To my mentors: James R. Buck (late), Gerald J. Thuesen, and Vernon E. Unger
PREFACE

Why Fundamentals of Engineering Economics?

Engineering economics is one of the most practical subject matters in the engineering curriculum, but it is an always challenging, ever-changing discipline. Contemporary Engineering Economics (CEE), now in its fifth edition, was first published in 1993, and since then, we have tried to reflect changes in the business world in each new edition along with the latest innovations in education and publishing. These changes have resulted in a better, more complete textbook, but one that is much longer than it was originally intended. This may present a problem: Today, covering the textbook in a single term is increasingly difficult. Therefore, we decided to create Fundamentals of Engineering Economics (FEE) for those who like contemporary but think a smaller, more concise textbook would better serve their needs.

Goals of the Text

This text aims not only to provide sound and comprehensive coverage of the concepts of engineering economics but also to address the practical concerns of engineering economics. More specifically, this text has the following goals:

1. To build a thorough understanding of the theoretical and conceptual basis upon which the practice of financial project analysis is built.
2. To satisfy the very practical needs of the engineer toward making informed financial decisions when acting as a team member or project manager for an engineering project.
3. To incorporate all critical decision-making tools—including the most contemporary, computer-oriented ones that engineers bring to the task of making informed financial decisions.
4. To appeal to the full range of engineering disciplines for which this course is often required: industrial, civil, mechanical, electrical, computer, aerospace, chemical, and manufacturing engineering as well as engineering technology.

Intended Market and Use

This text is intended for use in introductory engineering economics courses. Unlike the larger textbook (CEE), it is possible to cover FEE in a single term and perhaps even to supplement it with a few outside readings or case studies. Although the chapters in FEE are arranged logically, they are written in a flexible, modular format, allowing instructors to cover the material in a different sequence.
New to This Edition

Much of the content has been streamlined to provide materials in depth and to reflect the challenges in contemporary engineering economics. Some of the highlighted changes are as follows:

• All chapter opening vignettes—a trademark of *Fundamentals of Engineering Economics*—have been revised or completely replaced with more current and thought-provoking examples from both service and manufacturing sectors.

<table>
<thead>
<tr>
<th>Chapters</th>
<th>Chapter Opening Vignettes</th>
<th>Company</th>
<th>Sector</th>
<th>Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Social networking</td>
<td>Facebook</td>
<td>Technology services</td>
<td>Internet software/Services</td>
</tr>
<tr>
<td>2</td>
<td>Powerball lottery</td>
<td>Personal</td>
<td>Consumer</td>
<td>Gaming</td>
</tr>
<tr>
<td>3</td>
<td>Credit cards</td>
<td>Personal</td>
<td>Financial</td>
<td>Banking</td>
</tr>
<tr>
<td>4</td>
<td>Dallas Cowboys</td>
<td>Dallas Cowboys</td>
<td>Entertainment</td>
<td>Sports</td>
</tr>
<tr>
<td>5</td>
<td>LCD glass manufacturing</td>
<td>Corning Glass</td>
<td>Manufacturing</td>
<td>Electronic components</td>
</tr>
<tr>
<td>6</td>
<td>Owning a corporate jet</td>
<td>Hawker Beechcraft Corporation</td>
<td>Electronic technology</td>
<td>Aerospace/Defense</td>
</tr>
<tr>
<td>7</td>
<td>What’s a degree really worth?</td>
<td>Personal</td>
<td>Consumer</td>
<td>Education</td>
</tr>
<tr>
<td>8</td>
<td>High-speed Internet</td>
<td>Australian Government</td>
<td>Public</td>
<td>Computer communication</td>
</tr>
<tr>
<td>9</td>
<td>Obama to propose tax write-off for business</td>
<td>U.S. Government</td>
<td>Public</td>
<td>Taxation</td>
</tr>
<tr>
<td>10</td>
<td>Coke leveraging its investment in plant-based packaging</td>
<td>Coca Cola</td>
<td>Consumer nondurables</td>
<td>Beverages/Packaging</td>
</tr>
<tr>
<td>11</td>
<td>Japanese oil company looks to the rising sun</td>
<td>Solar Frontier KK’s</td>
<td>Energy</td>
<td>Integrated oil</td>
</tr>
<tr>
<td>12</td>
<td>Finding a fix for the Tappan Zee Bridge</td>
<td>State of New York</td>
<td>Public</td>
<td>Construction</td>
</tr>
<tr>
<td>13</td>
<td>Warren Buffett</td>
<td>Berkshire Hathaway</td>
<td>Finance</td>
<td>Property/Insurance</td>
</tr>
</tbody>
</table>

