phyllis Trosper and Janice Bruegge for their typing and secretarial support.

> David R. Anderson Dennis J. Sweeney Thomas A. Williams

February 1984

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