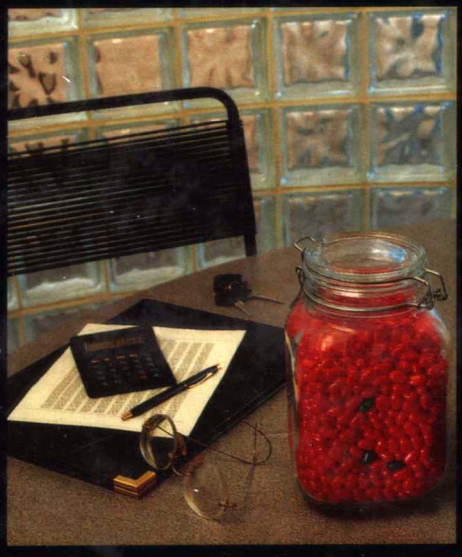
BUSINESS STATISTICS

TEXT ■ CASES ■ SOFTWARE



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BUSINESS STATISTICS

TEXT ▪ CASES ▪ SOFTWARE

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Preface

Statistical analysis has become an increasingly important management tool throughout all levels of business and government. The glowing success of the Japanese in effectively penetrating the international marketplace with products of high quality and high reliability can be directly attributed to their emphasis on statistical quality control. The need for a better understanding of basic statistical principles will continue to grow in concert with the advent of the information age. The primary purpose of this text is to provide the student with such an understanding using the latest developments in computer-based courseware (CBS).

A number of different approaches have been used in the preparation of statistical textbooks. They have ranged from the "theoretical" to the "intuitive." For the most part, however, the primary focus of these texts has been on solving simple problems using hand solution methods. The authors believe that this approach is inconsistent with the needs of modern management practice. Instead, we think the primary focus should be on problem formulation and results interpretation. The role of performing the computations should be left to the computer. The widespread proliferation of microcomputers on college campuses provides an effective vehicle for implementing this pedagogical strategy. Although some texts do acknowledge the usefulness of computers in solving statistical problems, few have modified their basic approach to incorporate the full potential of computer-based analysis. As an instructional aid, however, most of the technical chapters in these books contain an appendix that presents the basic analytical formulas along with appropriate examples.

The most important challenge in statistics, however, is not in performing the computations (either by hand or by machine) but in collecting the data and properly interpreting the computational results. Normally, the primary issue facing the business manager is not in developing an answer but in asking and formulating the proper question. Accordingly, a major focus of *this* text is to provide a contextual framework to aid the student in understanding the questioning process and to provide answers through computer-based analysis.

The modern manager uses statistics in three basic ways:

1. Collecting and processing data (i.e., descriptive statistics).
2. Estimating population characteristics from the collected data (i.e., statistical inference).
3. Developing relationships from the processed data (i.e., statistical forecasting).

In each application, the manager must relate the questions that have been asked to the data collected and the statistical analysis performed. This text is designed to assist the student in developing insights into the application of statistics in modern management practice through the application of real-world business cases.

TOPICS COVERED

The topics covered in the 15 chapters of this book are similar to those found in most first-year statistics texts. Within each chapter, however, the primary emphasis is on *problem formulation* and on *interpreting the results.* Simple graphical models are used to illustrate the basic principles before expanding to more realistic and interesting business management problems. This text features a wide array of statistical quality-control applications. Additionally, a number of internally based cases and examples are presented.

This text introduces the most frequently used statistical methods via specific business applications. Each subject area is introduced by describing examples of its use in a real organization. Formulation is emphasized, and each chapter contains examples of formulated problems and at least one formulated business case. The text contains over 800 problems and approximately 40 cases. The same basic outline, which is fully explained in chapter 1, is used in each chapter.

This text has been designed to provide the instructor with considerable flexibility in terms of selecting topics to meet specific course requirements. With several exceptions each chapter stands by itself, so the course can be taught with topics introduced in the order preferred by the instructor. The variety and extent of the problem sets provides the instructor with considerable flexibility in preparing a course ranging in length from one quarter to two semesters.

