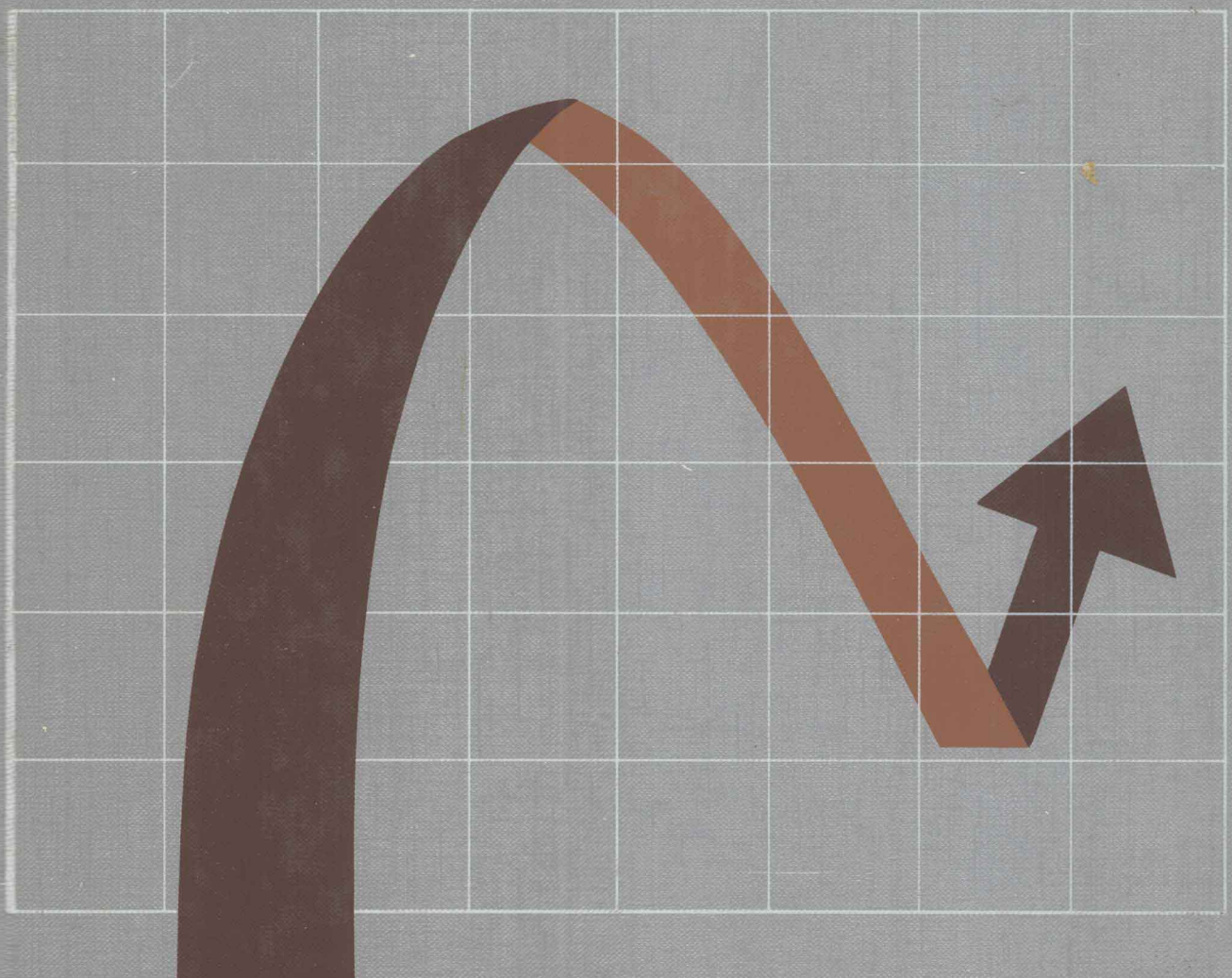
Business Statistics

Methods and Applications

Philip G. Enns



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Preface

This book is intended to serve as the text for an introductory noncalculus business statistics course. I have tried to present the subject in a "user friendly" style, employing methods developed in teaching the subject over the past dozen years. I believe the book achieves a good balance between the technical precision of formal statistical science and the often vaguely defined conditions of real business and economic applications. Of equal importance, I have attempted to motivate the discussion of statistics by appealing to the reader's common sense and experience. We routinely encounter the use of statistics in our daily lives. Recognizing these situations is a useful starting point for understanding how statistics can help in business decision making.

Organization

Business Statistics is organized in four parts designed to take advantage of the logical structure of statistics. Part I presents an overview of the subject, followed by the topic of descriptive statistics. Chapter 1 is not a short throwaway but instead contains terms and discussion that are important to what follows. Chapters 2 and 3 are also somewhat longer than normal. This is a measure of my belief that there is much to be learned by lingering over data before racing off to the conclusions of statistical inference. The inclusion of some exploratory data analysis techniques also reflects the growing interest of the statistics profession in EDA and related descriptive methods. In these and later chapters, sections containing optional or review topics are denoted by an asterisk (*).

Part II is devoted to probability and random variables. I try to accomplish several things in these chapters. First, I emphasize how probability links the description of past data observations with the uncertainty

of future data. Second, I explore the use of probability in decision making. Finally, avoiding card game and dice rolling examples, I try to relate the elegance of probability theory to the reader's understanding and experience with the worlds of business and economics.

