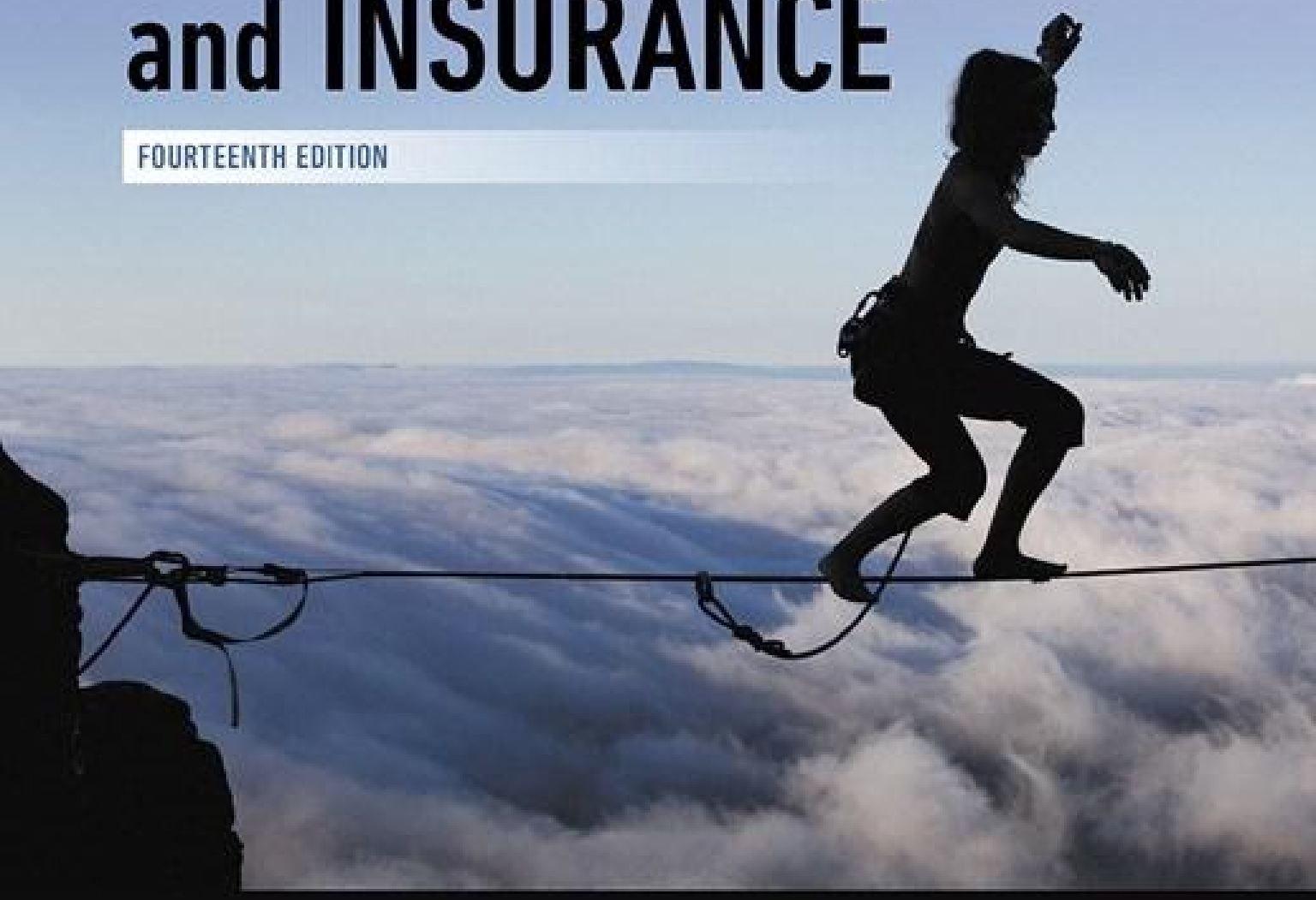
Principles of RISK MANAGEMENT and INSURANCE

FOURTEENTH EDITION



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George E. Rejda
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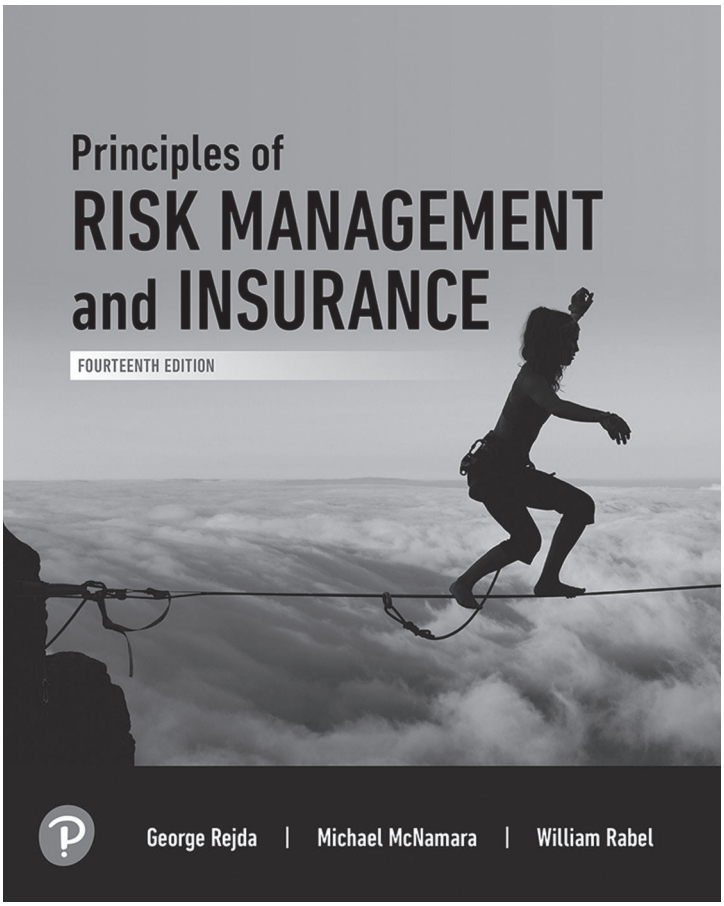