• **Self-Test Questions** have been added at the end of each chapter (131 problems in total), and worked-out solutions to the questions are provided in Appendix A. These questions are formatted in a style suitable for Fundamentals Engineering Exam review and were created to help students prepare for a typical class exam common to introductory engineering economic courses.
• The Benefit–Cost Analysis section has been moved to Chapter 8 as a part of measurement of investment chapters. The profitability index is included in this chapter.

• Most of the end-of-chapter problems are revised to reflect the changes in the main text. There are 708 problems, including 131 self-test questions, 43% of which are new or updated.

• Various Excel® spreadsheet modeling techniques are introduced throughout the chapters, and the original Excel files are provided online at the Companion Website. Most worksheets have been redesigned with graphical outputs.

• Some other specific content changes made in the third edition are as follows:
  • In Chapter 1, a cost reduction (Apple’s iPad®) project is introduced.
  • In Chapter 2, a new retirement planning example is introduced.
  • In Chapter 4, all CPI- and inflation-related data have been updated.
  • In Chapter 5, an example of comparing mutually exclusive revenue projects is provided.
  • In Chapter 6, a section on capital cost has been expanded with an automobile ownership example.
  • In Chapter 8, benefit–cost contents have been streamlined, and a new section on the profitability index has been created.
  • In Chapter 11, the section on risk-adjusted discount rate approach is expanded in which the risk element is incorporated through the cost of capital.
  • In Chapter 13, all financial statements for Lam Research Corporation have been updated, and a new set of financial ratio analysis is provided. Investment strategies have been added as a part of managing personal financial asset under uncertainty.

Features of the Book

FEE is significantly different from CEE, but most of the chapters will be familiar to users of CEE. Although we pruned some material and clarified, updated, and otherwise improved all of the chapters, FEE should still be considered an alternative and streamlined version of CEE.

We did retain all of the pedagogical elements and supporting materials that helped make CEE so successful. For example:

• Each chapter opens with a real economic vignette describing how an individual decision maker or actual corporation has wrestled with the issues discussed in the chapter. These opening cases heighten students' interest by pointing out the real-world relevance and applicability of what might otherwise seem to be dry technical material.

• In working out each individual chapters example problems, students are encouraged to highlight the critical data provided by each question, isolate the question being asked, and outline the correct approach in the solution under the headings Given, Find, Approach, and Comments, respectively. This convention is employed throughout the text. This guidance is intended to stimulate student curiosity to look beyond the mechanics of problem solving to explore “what-if” issues, alternative solution methods, and the interpretation of the solutions.

• There are a large number of end-of-chapter problems and exam-type questions varying in level of difficulty; these problems thoroughly cover the book’s various topics.
Most chapters contain a section titled “Short Case Studies with Excel,” enabling students to use Excel to answer a set of questions. These problems reinforce the concepts covered in the chapter and provide students an opportunity to become more proficient with the use of an electronic spreadsheet.

All Excel spreadsheets now contain easy-to-follow call-out formulas. The integration of Excel is another important feature of FEE. Students have increased access to and familiarity with Excel, and instructors have more inclination either to treat these topics explicitly in the course or to encourage students to experiment independently. One could argue that the use of Excel will undermine true understanding of course concepts. This text does not promote the trivial or mindless use of Excel as a replacement for genuine understanding of and skill in applying traditional solution methods. Rather, it focuses on Excel’s productivity-enhancing benefits for complex project cash flow development and analysis.

To Student: How to Prepare for the Fundamentals of Engineering (FE) Exam

The set of self-study questions at the end of each chapter is designed primarily to help you develop a working knowledge of the concepts and principles of engineering economics. However, the questions are also perfect resource to help you prepare the Fundamentals of Engineering (FE) exam. All questions are structured in multiple-choice format because these types of exam questions are used in the FE exam and, increasingly, in introductory engineering economics courses.

The FE exam typically consists of 180 multiple-choice questions. During the morning session (120 questions), all examinees take a general exam common to all disciplines. During the afternoon session (60 questions), examinees can opt to take a general exam or a discipline-specific (Chemical, Civil, Electrical, Environmental, Industrial, or Mechanical) exam.