Part III presents an introduction to sampling and statistical inference. The discussion is very basic; it is at once formal and informal. I try to convince the reader of the need for discipline and precision in reaching decisions based on sample data. At the same time, it is acknowledged that the art of applying the tools of inference often forces us to blink at strict rules and definitions.

Part IV contains eight chapters that deal with a range of topics used in business applications of statistics. With the exception of 12 (Multiple Regression), these are meant to be "stand alone" chapters. While they all rely in varying degrees on the first three parts, there is little cross-referencing among these chapters. This is intended to give the instructor maximum flexibility in planning a course. It should also help the reader in using the book for later reference.

Each chapter contains a set of learning aids. Each opens with an outline and objectives corresponding to the chapter sections. At the end of each chapter is a list of suggested readings that provide the interested student with different views of statistics and additional depth in specific topics. A list of terms introduced or emphasized in the chapter is included for the reader's review. The exercises all appear at the end of the chapter. They are grouped according to sections, followed by additional exercises for which the related section(s) is not explicitly identified. Finally, each chapter contains a series of questions concerning one or both sets of real data that appear in Appendix B.

Appendix A contains statistical tables needed for various calculations throughout the book. Appendix B describes and lists two sets of real data: a cross-section of bank loan data and quarterly time series of a corporation's revenues together with several economic measures. These sets are small enough to permit useful analysis by hand calculations but can also be used as input to computer-supported decision making.

Answers to the odd-numbered exercises are provided, followed by a glossary of terms that includes the chapter in which each term first appears.

Some Goals and Objectives

Instructors will see that my exposition of probability and statistics follows a traditional path. I have always found special pleasure in

the logic and consistency of mathematical statistics; trying to hide this would only weaken the book. But for this reason, I have made an extra effort to provide illustrations of statistics that are interesting and relevant to the reader's experience and business training. In choosing examples and exercises, one quickly tires of fabricating situations that perfectly illustrate a specific definition or rule and nothing else. As much as possible, I have drawn on the use of real data and, especially, the statistical applications of researchers in business, economics, and related fields. This was often quite a challenge, since real-world applications of statistics are rarely as simple and tidy as introductory textbooks would have us think. I believe I have succeeded in adapting these real examples to this beginning book in a way that is both interesting and unintimidating. I certainly learned a lot about the variety of business applications of statistics along the way.

The exercises range in difficulty from very simple to reasonably challenging. Some require a fair amount of data entry effort. Students and their instructors are encouraged to utilize whatever computing equipment is available; I see no special virtue in doing more arithmetic than is absolutely necessary. Beware that the precision of your calculations will sometimes produce substantial differences between your solutions and those provided in the book.

Some statistics-related cartoons from *The New Yorker* magazine are reprinted at various points in the book. I hope the reader enjoys these. I hope also that the cartoons help express what, to me, is important in teaching statistics in a school of business. We use data to support decisions that relate to all aspects of our lives. Most people don't really care very much about the technical side of statistics. When they filter the subject through their own experience and intelligence, it comes out looking quite different from the tight, logical discipline of the academic statistician. Theirs is not an invalid view. In teaching statistics, I have the most success when I am able to see the subject from a nonstatistician's angle. The cartoons offer some very perceptive nonstatistical views of statistics.

Supplements to the Text

A study guide, prepared by Professor Carol Diminnie and myself, is available as a supplement to *Business Statistics*. This book contains a variety of study suggestions and self-examination tools. It also displays detailed solutions to exercises selected from the text and additional exercises prepared for the study guide.

An instructor's manual is available from the publisher. This book

includes chapter teaching suggestions, solutions to the text exercises, discussion of the Appendix B data set questions, and overhead transparency masters based on figures found in the text.

A separate test bank contains objective true-false and multiple choice questions and problems with solutions provided. Special effort is made to coordinate these examination materials with the style of the text to help the instructor construct tests that are compatible with the student's learning.

The data sets described in Appendix B are available from the publisher.

Acknowledgments

I wish to thank a number of people whose contributions made possible the completion of this project. The following reviewers provided many valuable comments and suggestions that helped shape the final book:

M. David Beveridge, *Western Illinois University;* Warren J. Boe, *The University of Iowa;* Michael S. Broida, *Miami University—Oxford, Ohio;* Stephen K. Campbell, *University of Denver;* Bernice E. Evans, *Morgan State University;* Robert J. Healey, *Cal State Poly University—Pomona, California;* Gene Iverson, *The University of South Dakota;* Arthur Kraft, *University of Nebraska;* Joseph S. Longi, *St. Louis Community College at Meramec;* Saul Mason, *Villanova University;* Robert J. Meier, *Fort Hays State University;* Donald S. Miller, *Emporia State University;* Gerald E. Rubin, *Marshall University;* John C. Shannon, *Suffolk University;* Justin D. Stolen, *University of Nebraska;* Kenneth J. Wessel, *Training and Development Specialist;* Richard J. Westfall, *Cabrillo College;* and Howard J. Williams, *Wilkes College.*

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Professor Carol Diminnie of Saint Bonaventure University was my coauthor on the Study Guide, and she assisted with proofreading. I am deeply indebted to her for a heroic and timely effort.

On a personal note, I wish to thank my economist friends Gerry and Pat Welch for demonstrating that it is indeed possible to finish a textbook. I am especially grateful to my parents, who have always stressed the value of education, both as a career and for one's personal fulfillment.

This book would not have been written without the encouragement of my wife Paula. Her love was my greatest joy, and her memory will guide and sustain me always.

Philip G. Enns

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* Denotes optional section. This symbol is used throughout when it occurs.