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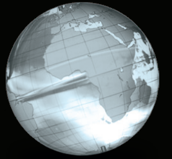

Principles of

Risk Management and Insurance

FOURTEENTH EDITION

George E. Rejda
Michael J. McNamara
William H. Rabel

Principles of
Risk Management and Insurance

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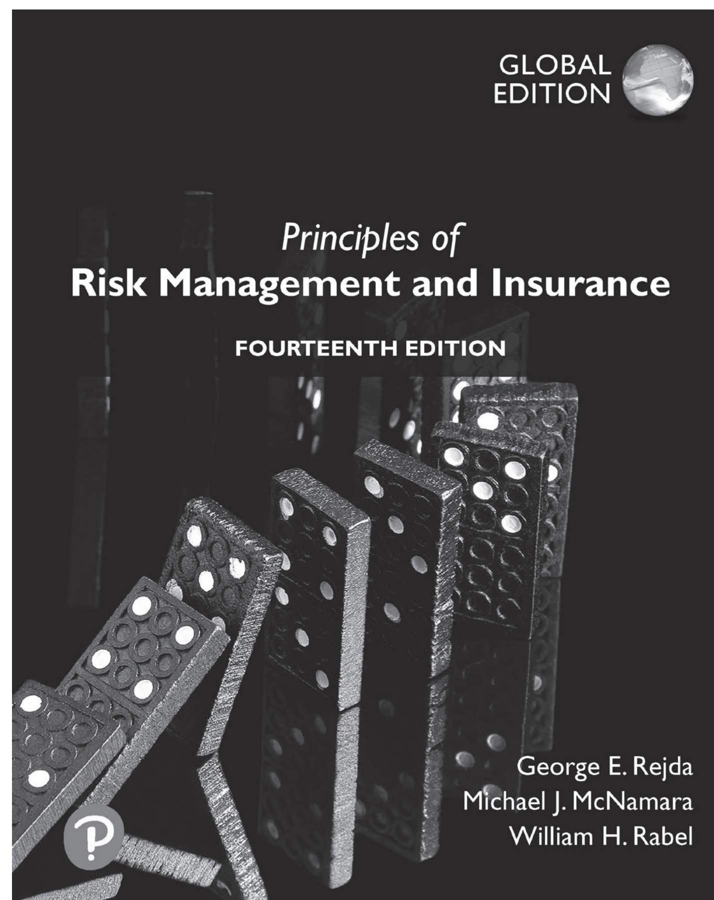

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Contents

Preface 13
About the authors 20

Chapter 1 Risk and Its Treatment 21

Definitions of Risk 22
Chance of Loss 24
Peril and Hazard 24
Classification of Risk 25
Major Personal Risks and Commercial Risks 27
Burden of Risk on Society 32
Techniques for Managing Risk 33

Summary 37 ▪ Key Concepts and Terms 38 ▪ Review Questions 39 ▪ Application Questions 39 ▪ Internet Resources 40 ▪ Selected References 41 ▪ Notes 41

Case Application 37

Insight 1.1: What Are Your Chances of Not Being Able to Earn an Income? Calculate Your Personal Disability Quotient 29

Insight 1.2: Careers in Risk Management and Insurance 36

Chapter 2 Insurance and Risk 42

Definition of Insurance 43
Basic Characteristics of Insurance 43
Law of Large Numbers 44
Characteristics of an Ideally Insurable Risk 45
Two Applications: The Risks of Fire and Unemployment 47
Adverse Selection and Insurance 49
Insurance and Gambling Compared 49
Insurance and Hedging Compared 49
Types of Insurance 50
Benefits of Insurance to Society 54
Costs of Insurance to Society 55

Summary 60 ▪ Key Concepts and Terms 60 ▪ Review Questions 61 ▪ Application Questions 61 ▪ Internet Resources 61 ▪ Selected References 62 ▪ Notes 62

Case Application 59

Insight 2.1: Insurance frauds: Myths versus reality 56

Insight 2.2: Examples of Insurance Fraud—Hall of Shame 57

Appendix: Basic Statistics and the Law of Large Numbers 64
Probability and Statistics 64
Law of Large Numbers 65
Notes 66

Chapter 3 Introduction to Risk Management 67

Meaning of Risk Management 68
Objectives of Risk Management 69
Steps in the Risk Management Process 69
Benefits of Risk Management 80
Personal Risk Management 81

Summary 83 ▪ Key Concepts and Terms 84 ▪ Review Questions 84 ▪ Application Questions 84 ▪ Internet Resources 85 ▪ Selected References 86 ▪ Notes 86

Case Application 82

Insight 3.1: Bermuda Leads Global Captive Domiciles 74
Insight 3.2: When You Should Self-Insure? 75

Chapter 4 Enterprise Risk Management 88
Enterprise Risk Management 90
Benefits of Enterprise Risk Management Programs 97
Insurance Market Dynamics 98
Loss Forecasting 101
Financial Analysis in Risk Management Decision Making 104
Other Risk Management Tools 106

Summary 109 ▪ Key Concepts and Terms 110 ▪ Review Questions 111 ▪ Application Questions 111 ▪ Internet Resources 111 ▪ Selected References 112 ▪ Notes 112

Case Application 109

Insight 4.1: Weather Futures and Options: Financial Tools That Provide a Means of Transferring Risk Associated with Adverse Weather Events 102

Chapter 5 Types of Insurers and Marketing Systems 114
Overview of Private Insurance in the Financial Services Industry 115
Types of Private Insurers 116
Agents and Brokers 121
Types of Marketing Systems 124

Summary 129 ▪ Key Concepts and Terms 129 ▪ Review Questions 129 ▪ Application Questions 130 ▪ Internet Resources 130 ▪ Selected References 131 ▪ Notes 132

Case Application 128

Insight 5.1: Show Me the Money—How Much Can I Earn as an Insurance Sales Agent? 123

Chapter 6 Insurance Company Operations 133
Insurance Company Operations 134
Rating and Rate Making 134
Underwriting 135
Production 138
Claims Settlement 139
Reinsurance 141
Investments 147
Other Insurance Company Functions 149

Summary 150 ▪ Key Concepts and Terms 151 ▪ Review Questions 151 ▪ Application Questions 152 ▪ Internet Resources 152 ▪ Selected References 153 ▪ Notes 153

Case Application 150

Insight 6.1: Home Owner's Failure to Cooperate Yields Denied Claim 141
Insight 6.2: Insurance 4.0—Digitalization of Insurance Operations 142

Chapter 7 Financial Operations of Insurers 155
Property and Casualty Insurers 156
Life Insurance Companies 161
Rate Making In Property and Casualty Insurance 163
Rate Making in Life Insurance 167

Summary 168 ▪ Key Concepts and Terms 169 ▪ Review Questions 170 ▪ Application Questions 170 ▪ Internet Resources 170 ▪ Selected References 171 ▪ Notes 171

Case Application 168

Insight 7.1: How Profitable Is the Property and Casualty Insurance Industry? 162

Chapter 8 Government Regulation of Insurance 173

Reasons for Insurance Regulation 174
Historical Development of Insurance Regulation 175
Methods For Regulating Insurers 177
What Areas are Regulated? 178
State Versus Federal Regulation 184
Current Issues in Insurance Regulation 187
Insolvency of Insurers 190
Market Conduct Regulation 192

Summary 194 ▪ Key Concepts and Terms 195 ▪ Review Questions 195 ▪ Application Questions 196 ▪ Internet Resources 196 ▪ Selected References 197 ▪ Notes 197

Case Application 194

Insight 8.1: The Pros and Cons of Credit-Based Insurance Scores 193

Chapter 9 Fundamental Legal Principles 199

Principle of Indemnity 200
Principle of Insurable Interest 203
Principle of Subrogation 205
Principle of Utmost Good Faith 205
Requirements of an Insurance Contract 207
Distinct Legal Characteristics of Insurance Contracts 209
Law and the Insurance Agent 210

Summary 212 ▪ Key Concepts and Terms 214 ▪ Review Questions 214 ▪ Application Questions 214 ▪ Internet Resources 215 ▪ Selected References 215 ▪ Notes 215

Case Application 212

Insight 9.1: Corporation Lacking Insurable Interest at Time of Death Can Receive Life Insurance Proceeds 204

Insight 9.2: Auto Insurer Denies Coverage Because of Material Misrepresentation 206

Insight 9.3: Insurer Voids Coverage Because of Misrepresentations in Proof of Loss 207

Chapter 10 Analysis of Insurance Contracts 216

Basic Parts of an Insurance Contract 217
Definition of "Insured" 219
Endorsements and Riders 220
Deductibles 220
Coinsurance 223
Coinsurance in Health Insurance 225
Other-Insurance Provisions 225

Summary 227 ▪ Key Concepts and Terms 228 ▪ Review Questions 228 ▪ Application Questions 228 ▪ Internet Resources 229 ▪ Selected References 230 ▪ Notes 230