The general exam includes four questions related to engineering economics in the morning session and five in the afternoon session. The specific engineering economics topics covered in the FE exam are

- Discounted cash flow (e.g., equivalence, PW, equivalent annual, FW, and rate of return)
- Cost (e.g., incremental, average, sunk, estimating)
- Analyses (e.g., breakeven, benefit–cost)
- Uncertainty (e.g., expected value and risk)
- Valuation and depreciation

Some sample questions are also provided by the National Council of Examiners for Engineering and Surveying (www.ncees.org/exams).

Companion Book Website

A Companion Website (www.pearsonhighered.com/park) has been created and maintained by the publisher. This text takes advantage of the Internet as a tool that has become increasingly important in accessing a variety of information. The website contains a variety of resources for both instructors and students, including various online resources.
financial calculators. As you type the address and click the open button, you will see the Fundamentals of Engineering Economics home page. There are three main links on the Companion Website:

- **Instructor Resources:** This is a password-protected link for registered instructors where the Instructor’s Manual and PowerPoint slides for lecture notes can be found. A comprehensive Instructor’s Manual in Word® format includes answers to end-of-chapter problems and Excel® solutions to all complex problems.

- **Student Resources:** This is where students can access online financial tools such as (1) Interest Factor Tables, (2) Cash Flow Analyzer, (3) Depreciation Analysis, and (4) Loan Analysis. The Cash Flow Analyzer is an integrated computer software package written in Java®. The software includes the most frequently used methods of economic analysis. It is menu-driven for convenience and flexibility, and it provides (1) a flexible and easy-to-use cash flow editor for data input and modifications and (2) an extensive array of computational modules and user-selected graphic outputs.

- **Author’s Resource Website:** This content has been created and maintained by the author and contains several pieces of information useful in conducting engineering economic analyses.

- **Tax Information:** This section will serve as a clearinghouse for disseminating ever-changing tax information, personal as well as corporate. Links are provided to various tax sites on the Web, so you will find the most up-to-date information on depreciation schedules as well as capital gains taxes.

- **Money and Investing:** This section provides a gateway to a variety of information useful in conducting engineering economic analysis. For example, a direct link is provided to the most up-to-date stock prices, options, and mutual fund performances.

- **Economic Tracks:** This section includes cost and price information as well as the most recent interest rate trends. In particular, the consumer price indices, productivity figures, and employment cost indices are some of the representative economic data provided.

- **Financial News:** This section provides access to various financial news outlets on the Web. The site divides news outlets into online news and daily, weekly, and monthly publications.

Acknowledgments

This book reflects the efforts of a great many individuals over a number of years. In particular, I would like to recognize the following individuals whose reviews and comments for the previous editions have contributed to this edition. Once again, I would like to thank each of them:

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Chan S. Park
Auburn, Alabama

CONTENTS

Preface v

PART I UNDERSTANDING MONEY AND ITS MANAGEMENT 1

Chapter 1 Engineering Economic Decisions 2

1.1 The Rational Decision-Making Process 4
1.1.1 How Do We Make Typical Personal Decisions? 4
1.1.2 How Do We Approach an Engineering Design Problem? 7
1.1.3 What Makes Economic Decisions Different from Other Design Decisions? 9

1.2 The Engineer’s Role in Business 10
1.2.1 Making Capital-Expenditure Decisions 10
1.2.2 Large-Scale Engineering Economic Decisions 10
1.2.3 Impact of Engineering Projects on Financial Statements 12

1.3 Types of Strategic Engineering Economic Decisions 13
1.3.1 New Products or Product Expansion 14
1.3.2 Equipment and Process Selection 14
1.3.3 Cost Reduction 15
1.3.4 Equipment Replacement 16
1.3.5 Service or Quality Improvement 16

1.4 Fundamental Principles in Engineering Economics 17
Summary 18
Self-Test Questions 19
Problems 19

Chapter 2 Time Value of Money 20

2.1 Interest: The Cost of Money 22
2.1.1 The Time Value of Money 22
2.1.2 Elements of Transactions Involving Interest 24
2.1.3 Methods of Calculating Interest 26

