

NINTH EDITION

APPLIED STATISTICS

for Public and Nonprofit Administration

KENNETH J. MEIER ■ JEFFREY L. BRUDNEY ■ JOHN BOHTE

APPLIED STATISTICS

FOR PUBLIC AND NONPROFIT ADMINISTRATION

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Australia • Brazil • Mexico • Singapore • United Kingdom • United States

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**Applied Statistics for Public and
Nonprofit Administration;
Ninth Edition**

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and John Bohte**

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To Diane and Nancy

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List of Symbols

μ	population mean
σ	population standard deviation
Σ	summation of all listed numbers
$!$	factorial
C_r^n	combination of n things taken r at a time
p^r	probability p raised to the r -th power
EV	expected value
\bar{X}	sample mean
s	sample standard deviation
n	size of the sample
N	size of the population
λ	lambda for the Poisson distribution
α	population regression intercept
β	population regression slope
a	sample regression intercept
b	sample regression slope
\hat{Y}	predicted value of Y
e	error
s.e.	standard error of the mean
$S_{y x}$	standard error of the estimate
r^2	coefficient of determination (bivariate)
R^2	multiple coefficient of determination (multivariate)
Adj. R^2	adjusted R^2 (coefficient of determination adjusted for variables with little or no explanatory power)
s.e. _{b}	standard error of the slope
z	standard normal score
t	t -distribution score

Preface

The first edition of this book was not the product of years of planning. It was written out of necessity. Assigned to teach a master's degree course entitled "Measurement and Analysis for Public Administrators," the original two authors could find no suitable text, so we wrote one. Since the initial publication of this book in 1981, other textbooks have appeared intended for the "methods" course(s) in master of public administration (MPA) degree programs. With this ninth edition, we believe that *Applied Statistics for Public and Nonprofit Administration* continues to possess unique advantages for study and practice in this field.

The first advantage—long a hallmark of the book—is accessibility. Because MPA students as well as those with an interest in the nonprofit sector come from disparate backgrounds, their prior exposure to statistics and quantitative methods is generally weak and varies widely. For many, if not most, students with an interest in public and/or nonprofit sectors, the last time they took a mathematics course was in high school. Given this audience, a rigorous presentation of statistical methods would have proved too threatening, difficult, and off-putting. Instead, we wanted a volume that would assume little familiarity with the subject but one that would teach quantitative novices a great deal in very little time. We also wanted to adopt a tone that would invite readers rather than intimidate them.

A second advantage of the book is that it addresses substantive problems illustrative of those faced by practicing administrators in the public and nonprofit sectors. Methods and statistics textbooks in political science and sociology and other disciplines rely predominantly on academic, rather than practitioner-oriented, examples. Although a number of excellent methods textbooks for business administration are available, they typically focus, understandably, on a different set of issues and problems (e.g., manufacturing production, market analysis, etc.) than those that normally concern and activate public and nonprofit administrators. We wanted a methods statistics book with examples that would be relevant for this audience.

A third advantage of the book is that it can help colleges, schools, and departments meet the accreditation standards for master's degree programs established by the National Association of Schools of Public Affairs and Administration, or NASPAA.* In addition, with respect to nonprofit studies, the book can help

*<http://www.naspaa.org/accreditation/standard2009/docs/NS2009FinalVote10.16.2009.pdf>

schools in meeting the *Curricular Guidelines for Graduate Study in Nonprofit Leadership, the Nonprofit Sector and Philanthropy*.** Published by the Nonprofit Academic Centers Council, or NACC (which at this writing does not have authority or responsibility to accredit academic programs in nonprofit studies), the guidelines are instructive nevertheless in suggesting a solid curriculum in this domain. Of particular relevance here, Section 16.0 provides guidelines relating to “Assessment, Evaluation and Decision-Making Methods” in the nonprofit sector. Chapter 1 discusses in greater detail how *Applied Statistics for Public and Nonprofit Administration* addresses the standards for curricula in public administration and nonprofit studies.