Case Application 227

Insight 10.1: Will Your Auto Insurance Cover You When You Drive Another Person's Car? 222

Chapter 11 Life Insurance 231

Premature Death 232
Financial Impact of Premature Death on Different Types of Families 233
Amount of Life Insurance to Own 234
Types of Life Insurance 239
Variations of Whole Life Insurance 245
Other Types of Life Insurance 253

Summary 256 ▪ Key Concepts and Terms 258 ▪ Review Questions 258 ▪ Application Questions 259 ▪ Internet Resources 260 ▪ Selected References 261 ▪ Notes 261

Case Application 256

Insight 11.1: Cash-Value Life Insurance as an Investment—Don't Ignore Two Points 244

Insight 11.2: Be a Savvy Consumer—Four Life Insurance Policies to Avoid 254

Chapter 12 Life Insurance Contractual Provisions 263

Life Insurance Contractual Provisions 264
Dividend Options 270
Nonforfeiture Options 271
Settlement Options 274
Additional Life Insurance Benefits 278

Summary 283 ▪ Key Concepts and Terms 284 ▪ Review Questions 285 ▪ Application Questions 285 ▪ Internet Resources 286 ▪ Selected References 287 ▪ Notes 287

Case Application 283

Insight 12.1: Is This Death a Suicide? 266

Insight 12.2: Selection of the Best Dividend Option in a Participating Whole Life Policy 272

Insight 12.3: Accelerated Death Benefits: A Real-Life Example 281

Insight 12.4: What Is a Life Settlement? Examples of Actual Cases 282

Chapter 13 Buying Life Insurance 288

Determining the Cost of Life Insurance 289
Rate of Return on Saving Component 292
Taxation of Life Insurance 294
Shopping for Life Insurance 295

Summary 299 ▪ Key Concepts and Terms 299 ▪ Review Questions 299 ▪ Application Questions 300 ▪ Internet Resources 300 ▪ Selected References 301 ▪ Notes 301

Case Application 298

Insight 13.1: Be Careful in Replacing an Existing Life Insurance Policy 292

Appendix: Calculation of Life Insurance Premiums 302

Net Single Premium 302
Net Annual Level Premium 304
Gross Premium 305
Policy Reserves 305

Case Application 306

Key Concepts and Terms 306 ▪ Notes 306

Chapter 14 Annuities and Individual Retirement Accounts 307

Individual Annuities 308
Types of Annuities 309
Taxation of Individual Annuities 316
Individual Retirement Accounts 317

Summary 323 ▪ Key Concepts and Terms 324 ▪ Review Questions 325 ▪ Application Questions 325 ▪ Internet Resources 325 ▪ Selected References 326 ▪ Notes 326

Case Application 1 322

Case Application 2 323

Insight 14.1: Advantages of an Immediate Annuity to Retired Workers 310

Insight 14.2: Optional Variable Annuity Benefits To Meet Specific Needs 313

Insight 14.3: Ten Questions to Answer Before You Buy a Variable Annuity 318

CHAPTER 15 INDIVIDUAL HEALTH INSURANCE COVERAGES 327

Defects in the Healthcare System in the United States 328
Basic Provisions of the Affordable Care Act 332
Individual Medical Expense Insurance 338
Managed Care Plans 342
Health Savings Accounts 342
Long-Term Care Insurance 343
Disability-Income Insurance 347
Individual Health Insurance Contractual Provisions 350

Summary 352 ▪ Key Concepts and Terms 354 ▪ Review Questions 354 ▪ Application Questions 355 ▪ Internet Resources 355 ▪ Selected References 356 ▪ Notes 357

Case Application 352

INSIGHT 15.1: HEALTH INSURANCE OPTIONS FOR COLLEGE STUDENTS UNDER THE AFFORDABLE CARE ACT 335

CHAPTER 16 EMPLOYEE BENEFITS: GROUP LIFE AND HEALTH INSURANCE 358

Meaning of Employee Benefits 359
Fundamentals of Group Insurance 360
Group Life Insurance 362
Group Medical Expense Insurance 363
Managed Care Plans 364
Affordable Care Act and Group Medical Expense Insurance 368
Key Features of Group Medical Expense Insurance 370
High-Deductible Health Plan With Savings Option 371
Recent Developments in Employer-Sponsored Health Plans 372
Group Medical Expense Contractual Provisions 375
Group Dental Insurance 377
Group Disability-Income Insurance 378
Cafeteria Plans 378

Summary 380 ▪ Key Concepts and Terms 381 ▪ Review Questions 382 ▪ Application Questions 382 ▪ Internet Resources 383 ▪ Selected References 384 ▪ Notes 384

Case Application 380

INSIGHT 16.1: HISTORY OF HEALTH MAINTENANCE ORGANIZATION 366
INSIGHT 16.2: BASIC CHARACTERISTICS OF THE SMALL BUSINESS HEALTH OPTIONS PROGRAM (SHOP) 369

CHAPTER 17 EMPLOYEE BENEFITS: RETIREMENT PLANS 385

Fundamentals of Private Retirement Plans 386
Types of Qualified Retirement Plans 390
Defined-Benefit Plans 390
Defined-Contribution Plans 393
Section 401 (K) Plan 394
Section 403(B) Plan 397
Simplified Employee Pension (SEP) 397
Simple Ira Plan 397
Profit-Sharing Plans 398
Saver's Credit 399
Retirement Plan Security 399
Funding Agency and Funding Instruments 399
Problems and Issues In Qualified Retirement Plans 400

Summary 402 ▪ Key Concepts and Terms 403 ▪ Review Questions 404 ▪ Application Questions 404 ▪ Internet Resources 405 ▪ Selected References 405 ▪ Notes 405

Case Application 402

INSIGHT 17.1: SIX COMMON 401(K) MISTAKES 395

CHAPTER 18 SOCIAL INSURANCE 407

Social Insurance Programs 409
Old-Age, Survivors, and Disability Insurance (OASDI) 410
Types of Benefits 411
Medicare 417
Problems and Issues 421
Unemployment Insurance 424
Workers' Compensation 427

Summary 431 ▪ Key Concepts and Terms 432 ▪ Review Questions 432 ▪ Application Questions 433 ▪ Internet Resources 433 ▪ Selected References 434 ▪ Notes 435

Case Application 431

INSIGHT 18.1: POSTPONING SOCIAL SECURITY BENEFITS—KEY FACTORS TO CONSIDER 414
INSIGHT 18.2: TRY YOUR HAND AT SOCIAL SECURITY REFORM 423

CHAPTER 19 THE LIABILITY RISK 437

Basis of Legal Liability 439
The Law of Negligence 439
Imputed Negligence 441
Res Ipsa Loquitur 442
Specific Applications of the Law of Negligence 442
Current Tort Liability Problems 445

Summary 454 ▪ Key Concepts and Terms 455 ▪ Review Questions 455 ▪ Application Questions 456 ▪ Internet Resources 457 ▪ Selected References 457 ▪ Notes 458

Case Application 454

INSIGHT 19.1: JUDICIAL HELLHOLES 2017–2018 448

CHAPTER 20 AUTO INSURANCE 460

Overview of Personal Auto Policy 461
Part A: Liability Coverage 463
Part B: Medical Payments Coverage 467
Part C: Uninsured Motorists Coverage 469
Part D: Coverage For Damage to Your Auto 473
Part E: Duties After an Accident or Loss 479
Part F: General Provisions 480
Insuring Motorcycles and Other Vehicles 481

Summary 481 ▪ Key Concepts and Terms 482 ▪ Review Questions 482 ▪ Application Questions 483 ▪ Internet Resources 484 ▪ Selected References 485 ▪ Notes 485

Case Application 481

INSIGHT 20.1: PRIVATE PASSENGER AUTO INSURANCE REMAINS UNPROFITABLE FOR MANY INSURERS 462
INSIGHT 20.2: IN 5 STATES, 20% OR MORE OF DRIVERS HAVE NO INSURANCE; COUNTRYWIDE AVERAGE INCREASES 469
INSIGHT 20.3: THE FOUR TYPES OF RENTAL CAR INSURANCE, EXPLAINED 475

CHAPTER 21 AUTO INSURANCE (*CONTINUED*) 487

Approaches for Compensating Auto Accident Victims 488
Auto Insurance for High-Risk Drivers 498
Cost of Auto Insurance 499
Shopping for Auto Insurance 503
Auto Insurance Emerging Issues 505

Summary 507 ▪ Key Concepts and Terms 508 ▪ Review Questions 508 ▪ Application Questions 509 ▪ Internet Resources 509 ▪ Selected References 510 ▪ Notes 510

Case Application 507

Insight 21.1: Filing an Auto Claim with the Other Party's Insurance Company 492
Insight 21.2: Protect Yourself: Insuring Your Teen Driver 501
Insight 21.3: Distracted Driving 506

