



Applied Economic Analysis, for Technologists, Engineers, and Managers: Student Study Guide & the Bottom Line Case

By Michael S. Bowman

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* Contains worked solutions to odd-numbered problems and questions and help for case analyses and studying the text. * Also contains The Bottom Line Case, a comprehensive case that covers all chapters in the text. It is a valuable aid to understanding and applying the text material.

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Editorial Review

From the Back Cover

The new edition of *Applied Economic Analysis, for Technologists, Engineers, and Managers* focuses on classic engineering economy topics such as time value of money, project and investment analysis, depreciation, taxes, and asset replacement for contemporary organizations, projects, and individuals. Rich with applied examples, this text provides a practical approach to making integrated financial decisions in contemporary organizations.

New features of the second edition include:

- Additional questions, problems, and case studies to emphasize learning and applications.
- Revised and added topics on incremental analysis, risk, probability, uncertainty, and six sigma cost improvement techniques.
- Important equations printed inside the book cover.
- Important topics such as operating cash flow and financial ratios have been updated and rearranged to be more user-friendly.
- An improved and expanded instructor's manual and a student study guide that includes a comprehensive case study paralleling the topics in this text, study suggestions, and solutions to the odd-numbered end-of-chapter problems.

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This book is about money. It is about economic analysis, engineering economy, financial calculations, cost reduction, and profit improvement. It is written for students and for those working in design, process and manufacturing engineering, purchasing, and financial analysis in both manufacturing and service organizations; for members of financial improvement teams; and for technical and senior managers. It is also for individuals, proprietors, and small organizations.

No longer are an organization's financial planning and improvements the sole responsibility of a small number of technical, financial, or management staff. Today, organizations implement economic decisions using teams of operating employees, engineers, managers, office and manufacturing personnel, technical and marketing employees, accounting and nonaccounting staff, and others. This book is for those who are or will be members of those teams.

Today, approximately half of the people in the U.S. workforce are responsible for funding their own retirement without employer contributions, and this segment is growing. Also, government retirement plans such as Social Security are becoming a smaller proportion of retirees' benefits. Individuals face more complex financial decisions than in the past as they manage their current finances and plan for future retirement. This book is for individuals and families who are managing their own money decisions.

At work, employees are more involved in the financial decisions and improvements of the organization than they were in the past. At home, they face financial decisions about investments and retirement. With this increased financial responsibility at work and at home, individuals are becoming more financially knowledgeable. This book is for those who want to learn about economic analysis, apply financial tools,

understand financial statements, and monitor and continuously improve their financial results.

This text is based on the application of economic analysis and decisions in a capitalistic environment, as in our American economic system. Profit is the cornerstone of our system. As a reward for delivering services and products to customers and meeting or exceeding their expectations, we receive a profit. Competition is the key to economic improvements and success. Competition is international now, so no longer can the United States assume that it is the only economic leader in the world. Our future economic success requires that everyone, individually and in the organization, take responsibility for applying economic analysis, decisions, monitoring, and financial improvement in all our efforts. It is hoped that this book will contribute to that economic goal.

What's New in the Second Edition?

This second edition has a number of improvements and revisions that will interest instructors, students, and practitioners:

- New end-of-chapter **Discussion Case Problems**.
- Additional **Problems** and **Questions** at the ends of chapters.
- New and revised topics of incremental analysis, introduction to risk, marginal analysis, probability, uncertainty, and financial statement ratios.
- A **From Theory to Practice Case Study** at the beginning of each chapter to introduce the reader to an initial practical problem for discussion.
- Important **Formulas** printed inside the covers for quick reference.

New supplements have been added to support this edition:

- An extended comprehensive **Student Study Guide** containing fully-worked solutions to in-text problems and solutions to various **Discussion Case Problems** (ISBN: 0-13044990-3).
- New material in the **Instructor's Manual**, including a comprehensive case study covering major topics, CD of text illustrations in PowerPoint(c) for classroom projection or copying for overhead projection (ISBN: 0-13-048071-1).

Retained Features

- Over 65 end-of-chapter **Discussion Case Problems** for application of chapter material, which can be used individually, with teams, or for in-class discussions.
- Applied, user-friendly examples for technical, design, manufacturing, service, customer, supplier, improvement team, and manager situations.
- Topics that include both classical engineering economy topics of the time value of money, taxes, depreciation, and replacement analysis, plus contemporary topics of quality economics, financial statements, cash flow, team-based financial analysis, continuous financial improvement, breakeven, minimum costs, and team approaches to economic analysis.
- More than **380 Review Questions**.
- Over **300 Problems**.
- Team-based examples using the **Questions, Problems, and Cases**.
- Personal and family-based financial applications, including loans, mortgages, investments, and retirement accounts.
- Applied diagrams and calculations that help clarify examples.
- The chapter format emphasizes learning aids including **From Theory to Practice Case Studies, Key Terms, Learning Concepts, Summary, and Discussion Case Problems**.

