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Basic Business Statistics

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BASIC BUSINESS STATISTICS

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BASIC BUSINESS STATISTICS

Dedicated to My wife, Marcia
My parents, Lawson and Betty
And my kids,
Jennifer, Jason, Sara, and Shane

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PREFACE

Statistics is a subject with a reputation for being difficult. One of the major challenges in writing an introduction to a statistics text is to simplify the subject and make it interesting. However, difficult topics are not sacrificed in *Basic Business Statistics*. Beginning with descriptive statistics and continuing through correlation, simple regression, and the chi-square test for independence, the focus of this book is statistical inference—how we can describe a group when we obtain information from a subset of the group. The student is thus prepared to apply basic statistical principles in common decision-making situations as well as in more advanced courses.

In this text, which is designed for a one-term statistics course or for self-directed study, each chapter is a concise, but complete, exposition of a central topic. Details are included as necessary to contribute to the reader's understanding of what statistics can accomplish, to develop an idea so that it is believable, to expand the concept to common or interesting situations, and to review important concepts previously established. Some high school algebra is needed, although mathematical rigor is not stressed. Rather, intuition and personal experience form the basis for most measures and techniques. For example, hypothesis testing is introduced by referring to everyday instances of decision making and refutation. With such common situations in mind, students will come to understand statistics as technical renderings of familiar ideas.

Principles of probability are presented in sufficient detail so that readers can use the concept and basic rules to understand probability distributions and their characteristics. These principles are needed to comprehend uncertainty in business and in everyday situations as well as the role probability plays in statistical inferences. Two distributions, binomial and normal, are presented in this section and employed later in the inferential section, where they are complemented with the T and chi-square distributions.

Hypothesis testing terminology can be confusing and a hindrance to understanding the simple basic idea of the process. To simplify logical statements, the term "accept H_0" is substituted for "cannot reject H_0." However, the pitfalls of accepting H_0 rather than not rejecting H_0 are brought to students' attention and developed at various points in the hypothesis testing presentation.

FEATURES

Many modern topics are covered, beginning with stem-and-leaf plots. Since the computer is a primary tool of statistical analysis today, output from three popular statistical packages (SAS, SPSS, and MINITAB) is included. This output provides

practice in reading printouts as well as practice in statistical analysis of questions and problems. *p*-values are provided by these and many other statistical packages. Because *p*-values facilitate decision making and provide a more informative measure of the test results, a separate chapter is devoted to their development.

Questions are interspersed throughout the text to encourage the reader to pause and construct the answer. The answers follow these text questions. Such frequent self-tests provide opportunities not only to check comprehension and intuition but also to develop concepts and techniques. This pedagogy leads readers to discover results rather than simply having those results presented. Thus, readers can develop their ability to think critically and speculate about outcomes of different situations.

Many other questions and problem opportunities are provided. Most chapters contain an initial set of multiple-choice questions on material from previous chapters that is relevant to the present chapter. These questions are useful for review and for checking preparedness for the new chapter. Each chapter concludes with a set of multiple-choice questions and a set of traditional verbal problems. Both initial and concluding exercises contain thought (discussion, conceptual) questions as well as problems requiring calculations. Often calculation questions request a verbal statement of the result or meaning of the numerical answer. Such verbal summaries, even when not requested in the problem, benefit the statistics student in that a number without meaning is useless. In some cases, extensions of topics introduced in the chapter are covered in problem sections. These include relative frequency distributions, descriptive statistics of grouped data, and tests for a correlation coefficient of zero. The end-of-chapter exercises provide opportunities for reinforcing chapter material, developing confidence, relating topics to everyday experiences, and challenging readers to extend the material beyond the confines of the chapter overview.

Answers to the interactive questions within the chapter, to the multiple-choice questions at the beginning and end of each chapter, and to many of the problem sets are provided in the text. The numerous exercises, along with sections on objectives and review, provide the typical features of a study guide; consequently, the book itself is a complete package on modern statistical analysis for the student. Detailed solutions are given in a separate solutions manual and a test bank is also available.

A data base on financial variables for over 200 corporations is provided in Appendix B. This data base can be used for classroom demonstrations, class projects, or additional exercises, especially when the computer is involved.

The text presentation and problem sets have been revised several times after extensive use in my classes. Hopefully, the book will avoid many of the problems that accompany first editions.

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Also a special thanks is given to Professors Tom Stanley and Richard Cantrell. Over the years both have conversed at length with me about statistics and contributed to my intuition, which I hope I have imparted in the following pages. Finally, a very special thanks to my wife, Marcia, who did much of the typing, listened to my extended conversations about statistics and the book, continually encouraged me (especially to be terse, since the book would have been twice as long otherwise), and survived the effort.

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1 WHAT IS STATISTICS?

OBJECTIVES

This chapter is an introduction to the basic concepts and definitions of statistics, including the summation symbol, $\sum$. This symbol frequently appears in the formulas and measures you will use. When you complete this chapter, you should be able to

1. State three reasons why samples are used to infer information about a population
2. State the operation to be performed when $\sum$ is used and perform such an operation
3. Demonstrate that $\sum X_i Y_i \neq (\sum X_i)(\sum Y_i)$
4. Define
   a. Statistics
   b. Descriptive statistics
   c. Inferential statistics
   d. Population (census or universe)
   e. Sample

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