Chapter 22 Homeowners Insurance, Section I 512

Overview of Homeowners Insurance 513
The Homeowners 3 Policy: Persons Insured 518
The Homeowner 3 Policy: Section I Coverages 518
The Homeowners 3 Policy: Section I Perils Insured Against 524
The Homeowners 3 Policy: Section I Exclusions 527
The Homeowners 3 Policy: Section I Conditions 528
The Homeowners 3 Policy: Section I and II Conditions 534

Summary 535 ▪ Key Concepts and Terms 536 ▪ Review Questions 536 ▪ Application Questions 537 ▪ Internet Resources 538 ▪ Selected References 539 ▪ Notes 539

Case Application 535

Insight 22.1: Your Renters Insurance Guide: What to Look for When Shopping for Renters Insurance 516
Insight 22.2: How to Create a Home Inventory 529
Insight 22.3: The Big Gap between Replacement Cost and Actual Cash Value Can Empty Your Wallet 531

Chapter 23 Homeowners Insurance, Section II 540

Personal Liability Insurance and Medical Payments to Others Coverage 541
Section II Exclusions 544
Section II Additional Coverages 547
Section II Conditions 548
Endorsements to a Homeowners Policy 549
Cost of Homeowners Insurance 552
Suggestions for Buying a Homeowners Policy 554

Summary 557 ▪ Key Concepts and Terms 557 ▪ Review Questions 557 ▪ Application Questions 558 ▪ Internet Resources 559 ▪ Selected References 559 ▪ Notes 559

Case Application 556

Insight 23.1: Dog Bites Hurt, So Do Lawsuits 542
Insight 23.2: Five Insurance Mistakes to Avoid . . . (and Still Save Money) 555

Chapter 24 Other Property and Liability Insurance Coverages 561

ISO Dwelling Program 562
Mobile Home Insurance 564
Inland Marine Floaters 564
Watercraft Insurance 565
Government Property Insurance Programs 567
Title Insurance 572
Personal Umbrella Policy 573

Summary 577 ▪ Key Concepts and Terms 578 ▪ Review Questions 578 ▪ Application Questions 579 ▪ Internet Resources 580 ▪ Selected References 580 ▪ Notes 581

Case Application 577

Insight 24.1: Dispelling Myths about Flood Insurance 571
Insight 24.2: The Vitals on Title Insurance 573
Insight 24.3: 10 Real Examples of Umbrella Insurance Claims 575

CHAPTER 25 COMMERCIAL PROPERTY INSURANCE 583

Commercial Package Policy 584
Building and Personal Property Coverage Form 585
Reporting Forms 589
Business Income Insurance 590
Other Commercial Property Coverages 593
Transportation Insurance 597
Businessowners Policy (BOP) 601

Summary 604 ▪ Key Concepts and Terms 605 ▪ Review Questions 605 ▪ Application Questions 606 ▪ Internet Resources 607 ▪ Selected References 608 ▪ Notes 608

Case Application 603

INSIGHT 25.1: EXAMPLES OF EQUIPMENT BREAKDOWN CLAIMS: RECENT PAID CLAIMS 595

CHAPTER 26 COMMERCIAL LIABILITY INSURANCE 610

General Liability Loss Exposures 611
Commercial General Liability Policy 613
Employment Practices Liability Insurance 619
Workers Compensation Insurance 620
Commercial Auto Insurance 622
Aircraft Insurance 625
Commercial Umbrella Policy 626
Cyber Liability Insurance 628
Businessowners Policy 628
Professional Liability Insurance 630
Directors and Officers Liability Insurance 631

Summary 633 ▪ Key Concepts and Terms 634 ▪ Review Questions 635 ▪ Application Questions 635 ▪ Internet Resources 636 ▪ Selected References 637 ▪ Notes 637

Case Application 633

INSIGHT 26.1: GENERAL LIABILITY LAWSUIT EXAMPLES 613
INSIGHT 26.2: BEYOND PREVENTION: WORKERS COMPENSATION INSURANCE 621
INSIGHT 26.3: 10 MOST COMMON AND COSTLIEST SMALL BUSINESS CLAIMS 629

CHAPTER 27 CRIME INSURANCE AND SURETY BONDS 639

The ISO Commercial Crime Insurance Program 640
Commercial Crime Coverage Form (Loss-Sustained Form) 641
Financial Institution Bonds 647
Surety Bonds 648

Summary 651 ▪ Key Concepts and Terms 652 ▪ Review Questions 652 ▪ Application Questions 653 ▪ Internet Resources 654 ▪ Selected References 654 ▪ Notes 654

Case Application 651

INSIGHT 27.1: CRIME PREVENTION TIPS FOR SMALL BUSINESSES 643
INSIGHT 27.2: ISO'S CRIME CHANGES: KEEPING PACE WITH OUR DIGITAL WORLD 645

Appendix A: Personal Auto Policy 656

Appendix B: Homeowners 3 (Special Form) 671

Glossary 696

Index 715

PREFACE

The first edition of this text appeared 37 years ago in 1982. The basic objective was to write an intellectually stimulating and visually attractive text from which students could learn and professors could teach. The fundamental objective for this edition remains the same. This edition provides students with an in-depth treatment of major risk management and insurance topics in a visually attractive and user-friendly product with no prerequisites. The 14th edition is unique in this respect. Students can immediately apply the basic principles in this text to their own personal risk management and insurance programs to deal with major risks that create great economic insecurity.

CONTENT CHANGES IN THE 14TH EDITION

Thoroughly revised and updated, the 14th edition provides a comprehensive analysis of major life and health insurance contracts and property and liability insurance coverages, which readers have come to expect from *Principles of Risk Management and Insurance*. Key content changes in this edition include the following:

- *Enterprise risk management*. Chapter 4 provides a revised and expanded treatment of enterprise risk management.
- *Changes in marketing practices*. Chapter 5 covers significant changes in marketing practices. In particular, the fields of wholesale insurance and surplus lines insurance have been evolving rapidly, which has led to a new classification system for intermediaries in those areas. Wholesale insurance refers to property/casualty intermediaries who obtain business only from "retail" agents and brokers and do not deal with the public. The Wholesale and Specialty Insurance Association has been formed to provide a single voice for intermediaries in the field. In addition, Chapter 5 deals with shifts in consumer preferences that have produced changes in life insurance marketing and financial planning.
- *Government regulation*. Chapter 8 adds new material to enhance the understanding of state insurance regulation. Additional insights have been added dealing with insurance regulation following the severe 2008 financial debacle and economic downswing.
- *Estate tax law*. Policyholders with large taxable estates often purchase life insurance for federal estate tax purposes. Chapter 13 deals with important considerations in purchasing life insurance for federal estate tax purposes. Updates have been added to reflect recent changes in the federal estate tax law.
- *Poor performance of health care delivery system*. When compared to advanced foreign nations, the United States scores last or low on most measurements of health care delivery systems and health insurance. Chapter 15 provides an updated analysis of the broken and flawed health care delivery system in the United States.
- *Evaluation of the Affordable Care Act*. Chapters 15 and 16 provide a current analysis of the Affordable Care Act (ACA) and an evaluation of its effectiveness in reducing the number of uninsured individuals and family members. The 14th edition analyzes the most egregious defects now found in the current ACA program.
- *Update on developments in employer-sponsored group health insurance plans*. Employers continue to struggle with the rapid increase in group health insurance premiums and continue to seek new solutions for holding down costs. Chapter 16 is an update on current trends in group health insurance and proposals to slow health care cost increases.
- *Changes in group life and health insurance*. Chapter 16 also deals with changes in group life

and health insurance and the market for group health insurance. For example, high-deductible health insurance plans combined with health savings accounts are making substantial gains in the preferred provider organization (PPO) market.

- *Obsolescence of certain retirement plans*. Chapter 16 recognizes that certain older retirement plans such as money purchase retirement plans and Keogh plans for the self-employed have become obsolete and are being replaced by other options.
- *Coverage of new Personal Auto Policy (PAP)*. The Insurance Services Office (ISO) has released a new version of the Personal Auto Policy. The 2018 PAP is discussed in Chapter 20. The policy was revised to address car sharing and ride sharing (for example, Uber and Lyft) exposures. Additional changes in the 2018 PAP are also discussed.
- *Cyber insurance*. Computer hackers have been successful in accessing the credit card records and other personal information of millions of individuals. Cyber security remains an important financial concern for business firms and public entities because of data breaches and malware. Chapter 25 provides an updated treatment of cyber property insurance. Chapter 26 provides an updated treatment of cyber liability insurance.

