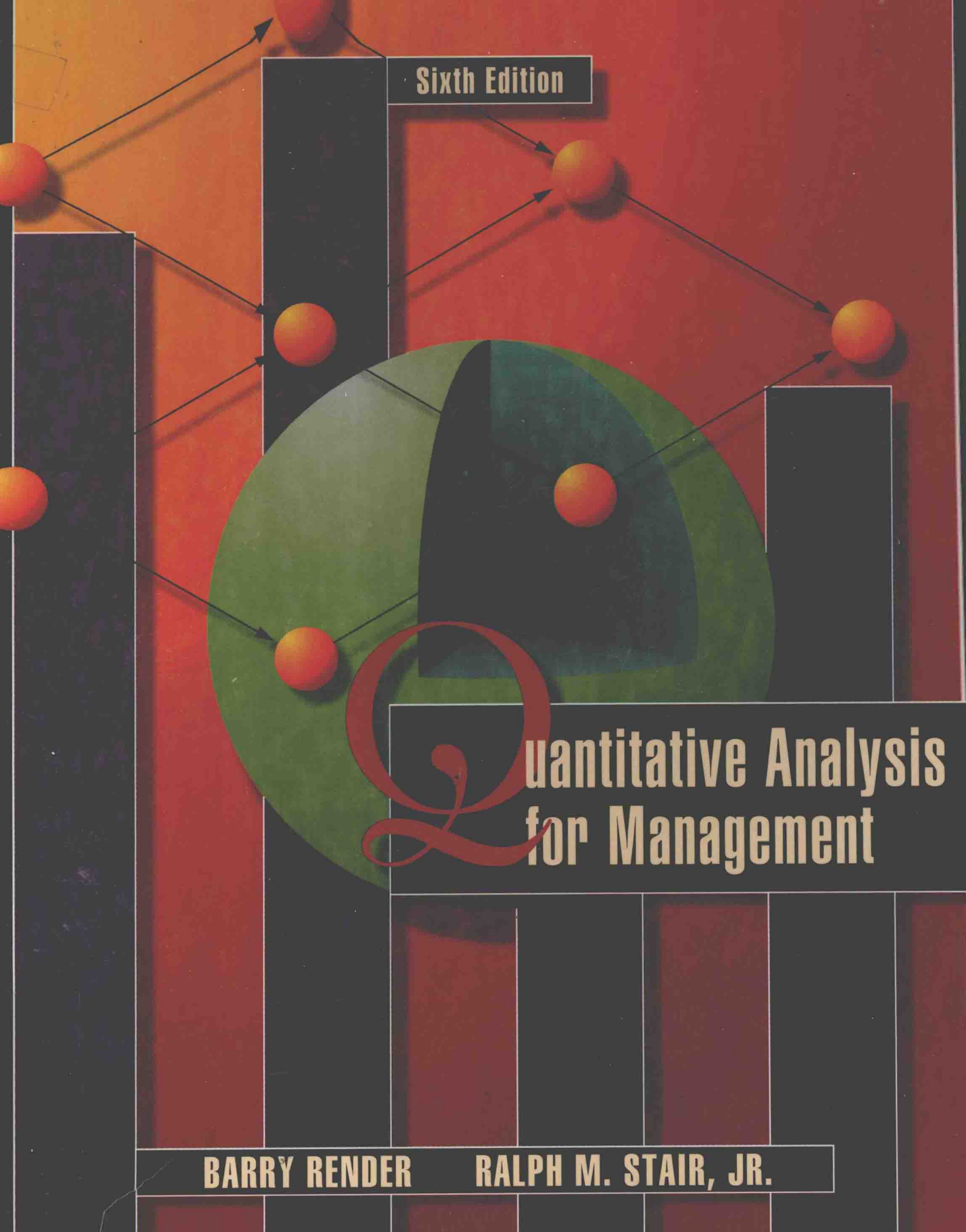
Sixth Edition
Quantitative Analysis for Management
BARRY RENDER
RALPH M. STAIR, JR.