SUPPORTING MATERIALS

Accompanying this text is a complete package of support materials. These include:

- Computerized Business Statistics (CBS) Software Package.
- Instructor's Manual.

- Financial Data on Fortune 500 Firms and Key Economic Data.
- Solutions to Problems and Cases.

The financial and economic data and the solutions to problems and cases are available on data diskette.

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Contents in Brief

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Chapter 1

Introduction

Statistical thinking will one day be as necessary for efficient citizenship as the ability to read and write.

H. G. Wells

CHAPTER OUTLINE

"A formal planning system is the key to effective business management." This refrain is heard with increasing regularity throughout corporate America. An effective planning system incorporates both an internal and an external context, and the status of each context requires continuous updating. Here, statistical analysis plays an important role. Computer-based systems provide the firm with a steady stream of processed data (i.e., information) that can be used for improving corporate decision making.

A recent study investigated some potential ramifications of the use of computer-based planning systems.* This study clearly showed that companies that updated their planning system on a continual basis outperformed (as measured by differences in earnings and absenteeism) those firms that did not use systematic planning. Thus, these types of planning systems offer considerable promise in helping to improve the management decision-making process.

* B. S. Chakravarthy, "Tailoring a Strategic Planning System to Its Context," *Strategic Management Journal* 8, no. 6, pp. 517–31.

1.1 WHAT IS BUSINESS STATISTICS?

To most managers, *statistics* means "numerical descriptions" of specific business or technical data. For example:

- May Company announced that third-quarter net income rose 21% over the past year, to $104 million.
- The Bureau of Labor Statistics reported that the unemployment rate for March fell below 6%.
- GTE Corporation plans to eliminate 14,000 positions over the next five years.
- The Los Angeles Lakers basketball team had a winning percentage of nearly 65% for the 1987 season.

The primary objective of **business statistics** is to provide quantitative information for decision making. Statistics in general, and business statistics in particular, are often divided into two major categories: descriptive statistics and inferential statistics.

Descriptive statistics includes data collection, data classification, data display (i.e., graphics) and data processing (i.e., computations) such as:

- Product failure rates.
- Customer preference for a new fast-food product.
- Market share data.
- Average wage rates between industry groups.

Inferential statistics represents an important analytical tool for business decision making. The basic premise behind statistical inference is quite simple. Namely, descriptive statistics from a small sample are used to describe a larger, unseen group (i.e., a population). Statistical inference is a necessity in most business situations because data on a **population** of interest are unavailable or unattainable. Consequently, a **sample** is selected to represent the population. In this way the decision maker can infer population characteristics from what is usually a very small sample drawn from the population, as in:

- Identifying the winner of the presidential race after conducting an exit poll of 1% of the voters.
- Determining whether a batch of computer chips can be shipped or must be reprocessed based on a sample inspection of 2% of the lot size.
- Estimating the demand for a new detergent based on testing the product in 500 households.
- Forecasting revenues for next year based on sales data over the last three years.

One of the key business uses of statistical inference is in forecasting. The forecasting process has as its primary objective the prediction or estimation of future events. More specifically, forecasting is the attempt to estimate future changes based on a set of assumptions. There are a wide variety of forecasting methodologies, ranging from subjective approaches to very complex computer-based models. Forecasting can range from an exact science to a naive art. As such, the quality of the forecast depends heavily on the quality of the data and the accuracy of the facilitating assumptions.

HISTORICAL NOTE

The recording of data can be traced back to early man. The book of Numbers in the Bible contains several accounts of early census taking. One of the earliest applications of statistics to business was by the Englishman Thomas Watt (1705–1769) during the early part of the 18th century. Watt established a school with a particular emphasis on mathematics and mensuration. The interest in measurement was short-lived, however, and did not surface again for nearly two centuries.