IDENTIFICATION AND TREATMENT OF MAJOR RISKS

A primary objective of the text is to identify major risks in our economy and the various techniques for treating risk. Since the last edition of the text appeared, several tragedies have occurred that vividly show the deadly presence of risk in our society. In August 2017, Hurricane Harvey caused $125 billion in damage, record rainfall and catastrophic flooding in Texas and Louisiana, and 107 confirmed deaths. Harvey was the second most-costly hurricane in the United States since 1900. Shortly thereafter, in October 2017, a deranged gunman rained gunfire on people attending an outdoor concert across the street from the Mandalay Bay Resort and Casino in Las Vegas, Nevada, killing 58 people and wounding and injuring more than 800 people from gunfire and panic.

In addition to catastrophic tragedies at the national level, the media routinely report events that clearly show the destructive presence of risk at the local level. Examples abound. An employee in a liquor store is shot and killed by a customer seeking cash and alcohol; a house fire leaves a family homeless; a tornado destroys a large part of a small town; a drunk driver fails to stop at a red light and smashes into another motorist; a plant explosion kills two people and injures several employees; and a blinding snowstorm and ice-packed interstate highway cause a chain-like accident and collision damage to 10 cars. As a result, victims and families experience catastrophic financial losses, intense emotional pain and suffering, serious physical and mental injuries, and often death. To say that we live in a risky and very dangerous environment is an enormous understatement.

OVERVIEW OF THE 14TH EDITION

The 14th edition of this text discusses the aforementioned risks and other insurance issues, as well. The text is designed for a beginning undergraduate course in risk management and insurance with no prerequisites. Topics discussed include basic principles in risk management and insurance, introductory and advanced topics in traditional risk management, newer enterprise risk management concepts, functional and financial operations of insurers, legal principles, life and health insurance, property and liability insurance, employee benefits, Social Security, and social insurance programs. In addition, the 14th edition is a user-friendly text for students who can apply basic concepts immediately to their own personal risk management and insurance programs.

SOLVING TEACHING AND LEARNING CHALLENGES

By its very nature, the introductory course in risk management and insurance involves the teaching of highly complex technical concepts that can present certain teaching and learning challenges to both professors and students. To deal with technical problems and complexity, the authors have designed the text to reflect a basic principle in education—*repetition is the*

mother of learning. The 14th edition reflects this important principle in the following ways:

LEARNING OBJECTIVES

After studying this chapter, you should be able to

1.1 Explain the historical definition of risk.

1.2 Explain the meaning of loss exposure.

1.3 Understand the following types of risk:
- Pure risk
- Speculative risk
- Diversifiable risk
- Nondiversifiable risk
- Enterprise risk
- Systemic risk

1.4 Identify the major pure risks that are associated with great economic insecurity.

1.5 Show how risk is a burden to society.

1.6 Explain the major techniques for managing risk.

- *Learning objectives*. Each chapter has specific learning objectives, which give students an overview of the subject matter and list the important concepts students are expected to know.

- *Chapter discussion*. Each chapter presents text material designed to give students the knowledge needed to attain the learning objectives specified at the beginning of the chapter. Important material is often presented in italics for emphasis.

Katerina, age 24, is a finance major at a large university. The placement director for the university has an annual job fair where recruiters from different business firms interview students for possible employment. Katerina signed up for an interview with a large multi-line insurance company to learn about job opportunities. The recruiter explained that job openings exist in several areas, and that the company hires new employees with a wide variety of educational backgrounds. Katerina is surprised to learn of the wide range of jobs in the insurance industry. The company has career openings in underwriting, sales, claims, actuarial, finance, information systems, accounting, legal, engineering, medicine, and in other areas as well.

SUMMARY

- There are several basic types of insurers:
  - Stock insurers
  - Mutual insurers
  - Lloyd's
  - Reciprocal exchange
  - Blue Cross and Blue Shield Plans
  - Health maintenance organizations (HMOs)
  - Captive insurers
  - Savings bank life insurance
- An *agent* is someone who legally represents the insurer and has the authority to act on the insurer's behalf. In contrast, a *broker* is someone who legally represents the insured.

- *Chapter summary*. Each chapter ends with a summary of the major concepts students should know so that the learning objectives listed at the beginning of the chapter can be attained.

- *Key concepts and terms*. Risk management and insurance has its own unique vocabulary and set of key concepts and terms. Instructors should inform students that these terms are clearly defined and easily accessible in the Glossary at the end of the text. If students do not understand the basic vocabulary, they will perform poorly.

KEY CONCEPTS AND TERMS

Advance premium mutual (117)
Agent (122)
Assessment mutual (117)
Broker (122)
Captive agent (125)
Captive insurer (121)
Career agents (125)
Demutualization (118)
Direct response system (128)
Direct writer (127)
Exclusive agency system (127)
Fraternal insurers (117)
Holding company (119)
Independent agency system (127)
Interinsurance exchange (120)
Lloyd's (119)
Managed care plans (121)
Managing general agent (MGA) (124)
Mass merchandising (128)

REVIEW QUESTIONS

1. a. What is the definition of insurance?
   b. From the definition, identify four basic characteristics of insurance.
2. Explain the law of large numbers.
3. Pure risks ideally should have certain characteristics to be insurable by private insurers. List the six characteristics of an ideally insurable risk.
4. Explain the term social insurance.
5. Give at least four examples of fraudulent claims.
6. a. What is the meaning of adverse selection?
   b. Identify some methods that insurers use to control for adverse selection.
7. a. Explain how insurance can provide benefits to the community.
   b. Explain how insurance can be costly to society.

- *Review questions*. The answers to review questions at the end of each chapter enable students to answer the learning objectives listed at the beginning of each chapter.

- *Application questions*. These questions are a continuation of the review questions but at a higher level. The application questions enable students to develop their analytical skills by having them apply the principles and concepts discussed in the chapter to specific risk management and insurance problems.

APPLICATION QUESTIONS

1. A group of investors are discussing the formation of a new property and liability insurer. The proposed company would market a new homeowners policy that combines traditional homeowner coverages with unemployment benefits if the policyholder becomes involuntarily unemployed. Each investor would contribute at least $100,000 and would receive a proportionate interest in the company. In addition, the company would raise additional capital by selling ownership rights to other investors. Management wants to avoid the expense of hiring and training agents to sell the new policy and wants to sell the insurance directly to the public by selective advertising in personal finance magazines.
   a. Identify the type of insurance company that best fits the preceding description.

- *Insights*. Each chapter has one or more Insights, which are short articles designed to give a practical application of the principle or concept discussed in the chapter.

INSIGHT 6.1

Home Owner's Failure to Cooperate Yields Denied Claim

A federal court in Ohio ruled that a home owner's claim stemming from a house fire could be denied after the insured failed to cooperate with his insurer's investigation. The court also ruled that misrepresentations on the home owner's insurance application voided the policy. The case is *Joseph v. State Farm Fire & Cas. Co.,* 2013 U.S. Dist. LEXIS 24511 (Feb. 22, 2013).

In March 2009, Namon Joseph applied for and was issued a homeowners policy with State Farm covering a residence in Sunbury, Ohio. In August 2010, a fire destroyed the residence, after which Joseph submitted a claim. Suspecting arson based on evidence that an accelerant was used to start the fire, State Farm investigated. It began inquiring into Joseph's financial condition and requested him to provide a number of financial records including tax returns. Joseph failed to provide the requested financial documentation. State Farm eventually discovered that, at the time of the fire, Joseph owed the IRS $391,000 in back taxes. The insurer ultimately concluded that the house fire was the result of arson and that Joseph had a financial motive to start the fire. State Farm denied the claim due to Joseph's lack of cooperation in the investigation.

State Farm also took a further look at Joseph's insurance policy application and discovered numerous misrepresentations including false statements that Joseph had no prior claim history and that Joseph failed to disclose that a previous insurer had cancelled his policy. Based on these and other misrepresentations, State Farm cancelled the policy.

Joseph sued State Farm, alleging breach of contract and bad faith. The court, however, ruled in favor of State Farm, explaining that State Farm was justified in denying the claim based on Joseph's lack of cooperation. An insured is required to cooperate with an insurer in its investigation of a loss as a condition precedent to coverage. Joseph's failure to cooperate was a breach of the policy on his part, thereby precluding coverage for the loss. Likewise, the court agreed that State Farm was justified in voiding the policy based on Joseph's material misrepresentations on his insurance application.

SOURCE: Case of the month, "Home Owner's Failure to Cooperate Yields Denied Claim," IRMI, *Personal Lines Pilot*, Issue 116, March 15, 2013. International Risk Management Institute, Inc.

DEVELOPING EMPLOYABILITY SKILLS

A new objective for the 14th edition is to design a text that will increase the employability skills of students who are taking a course in risk management and insurance. Projections indicate that some 400,000 positions in the insurance industry will become available in the next four years. These positions include underwriting, claims, actuarial science, information technology, enterprise risk management that treats both pure risk and speculative risk, loss prevention, investments, law and legal contracts, and numerous other functional areas. Most insurers today encourage or require new employees to participate in specialized education programs that increase their employability skills or take courses that lead to professional designations such as Chartered Life Underwriter (CLU), Chartered Property Casualty Underwriter (CPCU), or Certified Financial Planner (CFP). The 14th edition of the text provides the basic educational foundation for many of these professional designations.