In preparing this ninth edition, we have again followed these guidelines that motivated the original edition and all subsequent editions of this book. In fact, the ninth edition is more faithful to them than the original edition, for in the past 30 years or so we have had the opportunity to use this book—and receive valuable feedback from a great many students and practitioners—at several major research universities, as well as at numerous off-campus locations. The new edition benefits from this experience and “field testing.”

Over the years since initial publication, a constituency of valued students and colleagues has arisen around *Applied Statistics for Public and Nonprofit Administration*. We are grateful for their guidance and help. They have kindly provided us with comments and suggestions, both positive and negative, but always with an eye toward improving the book for students of public affairs and nonprofit administration. We welcome you to join this group by contacting us either directly or through the publisher, Cengage Learning/Wadsworth (www.cengage.com).

New to This Edition

At the suggestion of the reviewers for this edition, we have incorporated many changes into this edition. We thank these individuals for their suggestions. Several improvements to the text are especially noteworthy.

First, the ninth edition offers a leaner (but not meaner!) version of *Applied Statistics for Public and Nonprofit Administration*. We have eliminated multiple chapters that instructors informed us that they rarely have time to cover in class and devoted greater attention to the more important chapters remaining. In addition, we rewrote Chapter 1 to welcome new users, both faculty and students, and to reintroduce the book to old friends.

The ninth edition continues to make substantial progress on a process that schools and departments of public administration and affairs are also undertaking: incorporating greater recognition and discussion of problems and examples relevant and important to the nonprofit sector and organizations. More than

**<http://www.urban.csuohio.edu/nacc/documents/GradCG07.pdf>

any other academic unit (such as social work or business administration), public administration schools and departments offer their students concentrations in nonprofit management, leadership, or organizations and consequently attract students with these interests. A few universities also have freestanding master's degree programs in this burgeoning domain of research and practice. We feel that this book should reflect these emerging trends in public administration and affairs. Accordingly, we have tried to make the discussion, examples, and problems in this ninth edition more responsive and interesting to students with a background in nonprofit organizations or aspirations to work in the nonprofit sector. Our growing appreciation of the elements and processes important to the nonprofit sector makes the book more relevant for these students, as well as for MPA students who will increasingly encounter nonprofit organizations in their studies and profession.

This ninth edition of *Applied Statistics for Public and Nonprofit Administration* continues to illustrate the increasing role of the nonprofit sector in interacting and working with the public sector.

As recommended by the reviewers of this edition and by faculty members and students, in this edition we continue to focus on updating problems at the end of the chapters, including problems pertaining to nonprofit organizations. As in previous editions, answers to odd-numbered computational problems appear at the end of the book. In addition, instructors can access answers to all problems, and much other useful material for teaching courses in applied statistics for public and nonprofit administration, in our *Instructor's Manual*.

Among the problems at the end of the chapters, you will find more computer-based problems (clearly marked with an icon), based on practice and experience in the public and nonprofit sectors. We have also made the relevant datasets available for instructor and student use. We have not tied the book to any particular software because across schools, levels and types of government, and nonprofit organizations, great variety exists with respect to both computer support and statistical software. We provide datasets for practice and problem solving on *your* technology so that the text and problems are not bound to a particular choice.

The ninth edition incorporates more examples to guide use and interpretation of statistics for public and nonprofit managers. We have added more examples to the text and present them more completely. This edition also includes more figures and other graphical displays. The summaries presented at the end of several chapters have been improved.

Our guiding philosophy continues to be to make the book accessible, practical, and useful, even at the expense of statistical rigor. In their program of study, MPA students and those with an interest in the nonprofit sector will have plenty of time to pick up that *second* course in statistics if they are interested. But first they must get through their *initial* exposure. We wrote this book to assist them. Our goal is to help students make good sense and good use of data with appropriate statistics, recognize the strengths as well as the limitations of the results obtained, and communicate these findings and insights clearly and persuasively to others.