SIXTH EDITION

BARRY RENDER

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To Donna and Charlie

To Lila and Leslie

Preface

OVERVIEW

This sixth edition of *Quantitative Analysis for Management* continues to provide the reader with the skills to apply the techniques of quantitative analysis in all kinds of organizational decision-making situations. The chapters and supplements cover every major topic in the quantitative analysis/management science field. There is probably more material included than most instructors can cover in a typical first course, but we have found that the resulting flexibility of topic selection is appreciated by instructors who need to tailor their courses to different audiences and curricula.

We show how each technique works, discuss the assumptions and limitations of the models, and illustrate the real-world usefulness of each technique with many applications in both profit-making and nonprofit organizations. We have kept the notation, terminology, and equations standard with other books. As in the first five editions, we have tried to write a text that is easy to understand and use. Algebra is the only mathematics prerequisite.

FEATURES RETAINED FROM THE PREVIOUS EDITION

This book is student oriented; the following features have proved to be effective aids to the learning process.

- QA in Action boxes summarize published articles illustrating how real organizations have used quantitative analysis to solve problems. There are dozens of new QA in Action boxes in this sixth edition.
- INFORMS (formerly TIMS) videos, which tie directly to QA in Action boxes found throughout the book, are available for classroom use. The INFORMS videos are edited versions of award-winning presentations at the annual meeting.
- Data set problems, found in most chapters, require the computer to solve larger amounts of data presented. These real world problems are also available to instructors on data disks.
- Solved problems, included at the end of chapters, serve as models for students in solving their own homework problems.
- Appendices, found in most chapters, describe how to solve quantitative analysis problems using spreadsheets. These stress the ease of developing spreadsheet formulas to solve problems. We use Excel spreadsheets in this new edition.
- Problems, included in every chapter, are applications-oriented and test the student's ability to solve exam-type problems. They are graded by three levels: introductory (1 bullet), moderate (2 bullets), and challenging (3 bullets).

- History boxes briefly describe how a technique was discovered.
- Glossaries, at the end of each chapter, define important terms.
- Key equations which summarize the mathematical material, are listed at the end of each chapter.
- Discussion questions, at the end of each chapter, test the student's understanding of concepts.
- Case studies, at the end of each chapter, provide challenging managerial applications.
- End-of-chapter bibliographies provide a selection of more advanced books and interesting, practical articles.

KEY CHANGES IN THE SIXTH EDITION

The sixth edition of *Quantitative Analysis for Management* has a completely new look and feel. We hope that this major revision will make teaching more efficient and enhance student learning. Some of the key changes are listed below.

- *A New Organization*. We have reorganized the chapters to give a better flow of material and more flexibility in what material is covered.
- *A Revision of the Treatment of Linear Programming Sensitivity Analysis*. LP Sensitivity analysis is now discussed graphically in Chapter 7 and using the simplex method in Chapter 9. This permits the coverage of sensitivity even if the simplex chapter is not assigned in class.
- *New Supplements*. The modules at the end of the previous edition and some chapter material have been turned into supplements to various chapters. For example, the two chapters on probability theory have been shortened into a new supplement to Chapter 2. Chapter 2 deals with decision theory, a subject that is strengthened by this review of probability concepts.
- *A Greater Emphasis on Decision Making*. The decision theory chapters have been moved up from Chapters 5 and 6 to Chapters 2 and 3 to emphasize decision making earlier in the text.
- *A New Treatment of Inventory Control*. The two chapters on inventory control have been combined into one chapter, with a supplement that treats Material Requirements Planning and Just-in-Time inventory.
- *A New Chapter on Network Models*. Network models, including the shortest-route problem, the minimal spanning tree technique, and the maximal flow problem have been expanded into a complete chapter, Chapter 12.
- *A New Chapter on Dynamic Programming*. The module on dynamic programming has been expanded into a new chapter, Chapter 17.
- *New Photo Opener*. Each chapter now opens with a brief story of an application of QA, along with a photo. These photo openers set the stage for how QA is used in a real setting.
- *New Modeling in the Real World Boxes*. This new feature will help students apply the six steps of the quantitative analysis approach, first presented in Chapter 1, to every technique discussed in the book. These new boxes show how companies applied the QA steps to solve a real problem. In each box, a graphical and verbal description of each step is provided.

