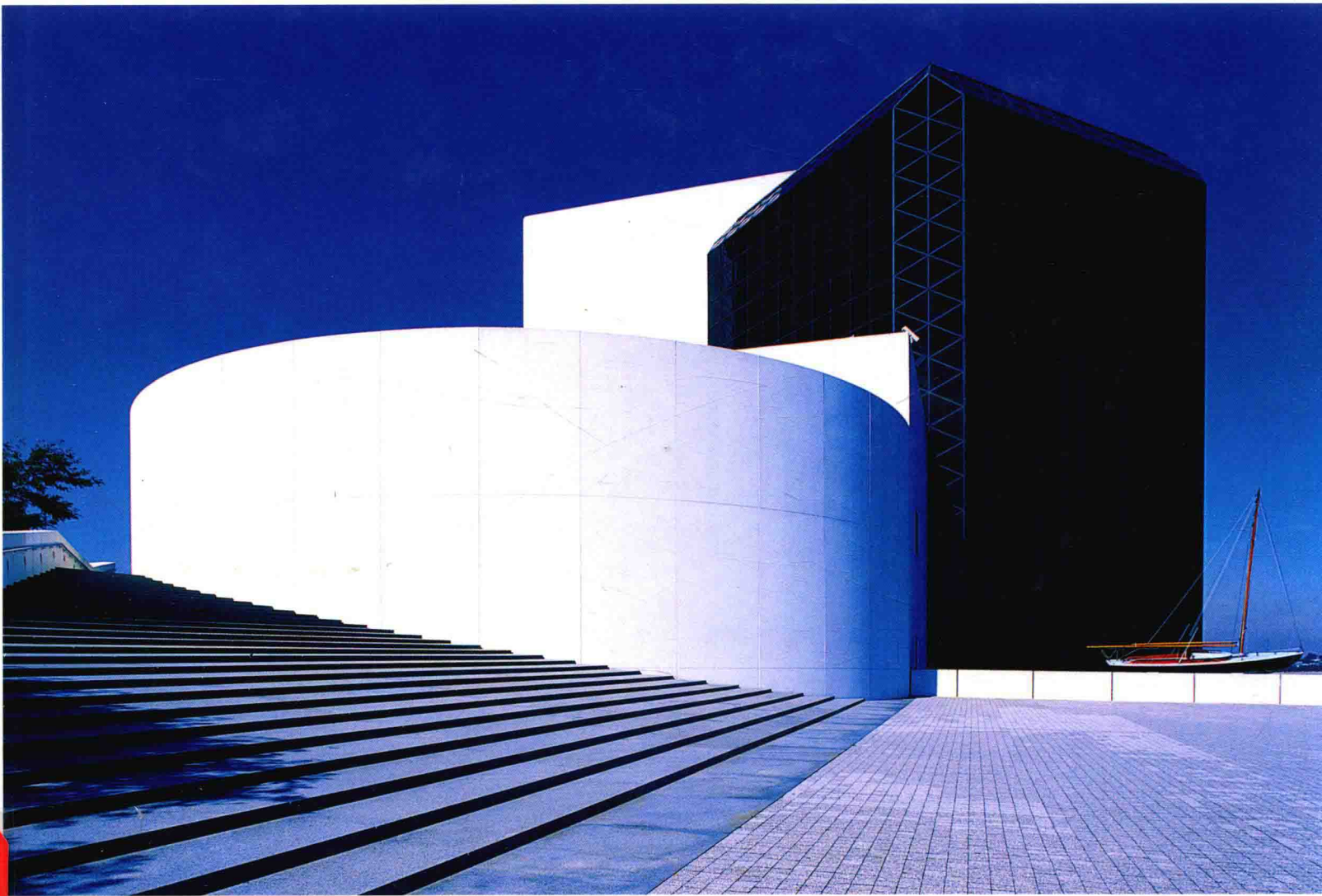


Quantitative Analysis for Management

Twelfth Edition



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Quantitative Analysis for Management