Toward these ends, the ninth edition maintains the tone, level of presentation, and approach featured in the eight previous editions. We have also updated, corrected, amended, clarified, and elaborated the material as necessary to make it more readable, current, and interesting.

We are grateful to students, colleagues, and reviewers for suggesting many of these changes. We look forward to hearing your ideas.

Teaching Enhancements

Instructor's Manual Online for *Applied Statistics for Public and Nonprofit Administration, 9th Edition*

ISBN-13: 9781285737294

The Instructor's Manual contains for each chapter: an outline and summary; critical thinking questions; in-class activities; lecture launching suggestions; a list of key terms with definitions; and suggested readings and Web resources.

Free Companion Website for *Applied Statistics for Public and Nonprofit Administration, 9th Edition*

ISBN-13: 9781285737263

The free student companion website for *Applied Statistics and Public and Nonprofit Administration* is accessible through cengagebrain.com, which allows access to chapter-specific interactive learning tools including flashcards, quizzes, glossaries, and more. Instructors may access these resources by logging into their account at www.cengage.com/login.

Acknowledgments

A task of this magnitude could not have been accomplished without the assistance of others. We are grateful to the many students and colleagues who have kindly given us feedback that informs this ninth edition.

Over the editions of this book, a great many students at Texas A&M University, the University of Georgia, Cleveland State University, the University of North Carolina Wilmington, the University of Oklahoma, Oakland University, and the University of Wisconsin–Milwaukee have provided us with a diverse teaching laboratory. They, too, have offered comments and suggestions that proved helpful in improving this book. We appreciate their tolerance not only for errors that appeared in earlier editions but also for a sense of humor that occasionally goes awry on the printed page. (Otherwise reasonable people may disagree over the frequency of the latter occurrence.)

Thanks are due to the reviewers of this ninth edition for their very helpful comments and suggestions: Steven Bourassa, University of Louisville; Jayce

Farmer, Florida State University; Kenneth Kickham, University of Central Oklahoma; Gina Reinhardt, Texas A&M University; and Eva Witesman, Brigham Young University.

We are also grateful to a lengthy list of colleagues who have reviewed and improved previous editions of the book: William C. Adams, George Washington University; Kristian Alexander, University of Utah; Akpan Akpan, Texas Southern University; Robert Aldinger, Valdosta State University; Nolan J. Argyle, Valdosta State University; George Antunes, University of Houston; Dave Armstrong, University of Wisconsin–Milwaukee; Charles Barrilleaux, Florida State University; Brady Baybeck, University of Missouri–St. Louis; Cindy Bennett-Boland, University of Arkansas; R. M. Bittick, California State University–Dominguez Hills; Nancy Brooks, Cornell University; Gerald R. Bushee, George Mason University; Gary Copeland, University of Oklahoma; Paul J. Culhane, Northern Illinois University; Mark Daniels, University of Memphis; Matthew Dull, Virginia Tech; Warren Eller, West Virginia University; Jeff Fine, Clemson University; Jody Fitzpatrick, University of Colorado–Colorado Springs; Barry D. Friedman, North Georgia College and State University; John Forrester, University of Missouri–Columbia; James F. Guyot, Baruch College–City University of New York; Uk Heo, University of Wisconsin–Milwaukee; Tom Holbrook, University of Wisconsin–Milwaukee; Deniz Leuenberger, Bridgewater State College; Steve Percy, University of Wisconsin–Milwaukee; John Piskulich, Oakland University; Steven Rhiel, Old Dominion University; Bruce D. Rogers, Tennessee State University; Arthur Sementelli, Stephen F. Austin State University; Soo Geun Song, West Virginia University; Brian Stipak, Portland State University; Jon R. Taylor, University of St. Thomas (Houston, Texas); Chris Toppe, Georgetown University; Meredith Weinstein, North Carolina State University; Robert Wrinkle, University of Texas–Pan American; and Lin Ye, Roosevelt University.