2.2 Economic Equivalence 28
2.2.1 Definition and Simple Calculations 29
2.2.2 Equivalence Calculations Require a Common Time Basis for Comparison 32

2.3 Interest Formulas for Single Cash Flows 33
2.3.1 Compound-Amount Factor 33
2.3.2 Present-Worth Factor 35
2.3.3 Solving for Time and Interest Rates 38
CONTENTS

2.4 Uneven-Payment Series 40
2.5 Equal-Payment Series 42
  2.5.1 Compound-Amount Factor: Find $F$, Given $A$, $i$, and $N$ 42
  2.5.2 Sinking-Fund Factor: Find $A$, Given $F$, $i$, and $N$ 46
  2.5.3 Capital-Recovery Factor (Annuity Factor): Find $A$, Given $P$, $i$, and $N$ 48
  2.5.4 Present-Worth Factor: Find $P$, Given $A$, $i$, and $N$ 51
  2.5.5 Present Value of Perpetuities 56
2.6 Dealing with Gradient Series 58
  2.6.1 Handling Linear Gradient Series 58
  2.6.2 Handling Geometric Gradient Series 64
2.7 More on Equivalence Calculations 68
  Summary 74
  Self-Test Questions 75
  Problems 79

Chapter 3  Understanding Money Management  94

3.1 Market Interest Rates 96
  3.1.1 Nominal Interest Rates 96
  3.1.2 Annual Effective Yields 97
3.2 Calculating Effective Interest Rates Based on Payment Periods 100
  3.2.1 Discrete Compounding 100
  3.2.2 Continuous Compounding 101
3.3 Equivalence Calculations with Effective Interest Rates 103
  3.3.1 Compounding Period Equal to Payment Period 103
  3.3.2 Compounding Occurs at a Different Rate than That at Which Payments are Made 106
3.4 Debt Management 110
  3.4.1 Borrowing with Credit Cards 110
  3.4.2 Commercial Loans—Calculating Principal and Interest Payments 113
  3.4.3 Comparing Different Financing Options 116
  Summary 121
  Self-Test Questions 123
  Problems 126

Chapter 4  Equivalence Calculations under Inflation  140

4.1 Measure of Inflation 141
  4.1.1 Consumer Price Index 142
  4.1.2 Producer Price Index 143
  4.1.3 Average Inflation Rate 145
  4.1.4 General Inflation Rate ($\bar{f}$) versus Specific Inflation ($f_j$) 146
### Part 2: Evaluating Business and Engineering Assets

#### Chapter 5: Present-Worth Analysis

- 5.1 Loan versus Project Cash Flows: 176
- 5.2 Initial Project Screening Methods: 177
  - 5.2.1 Benefits and Flaws of Payback Screening: 179
  - 5.2.2 Discounted-Payback Period: 180
- 5.3 Present-Worth Analysis: 182
  - 5.3.1 Net-Present-Worth Criterion: 182
  - 5.3.2 Guidelines for Selecting a MARR: 187
  - 5.3.3 Meaning of Net Present Worth: 188
  - 5.3.4 Net Future Worth and Project Balance Diagram: 192
  - 5.3.5 Capitalized-Equivalent Method: 193
- 5.4 Methods to Compare Mutually Exclusive Alternatives: 195
  - 5.4.1 Doing Nothing Is a Decision Option: 196
  - 5.4.2 Service Projects versus Revenue Projects: 196
  - 5.4.3 Analysis Period Equals Project Lives: 197
  - 5.4.4 Analysis Period Differs from Project Lives: 201
- Summary: 207
- Self-Test Questions: 207
- Problems: 210

#### Chapter 6: Annual-Equivalence Analysis

- 6.1 Annual-Equivalent Worth Criterion: 232
  - 6.1.1 Benefits of AE Analysis: 236
  - 6.1.2 Capital (Ownership) Costs versus Operating Costs: 236
- 6.2 Applying Annual-Worth Analysis: 241
  - 6.2.1 Unit-Profit or Unit-Cost Calculation: 241
  - 6.2.2 Make-or-Buy Decision: 245

CONTENTS

6.3 Comparing Mutually Exclusive Projects 248
   6.3.1 Analysis Period Equals Project Lives 248
   6.3.2 Analysis Period Differs from Project Lives 253
   Summary 256
   Self-Test Questions 256
   Problems 259