TWELFTH EDITION

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To Zoe and Gigi—MEH

To Valerie and Lauren—TSH

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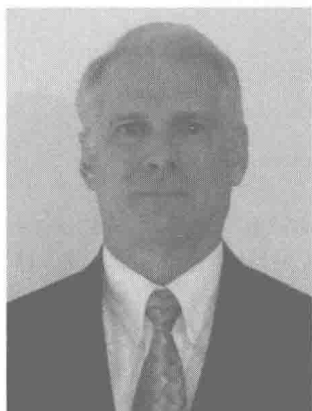


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PREFACE

OVERVIEW

Welcome to the twelfth edition of *Quantitative Analysis for Management*. Our goal is to provide undergraduate and graduate students with a genuine foundation in business analytics, quantitative methods, and management science. In doing so, we owe thanks to the hundreds of users and scores of reviewers who have provided invaluable counsel and pedagogical insight for more than 30 years.

To help students connect how the techniques presented in this book apply in the real world, computer-based applications and examples are a major focus of this edition. Mathematical models, with all the necessary assumptions, are presented in a clear and “plain-English” manner. The ensuing solution procedures are then applied to example problems alongside step-by-step “how-to” instructions. We have found this method of presentation to be very effective and students are very appreciative of this approach. In places where the mathematical computations are intricate, the details are presented in such a manner that the instructor can omit these sections without interrupting the flow of material. The use of computer software enables the instructor to focus on the managerial problem and spend less time on the details of the algorithms. Computer output is provided for many examples throughout the book.

The only mathematical prerequisite for this textbook is algebra. One chapter on probability and another on regression analysis provide introductory coverage on these topics. We employ standard notation, terminology, and equations throughout the book. Careful explanation is provided for the mathematical notation and equations that are used.

NEW TO THIS EDITION

- An introduction to business analytics is provided.
- Excel 2013 is incorporated throughout the chapters.
- The transportation, assignment, and network models have been combined into one chapter focused on modeling with linear programming.
- Specialized algorithms for the transportation, assignment, and network methods have been combined into Online Module 8.
- New examples, over 25 problems, 8 QA in Action applications, 4 Modeling in the Real World features, and 3 new Case Studies have been added throughout the textbook. Other problems and Case Studies have been updated.

SPECIAL FEATURES

Many features have been popular in previous editions of this textbook, and they have been updated and expanded in this edition. They include the following:

- *Modeling in the Real World* boxes demonstrate the application of the quantitative analysis approach to every technique discussed in the book. Four new ones have been added.
- *Procedure* boxes summarize the more complex quantitative techniques, presenting them as a series of easily understandable steps.
- *Margin notes* highlight the important topics in the text.
- *History* boxes provide interesting asides related to the development of techniques and the people who originated them.
- *QA in Action* boxes illustrate how real organizations have used quantitative analysis to solve problems. Several new QA in Action boxes have been added.
- *Solved Problems*, included at the end of each chapter, serve as models for students in solving their own homework problems.
- *Discussion Questions* are presented at the end of each chapter to test the student's understanding of the concepts covered and definitions provided in the chapter.
- *Problems* included in every chapter are applications oriented and test the student's ability to solve exam-type problems. They are graded by level of difficulty: introductory (one bullet), moderate (two bullets), and challenging (three bullets). More than 40 new problems have been added.
- *Internet Homework Problems* provide additional problems for students to work. They are available on the Companion Website.
- *Self-Tests* allow students to test their knowledge of important terms and concepts in preparation for quizzes and examinations.
- *Case Studies*, at the end of each chapter, provide additional challenging managerial applications.
- *Glossaries*, at the end of each chapter, define important terms.
- *Key Equations*, provided at the end of each chapter, list the equations presented in that chapter.
- *End-of-chapter bibliographies* provide a current selection of more advanced books and articles.
- *The software POM-QM for Windows* uses the full capabilities of Windows to solve quantitative analysis problems.
- *Excel QM* and *Excel 2013* are used to solve problems throughout the book.
- Data files with Excel spreadsheets and POM-QM for Windows files containing all the examples in the textbook are available for students to download from the Companion Website. Instructors can download these plus additional files containing computer solutions to the relevant end-of-chapter problems from the Instructor Resource Center Web site.
- *Online modules* provide additional coverage of topics in quantitative analysis.
- The Companion Website, at www.pearsonhighered.com/render, provides the online modules, additional problems, cases, and other material for almost every chapter.