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PART

1

Foundations of Quantitative Analysis

Statistics and Public and Nonprofit Administration

The Advantages of a Statistical Approach

Can the study of statistics be interesting and rewarding? We think it can be. Can learning to use statistics make you a more accomplished and professional public or nonprofit administrator? Without a doubt. Our commitment to these principles led us to write this book.

As we have revised and improved each edition of this textbook, we have been able to demonstrate more convincingly the advantages of statistics for the study and practice of public and nonprofit administration. Most important, by offering insight into issues and problems in a field that would otherwise go unnoticed and unheeded, statistics will help you to become a better decision maker.

First, statistics have great power to describe systematically a body of information or data to provide the background you need for decision making. No other approach matches the precision and quantification that statistics bring to this task. Statistics can show very precisely the average, as well as the variability, in a subset or *sample* of data or in the population as a whole. Consider a local food pantry, for example. The nonprofit manager would like to know how many hours volunteers donate to the organization in a typical week. How much do the hours donated vary week by week? Or, consider the regional office of the department of motor vehicles. The director needs to know how many clients on average visit in a typical day. How much does this number vary day to day? This information is essential for decision makers, for example, for planning and staffing. Answering such questions is the descriptive function of statistics.

Second, statistics are very useful for testing ideas *empirically*—that is, against actual data or observations. Statistics subject our intuitive ideas about how a process or phenomenon operates to empirical testing. Confronting our informed conjectures and speculations with data and observation is called *hypothesis testing*. A *hypothesis* is an informed guess or conjecture about an issue or problem of interest. For example, we might hypothesize or conjecture that as nonprofit organizations become more involved in the delivery of publicly financed services, more jobs will become available in these sectors, or that developing skills in statistics in a master of public administration (MPA) program or in a concentration in nonprofit management will enhance students' prospects in the

job market upon graduation. Statistics are helpful for evaluating the extent to which the data available support or refute our hypotheses. This use constitutes the hypothesis-testing function of statistics.

Third, statistics are the foremost method for drawing an accurate inference from a subset or sample of data to its parent, the full population. Rarely does a public or nonprofit administrator have the luxury of working with the complete population; instead, the data available are almost always a sample of observations. Nevertheless, administrators would like to use the sample of data to generalize or infer to the entire population. Public and nonprofit administrators need to know what the sample suggests about the population. For example, based on a random sample of residents, a nonprofit administrator may want to estimate the likely number of financial donors in the county. Based on a sample of agency records, a public administrator may need to estimate the number of housing units that are vacant in the city. Statistics provide an excellent methodology for drawing this linkage. Because we do not have the data from the entire population, we can still make an error in inferring from the sample to the population. Yet statistics are valuable, for they enable the analyst to estimate the probability or extent of this error. This function is the essence of statistical inference.

To these classic uses of statistics we can add two others. First, in public and nonprofit administration, managers face situations and challenges of daunting complexity, such as homelessness, poverty, illiteracy, crime, drug and alcohol dependency, and child and spousal abuse. We entrust to public and nonprofit managers the most difficult problems in society. A major advantage of statistics is that they can help the manager keep track of an almost innumerable collection of measured characteristics or attributes, called *variables*, at the same time. Statistics allow the manager to manipulate the variables and evaluate the strength of their influence on desired outcomes, such as raising agency performance and citizen satisfaction in the public sector or increasing success in obtaining grant funding and retaining volunteers in the nonprofit sector. The ability to examine a large number of variables simultaneously—and to sort out and make sense of the complicated interrelationships among them—is a great advantage of statistical methods for dealing with the highly complex problems that confront the public and nonprofit sectors.