- **Tables and Answers** to Odd-Numbered Problems—at end of text.
- **Important Formulas**—on endsheets.

Goals and Themes

Major and unique themes of the book are:

- Both traditional economic analysis techniques and contemporary financial topics and techniques.
- Emphasis on combining the dual goals of mathematical economic analysis problem solving and external factors of organizational, human, and other nonmathematical influences on decisions.
- Financial statements and accounting basics related to economic analysis.
- The financial importance of quality economics.
- The importance of team approaches in today's organizations.
- Cases as important bridges from theory and principles to real-world applications.
- Both corporate and individual examples and applications.
- Continuous financial improvement.

This text is comprehensive. It not only covers the traditional economic analysis topics but also extends coverage to basic financial statement and accounting understanding. It is difficult to work in a contemporary organization today without a basic understanding of the financial vocabulary and concepts. Employees who are required to do economic analysis and make financial improvements must understand basic vocabulary and concepts about the organization's financial system and its financial statements.

Classical analysis, applying traditional engineering economy principles and mathematics, is intertwined with other contemporary topics throughout the book. The basic principles are unchanging. Applications vary over time.

The emphasis is on both problem solving and nonmathematical considerations in economic analysis. Facts, data, time value of money, and analysis must be combined with organization characteristics, human factors, and other nonmathematical characteristics. Balance and combination are critical. Long-term financial results must be balanced with short-term organization goals.

Coverage also includes quality economics. At first, this may not appear to be a moneyrelated topic. However, experienced managers, engineers, and technicians know that as much as 20% or more of the organization's sales revenue can be lost due to poor quality. Today's staff is expected to understand quality, its cost, and its improvement. Quality is connected to the customer, design engineer, process employees, and to money. It is important.

Team approaches are highlighted throughout the text and in cases. Today's engineers, technicians, managers, and operating employees are normally part of multiple teams that are concerned with selection, analysis, and monitoring projects and investments. Senior management is not as all-knowing as in the past. Project and investment decisions are complex and often require a team for a solution.

In addition to questions and problems at the ends of the chapters there are discussion cases. These cases demonstrate the principles and concepts of the chapters. They are taken from actual situations, and are modified for inclusion in the book. Cases generally have no single textbook solution; multiple correct solutions often exist. And their information is never complete; assumptions are made to bridge the gaps. The mathematical components of the case are mixed with human and organization requirements and preferences. Very valuable real-world skills can be developed when analyzing and presenting cases. There are over 65 end-of-chapter cases, and a comprehensive case covering major topics is included in the Instructor's Manual.

There is not one set of financial principles for organizations and one set for individuals. For this reason, many techniques and tools apply to both organizations and individuals. Corporations, proprietorships, partnerships, not for profits, service organizations, manufacturers, medical offices, education, government—every organization and individual is an economic entity. Economic analysis principles apply to all. We do not change "financial hats" when we leave for work in the morning or when we return in the evening. Our economic understanding, analysis, and abilities are with us at home and work. *Oikos*, Greek for "house" or "household," is the root for the word economics. Economics *begins* in the home and extends to the organization, to the community, and to the nation.

A final theme throughout the book, detailed in the final chapter, is continuous improvement. To analyze and decide on a particular course of economic action is only the beginning. The investment or project must be monitored and improved throughout its life. The financial, economic, competitive, technical, and operating environments are so dynamic that investments need to be improved and monitored frequently. Few projects continue or are completed in exactly the same manner as planned. The concepts of monitoring, what-if, and continuous financial improvement appear throughout the book with specific techniques detailed in the last chapter.

Chapter Organization

Each chapter has a similar format to assist the reader to understand and review the material.

- **From Theory to Practice**—An introductory case to spark initial discussion by class or teams.
- **Key Terms**—New vocabulary that is introduced in the chapter.
- **Learning Concepts**—Important items for readers to focus on during their reading and study of the chapter.
- **Introduction**—An overview of the chapter. Content-The explanation, examples, and discussion of chapter topics.
- **Summary**—A checklist of topics that should be understood after reading and study. Questions-A review of the important key topics of the chapter.
- **Problems**—Similar to the examples in the chapter requiring specific solutions.
- **Discussion Cases**—Taken from actual situations that require analysis, assumptions, decisions, and consideration of both economic and noneconomic information. Ideal for class and team discussion situations, these cases are important applications of the principles.