SIGNIFICANT CHANGES TO THE TWELFTH EDITION

In the twelfth edition, we have introduced Excel 2013 in all of the chapters. Screenshots are integrated in the appropriate sections so that students can easily learn how to use Excel for the calculations. The Excel QM add-in is used with Excel 2013 allowing students with limited Excel experience to easily perform the necessary calculations. This also allows students to improve their Excel skills as they see the formulas automatically written in Excel QM.

From the Companion Website, students can access files for all of the examples used in the textbook in Excel 2013, QM for Windows, and Excel QM. Other files with all of the end-of-chapter problems involving these software tools are available to the instructors.

Business analytics, one of the hottest topics in the business world, makes extensive use of the models in this book. A discussion of the business analytics categories is provided, and the relevant management science techniques are placed into the appropriate category.

The transportation, transshipment, assignment, and network models have been combined into one chapter focused on modeling with linear programming. The specialized algorithms for these models have been combined into a new online module.

Examples and problems have been updated, and many new ones have been added. New screen-shots are provided for almost all of the examples in the book. A brief summary of the other changes in each chapter are presented here.

Chapter 1 *Introduction to Quantitative Analysis.* A section on business analytics has been added, the self-test has been modified, and two new problems were added.

Chapter 2 *Probability Concepts and Applications.* The presentation of the fundamental concepts of probability has been significantly modified and reorganized. Two new problems have been added.

Chapter 3 *Decision Analysis.* A more thorough discussion of minimization problems with payoff tables has been provided in a new section. The presentation of software usage with payoff tables was expanded. Two new problems were added.

Chapter 4 *Regression Models.* The use of different software packages for regression analysis has been moved to the body of the textbook instead of the appendix. Five new problems and one new QA in Action item have been added.

Chapter 5 *Forecasting.* The presentation of time-series forecasting models was significantly revised to bring the focus on identifying the appropriate technique to use based on which time-series components are present in the data. Five new problems were added, and the cases have been updated.

Chapter 6 *Inventory Control Models.* The four steps of the Kanban production process have been updated and clarified. Two new QA in Action boxes, four new problems, and one new Modeling in the Real World have been added.

Chapter 7 *Linear Programming Models: Graphical and Computer Methods.* More discussion of Solver is presented. A new Modeling in the Real World item was added, and the solved problems have been revised.

Chapter 8 *Linear Programming Applications.* The transportation model was moved to Chapter 9, and a new section describing other models has been added. The self-test questions were modified; one new problem, one new QA in Action summary, and a new case study have been added.

Chapter 9 *Transportation, Assignment, and Network Models.* This new chapter presents all of the distribution, assignment, and network models that were previously in two separate chapters. The modeling approach is emphasized, while the special-purpose algorithms were moved to a new online module. A new case study, Northeastern Airlines, has also been added.

Chapter 10 *Integer Programming, Goal Programming, and Nonlinear Programming.* The use of Excel 2013 and the new screen shots were the only changes to this chapter.

Chapter 11 *Project Management.* Two new end-of-chapter problems and three new QA in Action boxes have been added.

Chapter 12 *Waiting Lines and Queuing Theory Models.* Two new end-of-chapter problems were added.

Chapter 13 *Simulation Modeling.* One new Modeling in the Real World vignette, one new QA in Action box, and a new case study have been added.

Chapter 14 *Markov Analysis*. One new QA in Action box and two new end-of-chapter problems have been added.

Chapter 15 *Statistical Quality Control*. One new Modeling in the Real World vignette, one new QA in Action box, and two new end-of-chapter problems have been added.

Modules 1–8 The only significant change to the modules is the addition of Module 8: *Transportation, Assignment, and Network Algorithms*. This includes the special-purpose algorithms for the transportation, assignment, and network models.

ONLINE MODULES

To streamline the book, eight topics are contained in modules available on the Companion Website for the book.