An appreciation of statistics can also help the public and the nonprofit manager become a much more discerning consumer of quantitative information. Like it or not, managers in all sectors are bombarded with “facts” or assertions based on statistical analysis. There is no escape from them. They appear regularly in myriad sources, including reports, evaluations, memoranda, briefings, hearings, press releases, newspaper accounts, electronic communications, books, academic journals, and many other outlets. Public and nonprofit managers need the skills to evaluate the conflicting claims and representations often made, and to avoid being misled. Statistics offer major benefits in this area. Perhaps this reason is the best one of all for the study and application of statistics in public and nonprofit administration.

As reflected in the MPA curriculum, statistics are certainly not all there is to know about public or nonprofit organizations and management. One must acquire or hone additional skills as well as develop a general understanding of broader political, legal, economic, and social forces. But statistics, too, have a rightful place in the program of study for the MPA, as well as in academic concentrations and degree programs in nonprofit organizations and management.

Statistics and Options for Managers

For these reasons, statistics and quantitative analysis have become a major element of public and nonprofit management. The organizations and agencies in which you will likely work routinely use data and statistics to help understand complex situations and make decisions. Human resources managers receive personnel projections to schedule recruitment efforts. Transportation planners rely on complex computer simulations to design urban transportation systems. Budget officers and accountants scour economic projections and analyses. Program evaluators are charged with making quantitative assessments of a program's effectiveness. Nonprofit managers weigh the benefits against the costs of hiring a fund-raising firm. They compare volunteer recruitment and turnover rates by age and education level. They distribute surveys to donors and potential donors to learn about them and encourage further giving. Quantitative analyses have become so prevalent that no midlevel manager in the public or nonprofit sector can—or should—hope to avoid them.

The increasing sophistication of quantitative techniques affords public and nonprofit managers few options with regard to statistics. At one extreme, a manager untutored in statistical methods can act as if they did not exist and ignore reports containing statistics. Unfortunately, this option is exercised all too often and at considerable cost: The public or nonprofit manager loses valuable information presented in quantitative form. This option is not acceptable.

At the other extreme, public and nonprofit managers may choose to accept, uncritically, the findings of the data analyst or statistical report. This option leads to an error as serious as the first. Although quantitative analysts will almost certainly possess a stronger background in statistics than does the manager (that's their job), the analysts lack the experience and skills—and the responsibility—to make managerial decisions. Those decisions rest with public and nonprofit managers, based on the best statistical (and other) advice available. We wrote this book for students who consider public or nonprofit management their present or future occupation.

The third option open to the manager—the one endorsed by the authors—is to receive training in quantitative techniques. The training advocated and offered in this book, however, is *not* a standard course in statistics, which often remains a required (and dreaded) element of most MPA programs and nonprofit education degrees. Instead, we seek to develop appreciation for, and intuitive understanding of, basic elements of statistics and quantitative analysis for managers in the public and nonprofit sectors.

Reading this book and working the problems presented (which we recommend you do!) will not transform you from quantitative novice to master statistician. Such a transformation is not desired, nor necessary. By and large, public and nonprofit managers do not select and calculate the appropriate statistics. Far more often, they receive statistical information and are expected to make reasoned and responsible decisions based on it (and other factors). For this task, a rigorous course in mathematical statistics is not required. It is essential, however, that managers become intelligent and critical consumers of quantitative information. Toward that end, this book stresses the application, interpretation, and evaluation of basic statistics.

This book is intended primarily for students who have no, or only a very limited, background in mathematics, statistics, or other quantitative methods. We present the material in an applied, nonrigorous, easily readable format that focuses on practical problems faced by public and nonprofit managers. The book is designed to engage readers in the discussion of these problems and to help you see how statistics can be useful in managerial decision making. Often we present a step-by-step approach to learning the different statistical techniques to build your confidence and mastery. Statistical theory is discussed only rarely, and the computational formulas that pepper most statistics books are reserved for those instances in which they enlighten rather than mystify.