In addition, the principles discussed in the 14th edition are essential for success and promotion in the insurance industry and provide tremendous advantages to employees who understand them. As such, students taking the introductory course in risk management and insurance will have a major advantage over others who are applying for similar jobs in the insurance industry. Likewise, if students need to take a state licensing exam to sell insurance and other financial products, information in the 14th edition will give them a major educational advantage over others who do not have a similar background.

INSTRUCTOR RESOURCES

Several supplements are available to help busy instructors with a limited amount of time to prepare for class more efficiently and to have access to high-quality multiple choice questions for examinations. The available supplements are listed in the following table.

Supplements Available to Instructors at www.pearson-globaleditions.com	*Features of the Supplement*
Instructor's Manual	■ Teaching tips ■ Lecture outlines ■ Answer to Case application ■ Solutions to all review and application questions in the book
Test Bank	1350 multiple choice questions with these annotations: ■ Difficulty level (1 for straight recall, 2 for some analysis, 3 for complex analysis) ■ Learning Objective ■ AACSB learning standard (Written and Oral Communication; Ethical Understanding and Reasoning; Analytical Thinking; Information Technology; Interpersonal Relations and Teamwork; Diverse and Multicultural Work; Reflective Thinking; Application of Knowledge)

Supplements Available to Instructors at www.pearson-globaleditions.com	*Features of the Supplement*
Computerized TestGen	TestGen allows instructors to: ■ Customize, save, and generate classroom tests ■ Edit, add, or delete questions from the Test Item Files ■ Analyze test results ■ Organize a database of tests and student results
PowerPoints	Slides include all the tables and equations in the textbook. PowerPoints meet accessibility standards for students with disabilities. Features include, but are not limited to: ■ Keyboard and screen reader access ■ Alternative text for images ■ High color contrast between background and foreground colors

STUDENT SUPPLEMENTS AVAILABLE

To enhance student performance and higher class achievement levels, the text also makes available several supplements that can upgrade the overall learning experience of students. The following supplements enable students to understand more easily some difficult technical concepts in risk management and insurance.

Supplements Available to Students at www.pearsonglobaleditions.com	*Features of the Supplement*
Multiple-Choice Practice Quizzes	10 Question practice quizzes for each chapter
Internet Exercises	Available for all chapters
Problem Set	For Chapter 4

EMPLOYABILITY

INSIGHT 1.2

Careers in Risk Management and Insurance

Positions in Risk Management and Insurance. Rarely has there been a time when it was so advantageous to consider a career in risk management and insurance. Projections indicate that some 400,000 positions will be open in the next four years.[1] The breadth of knowledge and skills required for these positions has never been greater or the opportunities more lucrative. Try to think of an industry with a wider range of employment opportunities. You are probably familiar with sales and claims. These areas interact with the public, such as sales to place the coverage with insurance purchasers, and payment of claims when a loss occurs. However, insurance offers many other careers as well. Underwriters review the applications solicited by agents to determine whether the insurer should accept the applicant. Actuaries price the coverages that agents are selling. Loss control specialists focus on reducing losses and potential claims. Lawyers review policy forms. Accountants prepare financial statements using one or more accounting systems. Financial specialists determine the appropriate mix of financial assets that back an insurance company's liabilities. Information technology is also crucial for insurers, considering the large volume of data that insurers must manage. All of these functional areas must work together for an insurer to be successful. These areas are discussed in greater detail in Chapter 6.

Importance of Risk Management and Insurance. Whatever your specialty is and wherever you plan to work, experts agree that understanding the principles of risk management and insurance is important. Insurance is a challenging field, and considerable technical knowledge is required for employees who want to rise to top levels. To be effective in risk management and insurance means you must be able to think logically and apply important principles from law, finance, economics, mathematics, and decision making to problems you will encounter on a daily basis. As a result, insurance companies today require ongoing professional development for their employees as they enter the company and move up through the ranks. Most insurers today encourage their employees to participate in industry-specific education programs such as Chartered Life Underwriter (CLU), Chartered Property Casualty Underwriter (CPCU), Fellow, Life Management Institute (FLMI),

(*Continued*)

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The views expressed in the text are those solely of the authors and do not necessarily reflect the viewpoints or positions of the reviewers whose assistance we gratefully acknowledge.

Finally, the fundamental objective underlying the 14th edition remains the same as in the first edition: We have attempted to write an intellectually stimulating and visually attractive textbook from which students can learn and professors can teach.

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CHAPTER 1

Risk and Its Treatment

"When we take a risk, we are betting on an outcome that will result from a decision we have made, though we do not know for certain what the outcome will be."

Peter L. Bernstein
Against the Gods: The Remarkable Story of Risk

Learning Objectives

After studying this chapter, you should be able to

1.1 Explain the historical definition of risk.

1.2 Explain the meaning of loss exposure.

1.3 Understand the following types of risk:

- Pure risk
- Speculative risk
- Diversifiable risk
- Nondiversifiable risk
- Enterprise risk
- Systemic risk

1.4 Identify the major pure risks that are associated with great economic insecurity.

1.5 Show how risk is a burden to society.

1.6 Explain the major techniques for managing risk.

Ashley, age 25, works as a waitress in a small restaurant in Omaha, Nebraska. After the restaurant closed one evening, she drove home in a blinding rainstorm. A driver failed to stop at a red-light and smashed head-on into Ashley's car and was instantly killed. Ashley survived but was unable to work for six months. During that time, she incurred medical bills in excess of $200,000 and lost about $20,000 in tips and wages. The restaurant did not provide any health or disability income insurance. As a result of the accident, Ashley was forced to declare bankruptcy.

Ashley's tragic accident shows we live in a dangerous and risky world. Newspapers report similar tragedies on a daily basis. Terrorists and suicide bombers kill or severely injure thousands of bystanders throughout the world. An individual with mental problems drives his car into a group of people leaving a church service, killing five and injuring 10 others. Homeowners lose their homes and personal property by fires, hurricanes, tornadoes, earthquakes, mudslides, brush fires, or other natural disasters. A tornado touches down and destroys a large part of a small town, and an executive is found guilty of defrauding his company of several millions of dollars.

In addition, people often experience personal tragedies and financial setbacks that seldom make headlines but nevertheless cause great economic insecurity—the unexpected death of a family head and loss of earnings; catastrophic medical bills that wipe out a family's savings; the loss of a good-paying job and long-term unemployment during a severe business recession; total disability from sickness or an accident that results in a significant loss of income; and a sizable liability judgment because of a negligent act.

This chapter discusses the nature and treatment of risk in our society. Topics discussed include the meaning of risk, the major types of personal risks that affect individuals and families, major commercial risks that affect business firms, the burden of risk on society, and the major methods for managing risk.

DEFINITIONS OF RISK

There is no single definition of *risk*. Economists, behavioral scientists, risk theorists, statisticians, actuaries, and historians each have their own concept of risk.

Traditional Definition of Risk

Risk traditionally has been defined in terms of uncertainty. Based on this concept, **risk** *is defined as uncertainty concerning the occurrence of a loss*. For example, the risk of being killed in an auto accident is present because uncertainty is present. The risk of lung cancer for smokers is present because uncertainty is present. The risk of flunking a required college course is present because uncertainty is present.

Employees in the insurance industry often use the term *risk* in a different manner to identify the property or life that is being considered for insurance. For example, in the insurance industry, it is common to hear statements such as "That driver is a poor risk," or "That building is an unacceptable risk."

Risk Distinguished from Uncertainty

In the economics and finance literature, authors and actuaries often make a distinction between risk and uncertainty. According to the American Academy of Actuaries, the term *risk* is used in situations where the probabilities of possible outcomes are known or can be estimated with some degree of accuracy, whereas *uncertainty* is used in situations where such probabilities cannot be estimated.[1] For example, the probability of dying at each attained age can be estimated with considerable accuracy. In contrast, the probability of destruction of your home by a meteorite from outer space is only a guess and generally cannot be accurately estimated. As such, many authors have developed their own concept of risk, and numerous definitions of risk exist in the professional literature.[2]

Loss Exposure

Because *risk* is an ambiguous term and has different meanings, many authors and corporate risk managers use the term *loss exposure* to identify potential losses. *A* **loss exposure** *is any situation or circumstance in which a loss is possible, regardless of whether a loss actually occurs*. Examples of loss exposures include manufacturing plants that may be damaged by an earthquake or flood, defective products that may result in lawsuits against the manufacturer, possible theft of company property because of inadequate security, and potential injury to employees because of unsafe working conditions.