1. Analytic Hierarchy Process
2. Dynamic Programming
3. Decision Theory and the Normal Distribution
4. Game Theory
5. Mathematical Tools: Determinants and Matrices
6. Calculus-Based Optimization
7. Linear Programming: The Simplex Method
8. Transportation, Assignment, and Network Algorithms

SOFTWARE

Excel 2013 Instructions and screen captures are provided for, using Excel 2013, throughout the book. Instructions for activating the Solver and Analysis ToolPak add-ins in Excel 2013 are provided in an appendix. The use of Excel is more prevalent in this edition of the book than in previous editions.

Excel QM Using the Excel QM add-in that is available on the Companion Website makes the use of Excel even easier. Students with limited Excel experience can use this and learn from the formulas that are automatically provided by Excel QM. This is used in many of the chapters.

POM-QM for Windows This software, developed by Professor Howard Weiss, is available to students at the Companion Website. This is very user-friendly and has proven to be a very popular software tool for users of this textbook. Modules are available for every major problem type presented in the textbook.

COMPANION WEBSITE

The Companion Website, located at www.pearsonhighered.com/render, contains a variety of materials to help students master the material in this course. These include the following:

Modules There are eight modules containing additional material that the instructor may choose to include in the course. Students can download these from the Companion Website.

Files for Examples in Excel, Excel QM, and POM-QM for Windows Students can download the files that were used for examples throughout the book. This helps them become familiar with the software, and it helps them understand the input and formulas necessary for working the examples.

Internet Homework Problems In addition to the end-of-chapter problems in the textbook, there are additional problems that instructors may assign. These are available for download at the Companion Website.

Internet Case Studies Additional case studies are available for most chapters.

POM-QM for Windows Developed by Howard Weiss, this very user-friendly software can be used to solve most of the homework problems in the text.

Excel QM This Excel add-in will automatically create worksheets for solving problems. This is very helpful for instructors who choose to use Excel in their classes but who may have students with limited Excel experience. Students can learn by examining the formulas that have been created, and by seeing the inputs that are automatically generated for using the Solver add-in for linear programming.

INSTRUCTOR RESOURCES

- **Instructor Resource Center:** The Instructor Resource Center contains the electronic files for the test bank, PowerPoint slides, the Solutions Manual, and data files for both Excel and POM-QM for Windows for all relevant examples and end-of-chapter problems. (www.pearsonhighered.com/render).
- **Register, Redeem, Login:** At www.pearsonhighered.com/irc, instructors can access a variety of print, media, and presentation resources that are available with this text in downloadable, digital format. For most texts, resources are also available for course management platforms such as Blackboard, WebCT, and Course Compass.
- **Need help?** Our dedicated technical support team is ready to assist instructors with questions about the media supplements that accompany this text. Visit <http://247pearsoned.custhelp.com/> for answers to frequently asked questions and toll-free user support phone numbers. The supplements are available to adopting instructors. Detailed descriptions are provided on the Instructor Resource Center.

Instructor's Solutions Manual The Instructor's Solutions Manual, updated by the authors, is available for download from the Instructor Resource Center. Solutions to all Internet Homework Problems and Internet Case Studies are also included in the manual.

PowerPoint Presentation An extensive set of PowerPoint slides is available for download from the Instructor Resource Center.

Test Bank The updated test bank is available for download from the Instructor Resource Center.

TestGen The computerized TestGen package allows instructors to customize, save, and generate classroom tests. The test program permits instructors to edit, add, or delete questions from the test bank; edit existing graphics and create new graphics; analyze test results; and organize a database of test and student results. This software allows the instructors to benefit from the extensive flexibility and ease of use. It provides many options for organizing and displaying tests, along with search and sort features. The software and the test banks can be downloaded at www.pearsonhighered.com/render.

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We gratefully thank the users of previous editions and the reviewers who provided valuable suggestions and ideas for this edition. Your feedback is valuable in our efforts for continuous improvement. The continued success of *Quantitative Analysis for Management* is a direct result of instructor and student feedback, which is truly appreciated.

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