We hope that the advantages of our approach will become evident as you read and use the book. As noted before, it is not intended to be a comprehensive text in formal statistics. Instead, we have written the book as an introduction to statistics for managers in the public and nonprofit sectors. Too often, students in our field are alienated by more formal methods courses that emphasize precision over application, or theory over data, with the result that a first course in statistics becomes an eminently disliked and forgettable last one. We have worked to develop a text that will engage and hold the interest of students in public and nonprofit administration and, hopefully, whet their appetite for further training in this area. For those who seek a more mathematical and theoretical approach to managerial statistics, several good books are available (see the Annotated Bibliography at the end of the text).

The Role of Calculation

Whenever possible in this book, we have provided step-by-step instructions for performing statistical procedures and evaluating the results. We strongly recommend that you do these calculations and follow along. Statistics is not a spectator sport: You learn by doing.

But with laptop and desktop computer programs featuring an entire repertoire of statistics seemingly available at the click of a computer mouse, why worry about calculating statistics? Why go to the trouble?

Precisely because statistics have become so immediately accessible, it is all the more important to see how they are derived and computed. We know of no better way to understand the various statistics, their advantages and limitations, and their assumptions and anomalies than to experiment with a few data points, make the appropriate calculations, and observe what values of the statistic are generated in return. Whatever the strengths or peculiarities of the statistic, they will soon become apparent to you. You will see how the statistic can assist you in decision making.

Given the profusion of user-friendly statistical package programs available on laptop and desktop computers, however, many students and managers in the public and nonprofit sectors are becoming exposed to them through a different mechanism: Instead of learning about the statistics beforehand and then applying them, they may plunge into using them simply because they are so accessible. Unfortunately, though, they may not understand them. We do not want to discourage healthy curiosity or interest in statistics; nurturing it is difficult enough. But, in effect, these students and managers practice a tempting statistical version of the popular television quiz show *Jeopardy*; for those who are not aware, in this quiz show contestants are given the answer but must state the question (instead of the reverse—fun, huh?). For instance, you can easily obtain “the regression” (answer) on the computer, but what regression is, how you should interpret it, and why are questions that require prior study for correct application and use. In this book we pose the important questions before explaining the answers.

With statistical package programs increasingly loaded onto computers, students untrained in quantitative techniques can easily generate the statistical “answers” on their computer—but then can only guess at the question, use, or purpose behind those answers. In our judgment, these students have not learned statistics but have acquired a computer skill. There is a big difference. In this book, we emphasize building foundational knowledge of statistics for public and nonprofit managers.

Academic Standards for Master's Degree Programs in Public Affairs and Curricular Guidelines for Nonprofit Academic Programs

We can offer you one more reason for learning and using applied statistics in public administration and nonprofit administration: the accreditation standards in the field. The National Association of Schools of Public Affairs and Administration (NASPAA) has formulated standards for accreditation of master's degree programs in public affairs, policy, and administration. Many public administration programs also offer concentrations or certificates in nonprofit administration and include pertinent courses in the curriculum.

NASPAA adopted the revised *Standards for Accreditation for Master's Degree Programs* in 2009.¹ NASPAA Standard 5, “Matching Operations with the Mission: Student Learning,” section 5.1, “Universal Required Competencies,” states that an MPA program, “As the basis for its curriculum ... will adopt a set of required competencies related to its mission and public service values” in five domains. The domains encompass the ability to

- lead and manage in public governance;
- participate in and contribute to the policy process;
- analyze, synthesize, think critically, solve problems, and make decisions;
- articulate and apply a public service perspective; and
- communicate and interact productively with a diverse and changing workforce and citizenry.