Finally, when the definition of risk includes the concept of uncertainty, some authors make a careful distinction between objective risk and subjective risk.

Objective Risk

Objective risk (also called *degree of risk*) *is defined as the relative variation of actual loss from expected loss*. For example, assume that a property insurer has 10,000 houses insured over a long period and, on average, 1 percent, or 100 houses, burn each year. However, it would be rare for exactly 100 houses to burn each year. In some years, as few as 90 houses may burn; in other years, as many as 110 houses may burn. Thus, there is a variation of 10 houses from the expected number of 100, or a variation of 10 percent. This relative variation of actual loss from expected loss is known as objective risk.

Objective risk declines as the number of exposures increases. More specifically, *objective risk varies inversely with the square root of the number of cases under observation*. In our previous example, 10,000 houses were insured, and objective risk was 10/100, or 10 percent. Now assume that 1 million houses are insured. The expected number of houses that will burn is now 10,000, but the variation of actual loss from expected loss is only 100. Objective risk is now 100/10,000, or 1 percent. Thus, as the square root of the number of houses increased from 100 in the first example to 1,000 in the second example (10 times), objective risk declined to one-tenth of its former level.

Objective risk can be statistically calculated by some measure of dispersion, such as the standard deviation or the coefficient of variation. Because objective risk can be measured, it is an extremely useful concept for an insurer or a corporate risk manager. As the number of exposures increases, an insurer can predict its future loss experience more accurately because it can rely on the law of large numbers. The **law of large numbers** *states that as the number of exposure units increases, the more closely the actual loss experience will approach the expected loss experience*. For example, as the number of homes under observation increases, the greater is the degree of accuracy in predicting the proportion of homes that will burn. The law of large numbers is discussed in greater detail in Chapter 2.

Subjective Risk (Perceived Risk)

Subjective risk (perceived risk) *is defined as uncertainty based on a person's mental condition or state of mind*. Another name for subjective risk is *perceived risk*; some authors use the term in their discussion of the perception of risk by individuals. For example, assume that a driver with several convictions for drunk driving is drinking heavily in a neighborhood bar and foolishly attempts to drive home. The driver may be uncertain whether he will arrive home safely without being arrested by the police for drunk driving. This mental uncertainty or perception is called subjective risk.

The impact of subjective risk varies depending on the individual. Two persons in the same situation can have a different perception of risk, and their behavior may be altered accordingly. If an individual

experiences great mental uncertainty concerning the occurrence of a loss, that person's behavior may be affected. High subjective risk often results in conservative and prudent behavior, whereas low subjective risk may result in less conservative behavior. For example, assume that a motorist previously arrested for drunk driving is aware that he has consumed too much alcohol. The driver may then compensate for the mental uncertainty by getting someone else to drive the car home or by taking a cab. Another driver in the same situation may perceive the risk of being arrested as slight. This second driver might drive in a more careless and reckless manner; a low subjective risk results in less conservative driving behavior.

CHANCE OF LOSS

Chance of loss is closely related to the concept of risk. **Chance of loss** *is defined as the probability that an event will occur*. Like risk, *probability* has both objective and subjective aspects.

Objective Probability

Objective probability *refers to the long-run relative frequency of an event based on the assumptions of an infinite number of observations and of no change in the underlying conditions*. Objective probabilities can be determined in two ways. First, they can be determined by deductive reasoning. These probabilities are called *a priori probabilities*. For example, the probability of getting a head from the toss of a perfectly balanced coin is 1/2 because there are two sides, and only one is a head. Likewise, the probability of rolling a 6 with a single die is 1/6 since there are six sides, and only one side has six dots.

Second, objective probabilities can be determined by inductive reasoning rather than by deduction. For example, the probability that a person age 21 will die before age 26 cannot be logically deduced. However, by a careful analysis of past mortality experience, life insurers can estimate the probability of death and sell a five-year term life insurance policy issued at age 21.

Subjective Probability

Subjective probability *is the individual's personal estimate of the chance of loss*. Subjective probability need not coincide with objective probability. For example, people who buy a lottery ticket on their birthday may believe it is their lucky day and overestimate the small chance of winning. A wide variety of factors can influence subjective probability, including a person's age, gender, intelligence, education, and the use of alcohol or drugs.

In addition, a person's estimate of a loss may differ from objective probability because there may be ambiguity in the way in which the probability is perceived. For example, assume that a slot machine in a casino requires a display of three lemons to win. The person playing the machine may perceive the probability of winning to be quite high. But if there are 10 symbols on each reel and only one is a lemon, the objective probability of hitting the jackpot with three lemons is quite small. Assuming that each reel spins independently of the others, the probability that all three will simultaneously show a lemon is the product of their individual probabilities ($1/10 \times 1/10 \times 1/10 = 1/1{,}000$). This knowledge is advantageous to casino owners, who know that most gamblers are not trained statisticians and are therefore likely to overestimate the objective probabilities of winning.

Chance of Loss Versus Objective Risk

Chance of loss can be distinguished from objective risk. *Chance of loss* is the probability that an event that causes a loss will occur. *Objective risk* is the relative variation of actual loss from expected loss. *The chance of loss may be identical for two different groups, but objective risk may be quite different.* For example, assume that a property insurer has 10,000 homes insured in Los Angeles and 10,000 homes insured in Philadelphia, and that the chance of a fire in each city is 1 percent. Thus, on average, 100 homes should burn annually in each city. However, if the annual variation in losses ranges from 75 to 125 in Philadelphia, but only from 90 to 110 in Los Angeles, objective risk is greater in Philadelphia even though the chance of loss in both cities is the same.

PERIL AND HAZARD

The terms *peril* and *hazard* should not be confused with the concept of risk discussed earlier.

Peril

Peril *is defined as the cause of loss*. If your house burns because of a fire, the peril, or cause of loss, is the fire. If your car is damaged in a collision with another car, collision is the peril, or cause of loss. Common perils that cause loss to property include fire, lightning, windstorm, hail, tornado, earthquake, flood, burglary, and theft.

Hazard

A **hazard** *is a condition that creates or increases the frequency or severity of loss*. There are four major types of hazards:

- Physical hazard
- Moral hazard
- Attitudinal hazard (morale hazard)
- Legal hazard

Physical Hazard A **physical hazard** *is a physical condition that increases the frequency or severity of loss*. Examples of physical hazards include icy roads that increase the chance of an auto accident, defective wiring in a building that increases the chance of fire, and a defective lock on a door that increases the chance of theft.

Moral Hazard **Moral hazard** *is dishonesty or character defects in an individual that increase the frequency or severity of loss*. Examples of moral hazard in insurance include faking an accident to collect benefits from an insurer, submitting a fraudulent claim, inflating the amount of a claim, and intentionally burning unsold merchandise that is insured. Murdering the insured to collect the life insurance proceeds is another important example of moral hazard.

Moral hazard is present in all forms of insurance, and it is difficult to control. Dishonest individuals often rationalize their actions on the grounds that "the insurer has plenty of money." This view is incorrect because the insurer can pay claims only by collecting premiums from other insureds. Because of moral hazard, insurance premiums are higher for everyone.

Insurers attempt to control moral hazard by the careful underwriting of applicants for insurance and by various policy provisions, such as deductibles, waiting periods, exclusions, and riders. These provisions are examined in Chapter 10.

Attitudinal Hazard (Morale Hazard) **Attitudinal hazard** *is carelessness or indifference to a loss, which increases the frequency or severity of a loss*. Examples of attitudinal hazard include leaving car keys in an unlocked car, which increases the chance of theft; leaving a door unlocked, which allows a burglar to enter; and changing lanes suddenly on a congested expressway without signaling, which increases the chance of an accident. Careless acts like these increase the frequency and severity of loss.

The term *morale hazard* has the same meaning as attitudinal hazard. *Morale hazard* is a term that appeared in earlier editions of this text to describe someone who is careless or indifferent to a loss. However, the term *attitudinal hazard* is more widely used today and is less confusing to students and more descriptive of the concept being discussed.

Legal Hazard **Legal hazard** *refers to characteristics of the legal system or regulatory environment that increase the frequency or severity of losses*. Examples include adverse jury verdicts or large damage awards in liability lawsuits; statutes that require insurers to include coverage for certain benefits in health insurance plans, such as coverage for alcoholism; and regulatory action by state insurance departments that prevents insurers from withdrawing from a state because of poor underwriting results.

CLASSIFICATION OF RISK

Risk can be classified into several distinct classes. The most important include the following:

- Pure and speculative risk
- Diversifiable risk and nondiversifiable risk
- Enterprise risk
- Systemic risk

Pure Risk and Speculative Risk

Pure risk *is defined as a situation in which there are only the possibilities of loss or no loss*. The only possible outcomes are adverse (loss) and neutral (no loss). Examples of pure risks include premature death, job-related accidents, catastrophic medical

expenses, and damage to property from fire, lightning, flood, or earthquake.