This format lends itself to defining key terms and concepts initially, covering the content in detail, and then reviewing and applying content principles to questions, answers, problem solution and analysis, and discussion of applied, real-world cases.

The chapters are grouped into four parts.

Part I, *Financial Concepts*, describes the economic system in the United States, historical record keeping and financial statements, and the Accounting Equation. Part I includes Chapter 1, Introduction to Financial Decisions; Chapter 2, Introduction to Financial Statements and the Accounting Equation; and Chapter 3, The Accounting Equation—Depreciation, Inventory, and Ratios.

Part II, *Financial Analysis and Time Value of Money* is based on the traditional approaches of interest calculations, applications of time value of money, and project and investment analysis and justification. Part II includes Chapter 4, Return on Investment and Single-Payment Calculations; Chapter 5, Annual Amount and Gradient Functions; Chapter 6, Time Value of Money Applications; and Chapter 7, Analyzing, Selecting, Monitoring, and Evaluating Projects and Investments.

Part III, *Financial Decision Making*, looks at the decision-making tools that complement time value of

money analysis, such as breakeven, minimum costs, taxes, and replacement. Part III includes Chapter 8, Breakeven Analysis; Chapter 9, Minimum Cost Analysis; Chapter 10, Replacement Analysis; and Chapter 11, Taxes.

Part IV, *Continuous Financial Improvement*, presents the contemporary topics of quality economics and how to make continuous financial improvements in the organization. Part IV includes Chapter 12, Economics of Quality; and Chapter 13, Continuous Financial Improvement.

Supplements for Instructors and Students

In addition to the text, there are a number of supplements available to students, instructors, and practitioners. Feel free to contact the author at bowman@engr.iupui.edu

- **Student Study Guide** (0-13-044990-3) contains solutions to odd-numbered problems, questions, and help for case analyses and studying the text. Answers are given in the text with complete solutions in the manual. The manual also contains a **Comprehensive Case** that covers all chapters in the text. It is a valuable aid to understanding and applying the text material.
- **Instructor's Manual with PowerPoint CD** (0-13-048071-1) with solutions to questions, problems, and cases. Suggestions for presenting the topics and problem and case solutions are given.

Prerequisites

This text requires knowledge of college-level algebra and the use of a calculator. Example problems are solved using a basic calculator with exponential functions. However, it is helpful to have a programmable calculator and to program it with the time value of money equations. A scientific or financial calculator hard-wired with the time value of money formulas may also be useful.

Most readers are familiar with spreadsheets by the time they read this text material. Software such as Microsoft's Excel contains most of the depreciation and time value of money functions in its fx routines. Computer spreadsheets may be used with the examples, problems, and cases but are not required. These different solution techniques are demonstrated in the text and the reader is encouraged to use them.

Flexible Chapter Sequencing

Readers may choose to read or teach the materials in a sequence different from the one presented in the text. For example, financial statement topics may be omitted and the reader could start with the chapters on interest calculations and time value analysis. This approach would be valid in a curriculum in which accounting is a prerequisite. Or the last section, on measurement and continuous financial improvement, may be omitted without revising the applications of the first three sections.

The basics of interest calculations in Part 11 can be studied without covering Part III on tools and application of financial decision models. Part IV topics, monitoring and improvement techniques, can be introduced after Part II.

When used in in-service training courses for engineering, operating, management, and improvement teams, the parts and chapters may be selected individually as they apply to the organization's needs. For example, the organization's actual financial statements and cost information can be used to supplement Part I financial statement material. Specific chapters from Parts II and III can then be selected. If the organization is just beginning or continuing team approaches to financial improvements, topics from Part IV can be emphasized.

Specific focus on engineering, manufacturing, or service organizations can be obtained by assigning and

discussing those examples, questions, problems, and cases that correlate to the size and type of organization.

Individuals interested in using the text for their personal financial understanding and improvement can focus on Parts I and 11 with specific emphasis on the examples, questions, problems, and cases that relate to the individual and the family.

The topics of the book can be used to prepare for the state engineering exam. Topics in Part II, sections of Part I on depreciation, and sections of Part III on breakeven and minimum costs would be useful.

No prior economic or financial background is assumed. However, if readers have an accounting or financial background, they will find many new applications and approaches to topics with which they are already familiar.

Users Review

From reader reviews:

Tyrell Gutierrez:

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Arnold Williams:

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