The chapters and material presented in this book are intended especially to raise the ability of students in public administration to “analyze, synthesize, think critically, solve problems, and make decisions.” Increasing and honing this ability, in turn, will contribute to the other four required NASPAA competencies of leading and managing in governance, participating and contributing in the policy process, articulating and applying a public service perspective, and communicating and interacting with the workforce and citizenry. This book will help to create and refine the ability of students in public and nonprofit administration to synthesize information, understand and perform crucial data analysis and interpret the results, and support problem solving and decision making that underlie sound and effective practice in the other domains specified by NASPAA in its accreditation standards.

Although it does not yet have authority or responsibility to accredit academic programs in nonprofit studies, the Nonprofit Academic Centers Council (NACC) published revised *Curricular Guidelines for Graduate Study in Nonprofit Leadership, the Nonprofit Sector and Philanthropy* in 2007.² Section 16.0 treats “Assessment, Evaluation and Decision-Making Methods” and includes three guidelines for nonprofit academic programs to meet in this area:

1. methods and modes to evaluate performance and effectiveness at both organizational and programmatic levels;
2. decision-making models and methods and how to apply them in nonprofit organizational settings; and
3. the use and application of both quantitative and qualitative data for purposes of strengthening nonprofit organizations, the nonprofit sector, and society at large.

This book can assist MPA programs and students in meeting the NASPAA Standards for Accreditation with regard to the ability to “analyze, synthesize,

¹ <http://www.naspaa.org/accreditation/standard2009/docs/NS2009FinalVote10.16.2009.pdf>

² <http://www.naccouncil.org/pdf/GradCG07.pdf>

think critically, solve problems, and make decisions.” Likewise, this book offers coverage of the NACC Curricular Guidelines for “Assessment, Evaluation and Decision-Making Methods.”

This book can provide the basis for courses that satisfy the NASPAA Accreditation Standards and the NACC Curricular Guidelines relating to quantitative techniques of analysis and requisite skills in program evaluation, information synthesis, decision making, and problem solving. The book elaborates statistical methods as a tool for assisting public and nonprofit managers in making decisions. By focusing on the assumptions underlying the various techniques, the careful interpretation of results, and the limitations as well as the strengths of the information conveyed, the text stresses the ethical and effective utilization of statistics and quantitative analysis.

With respect to the competencies identified by NASPAA and NACC, Part 1 of the book addresses “Foundations of Quantitative Analysis.” The chapters in this section set out the rationale for a statistical approach in public and nonprofit administration and provide essential background in measurement and research design. The chapters elaborate on research methodology and treat a wide range of related issues, including problem diagnosis, the logic of inquiry, causal inference, and threats to the validity of a quantitative study.

Part 2, “Descriptive Statistics,” introduces basic statistical analysis. The chapters here are also useful for acquainting students with the presentation and interpretation of statistical charts, graphs, and tables to inform themselves as well as other decision makers.

Part 3, “Probability,” explores the many uses of this tool in public and nonprofit management. The chapters in this section assist students in defining and diagnosing decision situations and selecting and evaluating a course of action.

The chapters in Part 4, “Inferential Statistics,” not only develop sophisticated analytic skills but also help in the definition of problems, formulation of alternatives, choice of decision, and evaluation of results. They help the manager to understand the promise—and the limitations—of a sample of data for reaching conclusions about the entire population.

Part 5, “Analysis of Nominal and Ordinal Data,” introduces another set of quantitative skills useful for the public and nonprofit administrator. This type of analysis is employed frequently in written memoranda and technical reports and in the evaluation of survey data. These data distinguish public administration and nonprofit administration (and other social science fields) from the natural, physical, and biological sciences, in which measurement is typically much more precise.

Part 6 presents “Regression Analysis.” Regression is one of the most flexible and frequently utilized statistical techniques in the social sciences. The chapters in this section greatly enhance the decision-making, analytic, and evaluative capabilities of public and nonprofit managers. The chapters in this section discuss the methods of regression analysis and the varied applications of regression-based techniques in public and nonprofit management. The last chapter in this section, Chapter 21, explains how to read and interpret regression output generated by