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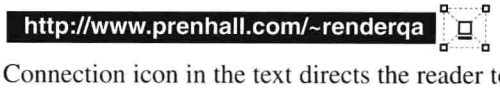
- *Upgraded QA in Action Boxes*. The Applications of QA boxes have been upgraded with many new applications. To better reflect their nature, they have been renamed QA in Action boxes.
- *Updated Marginal Notes*. The marginal notes and key idea markers of the previous edition have been upgraded to sentences or short paragraphs to make it easier for instructors to cover important points.
- *QA in Action Exercises*. Every chapter has one or more QA in Action exercises. These exercises ask students to apply quantitative analysis to real-world problems or situations.
- *New Self-Tests*. With this new feature, students can test their knowledge of important terms and concepts to help them prepare for quizzes and examinations. Answers to the multiple-choice, true/false, and fill-in-the-blank exercises are provided at the very end of the text in Appendix F.
- *QM for Windows*. An excellent Windows-based software package has been developed by Temple University Professor Howard Weiss for the sixth edition. This software package has the full capabilities of Windows and the power to solve all important quantitative analysis problems. A new appendix at the end of most chapters shows how QM for Windows can be used for that application. Appendix D, at the end of the text, details how to load and use this powerful software. QM for Windows' predecessor, AB:QM will still be available to DOS users.
- *New Excel Spreadsheets*. The Lotus spreadsheets of our previous edition have been replaced with Microsoft Excel spreadsheets to take advantage of the power of Excel. The linear programming chapters now use *Solver*, an optimization feature of Excel. A new appendix at the end of most chapters shows how these new spreadsheets can be used and provides an exercise for using them.
- *An INTERNET Tie-in*. This book has its own home page on the INTERNET, with additional cases, information about the companies noted in QA in Action boxes, and other features. Our address is http://www.prenhall.com/~renderqa.
- *New Cases*. There are many new cases in the chapters. Some of the cases require students to determine what data are needed to solve the case. The cases are provided by professors throughout the U.S. and are based on real organizations.
- *Updated Bibliographies*. The bibliographies at the end of the chapters have been updated to include newer applications of quantitative analysis. The classic references have been retained to give students a flavor of the history and development of the quantitative analysis field.

OUR INTERNET CONNECTION

Our new link to the INTERNET uses the benefits of this world-wide network to provide you with additional up-to-the-minute illustrations from real-world companies. It also includes numerous additional case studies. We strongly urge you to use the INTERNET for research and QA problem-solving, and we want to encourage professors to integrate the INTERNET in the quantitative analysis course.



The INTERNET Connection icon in the text directs the reader to additional materials and resources on the World-Wide-Web of the INTERNET dealing with topics and organizations discussed in each chapter. You can link to our home page inside Prentice-Hall's

World-Wide-Web site via either a university or home INTERNET service. Our address is http://www.prenhall.com/~renderqa.

Supplements

We have a complete supplement package. Details of the package can be found in the Annotated Instructor's Edition. It includes:

- QM for Windows software
- An Annotated Instructor's Edition
- A Testbank which is also available on our computerized testing software, the *P-H Custom Test for Windows*
- Videotapes from INFORMS (The Edelman Award Winners)
- Data Disks for marked problems

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The Institute for Operations Research and Management Science, a leading international association in the field of management science, contributes to the video component of this package. The work in the videotapes, representing the best in management science practice has been excerpted from videotapes of complete presentations from the Institute's Annual Franz Edelman Award for Management Science Achievement.

For further information or a complete catalog of videos, write to: INFORMS, 290 Westminster St., Providence, RI 02903.

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