In contrast, **speculative risk** *is defined as a situation in which either profit or loss is possible*. For example, if you purchase 100 shares of common stock, you would profit if the price of the stock increases but would lose if the price declines. Other examples of speculative risks include betting on a horse race, investing in real estate, and going into business for yourself. In these situations, both profit and loss are possible.

It is important to distinguish between pure and speculative risks for three reasons. First, private insurers generally concentrate on pure risks and do not emphasize the insurance of speculative risks. However, there are exceptions. Some insurers will insure institutional portfolio investments and municipal bonds against loss. Also, enterprise risk management (discussed later in this chapter) is another important exception where certain speculative risks can be insured.

Second, the law of large numbers can be applied more easily to pure risks than to speculative risks. The law of large numbers is important because it enables insurers to predict future loss experience. In contrast, it is generally more difficult to apply the law of large numbers to speculative risks to predict future loss experience. An important exception is the speculative risk of gambling, where casino operators can apply the law of large numbers in a most efficient manner.

Finally, society may benefit from a speculative risk even though a loss occurs, but is harmed if a pure risk is present and a loss occurs. For example, a firm may develop new technology for producing inexpensive computers. As a result, some competitors may be forced into bankruptcy. Despite the bankruptcy, society benefits because the computers are produced at a lower cost. However, society normally does not benefit when a loss from a pure risk occurs, such as a flood or earthquake that destroys a town or area.

Diversifiable Risk and Nondiversifiable Risk

Diversifiable risk *is a risk that affects only individuals or small groups and not the entire economy*. It is a risk that can be reduced or eliminated by diversification. For example, a diversified portfolio of stocks, bonds, and certificates of deposit (CDs) is less risky than a portfolio that is 100 percent invested in common stocks. Losses on one type of investment, say stocks, may be offset by gains from bonds and CDs. Likewise, there is less risk to a property and liability insurer if different lines of insurance are underwritten rather than only one line. Losses on one line can be offset by profits on other lines. Because diversifiable risk affects only specific individuals or small groups, it is also called *nonsystematic risk* or *particular risk*. Examples include car thefts, robberies, and dwelling fires. Only individuals and business firms that experience such losses are affected, not the entire economy.

In contrast, **nondiversifiable risk** *is a risk that affects the entire economy or large numbers of persons or groups within the economy*. It is a risk that cannot be eliminated or reduced by diversification. Examples include rapid inflation, cyclical unemployment, war, hurricanes, floods, and earthquakes because large numbers of individuals or groups are affected. Because nondiversifiable risk affects the entire economy or large numbers of persons in the economy, it is also called *fundamental risk*.

The distinction between a diversifiable and nondiversifiable (fundamental) risk is important because government assistance may be necessary to insure nondiversifiable risks. Social insurance and government insurance programs, as well as government guarantees or subsidies, may be necessary to insure certain nondiversifiable risks in the United States. For example, the risks of widespread unemployment and flood are difficult to insure privately because the characteristics of an ideal insurable risk (discussed in Chapter 2) are not easily met. As a result, state unemployment compensation programs are necessary to provide weekly income to workers who become involuntarily unemployed. Likewise, the federal flood insurance program makes property insurance available to individuals and business firms in flood zones.

Enterprise Risk

Enterprise risk *is a term that encompasses all major risks faced by a business firm. Such risks include pure risk, speculative risk, strategic risk, operational risk, and financial risk*. We have already explained the meaning of pure and speculative risk. **Strategic risk** refers to uncertainty regarding the firm's financial goals and objectives; for example, if a firm enters a new line of business, the line may be unprofitable. **Operational risk** results from the firm's business operations. For example, a bank that offers online banking

services may incur losses if "hackers" break into the bank's computer.

Enterprise risk also includes financial risk, which is becoming more important in a commercial risk management program. **Financial risk** *refers to the uncertainty of loss because of adverse changes in commodity prices, interest rates, foreign exchange rates, and the value of money*. For example, a food company that agrees to deliver cereal at a fixed price to a supermarket chain in six months may lose money if grain prices rise. A bank with a large portfolio of Treasury bonds may incur losses if interest rates rise. Likewise, an American corporation doing business in Japan may lose money when Japanese yen are exchanged for American dollars.

Enterprise risk is becoming more important in commercial risk management, which is a process that organizations use to identify and treat major and minor risks. In the evolution of commercial risk management, some risk managers are now considering all types of risk in one program. **Enterprise risk management** *combines into a single unified treatment program all major risks faced by the firm*. As explained earlier, these risks include pure risk, speculative risk, strategic risk, operational risk, and financial risk. By packaging major risks into a single program, the firm can offset one risk against another. As a result, overall risk can be reduced. As long as all risks are not perfectly correlated, the combination of risks can reduce the firm's overall risk. In particular, if some risks are negatively correlated, overall risk can be significantly reduced. Chapter 4 discusses enterprise risk management in greater detail.

Treatment of financial risks typically requires the use of complex hedging techniques, financial derivatives, futures contracts, options, and other financial instruments. Some firms appoint a chief risk officer (CRO), such as the treasurer, to manage the firm's financial risks. Chapter 4 discusses financial risk management in greater detail.

Systemic Risk

Systemic risk *is the risk of collapse of an entire system or entire market due to the failure of a single entity or group of entities that can result in the breakdown of the entire financial system*. For example, the severe 2008–2009 business recession in the United States was the second-worst economic downswing in U.S. history that was caused largely by systemic risk. The economy experienced a massive financial meltdown and a brutal stock market crash; the national unemployment rate soared to historically high levels; the housing market collapsed; more than 100 commercial banks and financial institutions failed or merged with other entities; commercial banks and some insurers sold complex derivatives that were largely unregulated and resulted in massive losses to investors; and state and federal regulation of the financial services industry, including insurance companies, proved inadequate and broken. Chapter 8 discusses in greater detail the economic impact of systemic risk on the insurance industry and government regulation of insurance.

MAJOR PERSONAL RISKS AND COMMERCIAL RISKS

The preceding discussion shows several ways of classifying risk. However, in this text, we emphasize primarily the identification and treatment of pure risk. Certain pure risks are associated with great economic insecurity for both individuals and families, as well as for commercial business firms. This section discusses (1) important personal risks that affect individuals and families and (2) major commercial risks that affect business firms.

Personal Risks

Personal risks *are risks that directly affect an individual or family*. They involve the possibility of the substantial loss or reduction of earned income, additional expenses, and the depletion of financial assets. Major personal risks that can cause great economic insecurity include the following:[3]

- Premature death
- Retirement risks
- Poor health
- Unemployment
- Alcohol and drug addiction

Premature Death **Premature death** *is the death of a family head with unfulfilled financial obligations*. These obligations include dependents to support, a mortgage to be paid off, children to educate, and credit cards or installment loans to be paid off. If the

surviving family members have insufficient replacement income or past savings to replace the lost income, they will be exposed to considerable economic insecurity.

Premature death can cause economic insecurity only if the deceased has dependents to support or dies with unsatisfied financial obligations. Thus, the death of a 7-year-old child is not "premature" in the economic sense, as small children generally are not working and contributing to the financial support of the family.

There are at least four costs that result from the premature death of a family head. First, the human life value of the family head is lost forever. The **human life value** *is defined as the present value of the family's share of the deceased breadwinner's future earnings*. This loss can be substantial; the actual or potential human life value of most college graduates can easily exceed $500,000. Second, additional expenses may be incurred because of funeral expenses, uninsured medical bills, probate and estate settlement costs, and estate and inheritance taxes for larger estates. Third, because of insufficient income, some families may have trouble making ends meet or covering expenses. Finally, certain noneconomic costs are also incurred, including emotional grief, loss of a role model, and counseling and guidance for the children.

Inadequate Retirement Income The major personal risk during retirement is inadequate income. The majority of workers in the United States retire before age 65. When they retire, they lose their earned income. Unless they have sufficient financial assets on which to draw or have access to other sources of retirement income—such as Social Security or a private pension, a 401(k) plan, or an individual retirement account (IRA)—their retirement income will be substantially lower. As a result, they will be exposed to considerable economic insecurity.

The majority of workers experience a substantial reduction in their money incomes when they retire, which can result in a reduced standard of living. *For example, according to the 2017 Current Population Survey, median income for a householder under age 65 was $66,487 in 2016. In contrast, median income for a householder age 65 and older was only $39,823, or 40 percent less.*[4] This amount generally is inadequate for many older retired workers with substantial additional expenses, such as high uninsured medical bills, catastrophic long-term care costs in a skilled nursing facility, high property taxes, or a substantial mortgage, or credit cards to be paid off.