Chapter 7 Rate-of-Return Analysis 276

7.1 Rate of Return 278
   7.1.1 Return on Investment 278
   7.1.2 Return on Invested Capital 279
7.2 Methods for Finding Rate of Return 280
   7.2.1 Simple versus Nonsimple Investments 280
   7.2.2 Computational Methods 282
7.3 Internal-Rate-of-Return Criterion 289
   7.3.1 Relationship to the PW Analysis 289
   7.3.2 Decision Rule for Simple Investments 289
   7.3.3 Decision Rule for Nonsimple Investments 293
7.4 Incremental Analysis for Comparing Mutually Exclusive Alternatives 295
   7.4.1 Flaws in Project Ranking by IRR 295
   7.4.2 Incremental-Investment Analysis 296
   7.4.3 Handling Unequal Service Lives 302
   Summary 304
   Self-Test Questions 304
   Problems 308

Chapter 7A Resolution of Multiple Rates of Return 324

7A-1 Net-Investment Test 324
7A-2 The Need for an External Interest Rate 326
7A-3 Calculation of Return on Invested Capital for Mixed Investments 327

Chapter 8 Benefit–Cost Analysis 332

8.1 Evaluation of Public Projects 334
   8.1.1 Valuation of Benefits and Costs 335
   8.1.2 Users’ Benefits 335
   8.1.3 Sponsor’s Costs 335
   8.1.4 Social Discount Rate 336
8.2 Benefit–Cost Analysis 337
   8.2.1 Definition of Benefit–Cost Ratio 337
   8.2.2 Incremental B/C-Ratio Analysis 340

PART 3 DEVELOPMENT OF PROJECT CASH FLOWS 365

Chapter 9 Accounting for Depreciation and Income Taxes 366
9.1 Accounting Depreciation 368
9.1.1 Depreciable Property 368
9.1.2 Cost Basis 369
9.1.3 Useful Life and Salvage Value 370
9.1.4 Depreciation Methods: Book and Tax Depreciation 370
9.2 Book Depreciation Methods 372
9.2.1 Straight-Line Method 372
9.2.2 Declining-Balance Method 374
9.2.3 Units-of-Production Method 378
9.3 Tax Depreciation Methods 379
9.3.1 MACRS Recovery Periods 379
9.3.2 MACRS Depreciation: Personal Property 380
9.3.3 MACRS Depreciation: Real Property 383
9.4 Corporate Taxes 385
9.4.1 How to Determine “Accounting Profit” 385
9.4.2 U.S. Corporate Income Tax Rates 387
9.4.3 Gain Taxes on Asset Disposals 389
Summary 393
Self-Test Questions 394
Problems 396

Chapter 10 Project Cash-Flow Analysis 408
10.1 Understanding Project Cost Elements 410
10.1.1 Classifying Costs for Manufacturing Environments 410
10.1.2 Classifying Costs for Financial Statements 412
10.1.3 Classifying Costs for Predicting Cost Behavior 413
10.2 Why Do We Need to Use Cash Flows in Economic Analysis? 417
10.3 Income-Tax Rate to Be Used in Project Evaluation 418
10.4 Incremental Cash Flows from Undertaking a Project 421
10.4.1 Operating Activities 421
10.4.2 Investing Activities 424
10.4.3 Financing Activities 425
10.5 Developing Project Cash Flow Statements 425
10.5.1 When Projects Require Only Operating and Investing Activities 425
10.5.2 When Projects Are Financed with Borrowed Funds 428
10.6 Effects of Inflation on Project Cash Flows 431
10.6.1 Depreciation Allowance under Inflation 431
10.6.2 Handling Multiple Inflation Rates 435
Summary 437
Self-Test Questions 438
Problems 441

Chapter 11 Handling Project Uncertainty 462
11.1 Origins of Project Risk 465
11.2 Methods of Describing Project Risk 465
11.2.1 Sensitivity Analysis 465
11.2.2 Sensitivity Analysis for Mutually Exclusive Alternatives 470
11.2.3 Break-Even Analysis 473
11.2.4 Scenario Analysis 474
11.3 Probabilistic Cash Flow Analysis 477
11.3.1 Including Risk in Investment Evaluation 478
11.3.2 Aggregating Risk over Time 479
11.3.3 Estimating Risky Cash Flows 482
11.4 Considering the Project Risk by Discount Rate 486
11.4.1 Determining the Company Cost of Capital 486
11.4.2 Project Cost of Capital: Risk-Adjusted Discount Rate Approach 491
Summary 493
Self-Test Questions 494
Problems 496

PART 4 SPECIAL TOPICS IN ENGINEERING ECONOMICS 511

Chapter 12 Replacement Decisions 512
12.1 Replacement-Analysis Fundamentals 514
12.1.1 Basic Concepts and Terminology 515
12.1.2 Approaches for Comparing Defender and Challenger 517
12.2 Economic Service Life 521
## Chapter 12

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.3</td>
<td>Replacement Analysis When the Required Service Period Is Long</td>
<td>527</td>
</tr>
<tr>
<td>12.3.1</td>
<td>Required Assumptions and Decision Frameworks</td>
<td>527</td>
</tr>
<tr>
<td>12.3.2</td>
<td>Handling Unequal Service Life Problems in Replacement Analysis</td>
<td>528</td>
</tr>
<tr>
<td>12.3.3</td>
<td>Replacement Strategies under the Infinite Planning Horizon</td>
<td>528</td>
</tr>
<tr>
<td>12.4</td>
<td>Replacement Analysis with Tax Considerations</td>
<td>534</td>
</tr>
<tr>
<td></td>
<td>Summary</td>
<td>541</td>
</tr>
<tr>
<td></td>
<td>Self-Test Questions</td>
<td>542</td>
</tr>
<tr>
<td></td>
<td>Problems</td>
<td>543</td>
</tr>
</tbody>
</table>

## Chapter 13

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.1</td>
<td>Accounting: The Basis of Decision Making</td>
<td>558</td>
</tr>
<tr>
<td>13.2</td>
<td>Financial Status for Businesses</td>
<td>559</td>
</tr>
<tr>
<td>13.2.1</td>
<td>The Balance Sheet</td>
<td>561</td>
</tr>
<tr>
<td>13.2.2</td>
<td>The Income Statement</td>
<td>566</td>
</tr>
<tr>
<td>13.2.3</td>
<td>The Cash-Flow Statement</td>
<td>568</td>
</tr>
<tr>
<td>13.3</td>
<td>Using Ratios to Make Business Decisions</td>
<td>574</td>
</tr>
<tr>
<td>13.3.1</td>
<td>Debt Management Analysis</td>
<td>574</td>
</tr>
<tr>
<td>13.3.2</td>
<td>Liquidity Analysis</td>
<td>577</td>
</tr>
<tr>
<td>13.3.3</td>
<td>Asset Management Analysis</td>
<td>578</td>
</tr>
<tr>
<td>13.3.4</td>
<td>Profitability Analysis</td>
<td>579</td>
</tr>
<tr>
<td>13.3.5</td>
<td>Market-Value Analysis</td>
<td>581</td>
</tr>
<tr>
<td>13.3.6</td>
<td>Limitations of Financial Ratios in Business Decisions</td>
<td>583</td>
</tr>
<tr>
<td>13.3.7</td>
<td>Where We Get the Most Up-to-Date Financial Information</td>
<td>585</td>
</tr>
<tr>
<td>13.4</td>
<td>Principle of Investing in Financial Assets</td>
<td>585</td>
</tr>
<tr>
<td>13.4.1</td>
<td>Trade-Off between Risk and Reward</td>
<td>585</td>
</tr>
<tr>
<td>13.4.2</td>
<td>Broader Diversification Reduces Risk</td>
<td>585</td>
</tr>
<tr>
<td>13.4.3</td>
<td>Broader Diversification Increases Expected Return</td>
<td>587</td>
</tr>
<tr>
<td></td>
<td>Summary</td>
<td>589</td>
</tr>
<tr>
<td></td>
<td>Self-Test Questions</td>
<td>590</td>
</tr>
<tr>
<td></td>
<td>Problems</td>
<td>594</td>
</tr>
</tbody>
</table>

### Appendix A

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Answers to the Self-Test Questions</td>
<td>603</td>
</tr>
</tbody>
</table>

### Appendix B

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest Factors for Discrete Compounding</td>
<td>631</td>
</tr>
</tbody>
</table>

### Appendix C

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>How to Read the Cumulative Standardized Normal Distribution Function</td>
<td>661</td>
</tr>
</tbody>
</table>

### Index

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>664</td>
</tr>
</tbody>
</table>