Insufficient Savings and Financial Assets During the next 15 years, millions of American workers will retire. However, an alarming number will be financially unprepared for a comfortable retirement. According to a 2017 survey by the Employee Benefit Research Institute, the amounts saved for retirement by the majority of workers and retirees are relatively small. Retirees are individuals who are retired or who are age 65 or older and not employed full-time. *The 2017 survey found that 47 percent of the workers who responded to the survey reported household savings and investments of less than $25,000, which did not include their primary residence or any defined benefit pension plan. A disturbing percentage of this group includes workers (24 percent) who reported having less than $1,000 in savings. Likewise, 67 percent of workers without a retirement plan reported less than $1,000 in savings and investments. In addition, only 38 percent of the retirees reported savings and investments of $250,000 or more.*[5] In general, the amounts saved are relatively small and will not provide a comfortable retirement.

Aged Poverty Many retired people are living in poverty and are economically insecure. New poverty data show that aged poverty in old age is more severe than the official rate indicates. For 2016, the official poverty rate by the Census Bureau showed that only 9.3 percent of the people age 65 and over were counted as poor. However, the official figure does not include the value of food stamps, payroll taxes, the earned income tax credit, work-related expenses, medical costs, child-care expenses, and geographical differences. The Census Bureau has developed a supplemental poverty measure that includes these factors and shows that the poverty rate for the aged is significantly higher than is commonly believed. *The new measure showed that the poverty rate for individuals age 65 and older was 14.5 percent, or about 56 percent higher than the official rate.*[6]

Poor Health Poor health is another major personal risk that can cause great economic insecurity. The risk of poor health includes both the payment of catastrophic medical bills and the loss of earned income. The costs of hospitalization, major surgery, diagnostic tests, and prescription drugs have increased substantially in recent years. Today, an open-heart operation can cost more than $300,000; a kidney or heart transplant can cost more than $500,000; and the costs of

a crippling accident requiring several major operations, plastic surgery, and rehabilitation can exceed $600,000. In addition, long-term care in a nursing home can cost $100,000 or more each year. Expensive prescription drugs taken daily present additional financial problems to many people. Chapter 15 discusses in greater detail the economic problem of poor health and problems of the uninsured.

The loss of earned income is another major cause of economic insecurity if the disability is severe and lengthy. In cases of long-term disability, there is substantial loss of earned income; medical bills are incurred; employee benefits may be lost or reduced; and savings are reduced or depleted. There is also the additional cost of providing care to a disabled person who is confined to the home. Most workers seldom think about the financial consequences of long-term disability. The probability of becoming disabled before age 65 is much higher than is commonly believed, especially by the young. According to the Social Security Administration, a 20-year-old worker has a 1-in-4 chance of becoming disabled before reaching the full retirement age.[7] The financial impact of total disability on savings, assets, and the ability to earn an income can be severe. In particular, the loss of earned income during a lengthy disability can be financially devastating.

Students should know their chances of being unable to work because of sickness of injury and the estimated financial impact if they become disabled. Insight 1.1 provides a valuable disability income calculator by the Council of Disability Awareness (CDA) that shows the probability of becoming disabled and the financial impact of a long-term disability. The calculator provides a personal disability quotient, which shows the probability of becoming disabled and the estimated total financial loss if you cannot work for three months or longer. The results are based on your age, gender, occupation, anticipated retirement age, health status, and certain diseases. Check it out. You will be surprised at what you find.

Unemployment Unemployment is a major cause of economic insecurity in the United States. Unemployment can result from business cycle downswings, technological and structural changes in the economy, seasonal factors, imperfections in the labor market, and other causes as well.

INSIGHT 1.1

What Are Your Chances of Not Being Able to Earn an Income? Calculate Your Personal Disability Quotient

The Council of Disability Awareness has developed a valuable disability income calculator, which enables you to calculate your personal disability quotient (PDQ), which is a way to calculate your odds of an injury or illness that could force you to miss work for weeks, months, or even years. The calculator, which gives you an estimate of the total financial impact of a severe illness or injury over your working career, is based on a variety of actuarial data and assumptions to determine the estimated odds of disability.

The calculation of your PDQ requires you to answer several questions—age and gender, height and weight, health status, tobacco use, whether you work indoors or outside, and whether you have been treated for certain diseases. In addition, you are asked your current income amount, expected rate of salary increases, and anticipated retirement age. It is a simple calculator to use, and you can calculate your PDQ in minutes.

Example: Thomas is age 25, 5 feet, 10 inches tall, weighs 170 pounds, and does indoor office work. He does not use tobacco, believes his health is average, and has not been treated for certain diseases, such as cancer or heart disease. He earns $30,000 annually, expects salary increases of 3 percent annually, and plans to retire at age 67. If Thomas becomes totally disabled at age 25, what is his PDQ?

- Based on Thomas's input, his PDQ is 13 percent, which reflects his own chance of becoming ill or injured and unable to work for three months or longer.
- If Thomas becomes disabled for three months, his chance of the disability lasting five years or longer is 32 percent.
- The average length of disability for someone like Thomas is 74 months.
- If Thomas can no longer earn an income, the loss of his earnings potential over the rest of his career is $2,460,696. This figure is a rough calculation based on his current income, expected rate of salary increases, and number of years until retirement.

SOURCE: Calculated from the PDQ calculator, Council for Disability Awareness at http://disabilitycanhappen.org/pdq-2/

Economists generally believe the economy is at full employment when the unemployment rate is between 4 and 5 percent. In October 2017, the total unemployment rate for the United States was 4.1 percent, which indicates full employment.[8] However, totals conceal as much as they reveal. The true unemployment rate is understated because the official rate does not count certain groups as unemployed. These groups include workers who drop out the labor force because they are discouraged, workers forced into part-time employment because of economic conditions, and workers with a marginal attachment to the labor force. The Bureau of Labor Statistics has developed six alternative measures that includes these factors. When a broader measurement of unemployment is used, the unemployment rate is 7.9 percent.[9] *Stated differently, at the time of writing, about one in 13 workers in the United States is either unemployed or underemployed*. As a result, millions of unemployed workers are currently experiencing serious problems of economic insecurity because of unemployment or underemployment.

Extended unemployment can cause economic insecurity in at least four ways. First, workers lose their earned income and employer-sponsored employee benefits. Unless there is sufficient replacement income or substantial past savings on which to draw, unemployed workers will be exposed to economic insecurity. Second, as stated earlier, hours of work may be cut, thereby reducing employees' hours to only part-time. The reduced income may be insufficient in terms of the workers' needs. Third, the problem of long-term unemployment must also be considered. *In October 2017, those jobless for 27 weeks or longer accounted for about 25 percent of the unemployed in the United States*.[10] The majority of long-term unemployed workers have limited savings. If the duration of unemployment extends over a long period, many unemployed workers exhaust their past savings and unemployment benefits, and economic insecurity is increased.

Finally, because of complex laws and tighter eligibility requirements, state unemployment insurance programs have significant limitations and defects, which have increased the financial burden on unemployed workers. Not all unemployed workers receive unemployment insurance benefits; a relatively high percentage of claimants exhaust their unemployment benefits during business recessions and are still unemployed; and many state programs are inadequately financed. These issues are discussed in greater detail in Chapter 18.

Alcohol and Drug Addiction Addiction to alcohol or drugs is a serious national problem and is an important cause of economic insecurity. The statistics on substance abuse are alarming. According to the National Council on Alcoholism and Drug Dependence (NCADD), 17.6 million people, or one in every 12 adults, suffers from alcohol abuse or dependence; millions of people engage in risky binge drinking that may result in alcohol problems; more than half of all adults have a family history of alcoholism or drinking problem; more than 7 million children reside in households where at least one parent is dependent on alcohol or has abused alcohol; and there are 88,000 deaths annually from alcohol-related diseases.[11] Alcoholism can cause serious health problems and is an important casual factor in domestic violence, auto accidents, homicides, divorce, child abuse, and crime.

In addition, illicit drug usage is rampant in the United States. According to the National Survey on Drug Use and Health (NSDUH), an estimated 20 million Americans ages 12 or older used an illicit drug in the past 30 days, which represents 8 percent of the population ages 12 or older. The illicit drugs include marijuana, cocaine, crack, hallucinogens, heroin, and prescription drugs without a prescription.[12]

Supporting a serious drug habit can cost thousands of dollars weekly, and addicts pay the high price of major health problems, dysfunctional families, loss of jobs and career opportunities, and incarceration in jail and prison.

Addiction to alcohol or drugs can cause severe economic insecurity to individuals in at least five ways: (1) loss or reduction of earned income to the family; (2) serious health problems from excessive drinking or habitual drug use; (3) loss of a job or inability to work at a steady job; (4) an increase in dysfunctional or broken families; and (5) an increase in crime and overall deterioration in the quality of life in many neighborhoods.

Property Risks

Persons owning property are exposed to **property risks**—the risk of having property damaged or destroyed from numerous causes. Homes and other