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PREFACE

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 (97)
Agent (102)
Assessment mutual (97)
Broker (102)
Captive agent (105)
Captive insurer (101)
Career agents (105)
Demutualization (98)
Direct response system (108)
Direct writer (107)
Exclusive agency system (107)
Fraternal insurers (97)
Holding company (99)
Independent agency system (107)
Interinsurance exchange (100)
Lloyd's (99)
Managed care plans (101)
Managing general agent (MGA) (104)
Mass merchandising (108)

REVIEW QUESTIONS

1. Explain each of the following characteristics of a typical insurance plan.
   a. Pooling of losses
   b. Payment of fortuitous losses
   c. Risk transfer
   d. Indemnification
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. Identify the approaches that insurers can use to deal with the problem of catastrophic loss exposures.
5. Why are most market risks, financial risks, production risks, and political risks considered difficult to insure by private insurers?

- *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.pearsonhighered.com/author	*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.pearsonhighered.com/author	*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.pearsonhighered.com/author	*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

real estate and personal property can be damaged or destroyed because of fire, lightning, tornado, windstorm, theft, and numerous other causes. There are two major types of loss associated with the destruction or theft of property: direct loss and indirect or consequential loss.

Direct Loss A **direct loss** *is defined as a financial loss that results from the physical damage, destruction, or theft of the property*. For example, if you own a home that is damaged or destroyed by a fire, the physical damage to the home is a direct loss.

Indirect or Consequential Loss *An* **indirect loss** *is a financial loss that results indirectly from the occurrence of a direct physical damage or theft loss*. For example, as a result of the fire to your home, you may incur additional living expenses to maintain your normal standard of living. You may have to get a motel room or rent an apartment while the home is being repaired. You may have to eat some or all of your meals at local restaurants. You may also lose rental income if a room is rented and the house is not habitable. These additional expenses that resulted from the fire would be a **consequential loss**.

Liability Risks

Liability risks are another important type of pure risk that most persons face. Under the U.S. legal system, you can be held legally liable if you do something that results in bodily injury or property damage to someone else. A court of law may order you to pay substantial damages to the person you have injured.

The United States is a litigious society, and lawsuits are common. Motorists can be held legally liable for the negligent operation of their vehicles; homeowners may be legally liable for unsafe conditions on the premises where someone is injured; dog owners can be held liable if their dog bites someone; operators of boats can be held legally liable because of bodily injury to boat occupants, swimmers, and water skiers. Likewise, if you are a physician, attorney, accountant, or other professional, you can be sued by patients and clients because of alleged acts of malpractice. Finally, business firms can be sued for defective products or services that result in bodily injury, property damage, and other harm to users of the product or service.

Liability risks are of great importance for several reasons. *First, there is no maximum upper limit with respect to the amount of the loss*. You can be sued for any amount. In contrast, if you own property, there is a maximum limit on the loss. For example, if your car has an actual cash value of $25,000, the maximum physical damage loss is $25,000. But if you are negligent and cause an accident that results in serious bodily injury to the other driver, you can be sued for any amount—$50,000, $500,000, $1 million, or more—by the person or party you have injured.

Second, a lien can be placed on your income and financial assets to satisfy a legal judgment. For example, assume that you injure someone, and a court of law orders you to pay damages to the injured party. If you cannot pay the judgment, a lien may be placed on your income and financial assets to satisfy the judgment. If you declare bankruptcy to avoid payment of the judgment, your credit rating will be impaired.

Finally, legal defense costs can be enormous. If you have no liability insurance, the cost of hiring an attorney to defend you can be staggering. If the suit goes to trial, attorney fees and other legal expenses can be substantial.

Commercial Risks

Business firms also face a wide variety of pure risks that can financially cripple or bankrupt the firm if a loss occurs. These risks include (1) property risks, (2) liability risks, (3) loss of business income, (4) cybersecurity and identity theft, and (5) other risks.

Property Risks Business firms own valuable business property that can be damaged or destroyed by numerous perils, including fires, windstorms, tornadoes, hurricanes, earthquakes, and other perils. Business property includes plants and other buildings; furniture, office equipment, and supplies; computers, computer software, and data; inventories of raw materials and finished products; company cars, boats, and planes; and machinery and mobile equipment. The firm also has accounts receivable records and may have other valuable business records that could be damaged or destroyed and expensive to replace.

Liability Risks Business firms often operate in highly competitive markets where lawsuits for bodily injury and property damage are common. The

lawsuits range from small nuisance claims to multimillion-dollar demands. Firms are sued for numerous reasons, including defective products that harm or injure others, pollution of the environment, damage to the property of others, injuries to customers, discrimination against employees and sexual harassment, violation of copyrights and intellectual property, and numerous other reasons. In addition, directors and officers may be sued by stockholders and other parties because of financial losses and mismanagement of the company. Finally, commercial banks, other financial institutions, and other business firms are exposed to enormous potential liability because of cyber security and identify theft crimes that have occurred in recent years.

Loss of Business Income Another important risk is the potential loss of business income when a covered physical damage loss occurs. The firm may be shut down for several months because of a physical damage loss to business property due to a fire, tornado, hurricane, earthquake, or another peril. During the shutdown period, the firm would lose business income, which includes the loss of profits, the loss of rents if business property is rented to others, and the loss of local markets.

In addition, during the shutdown period, certain expenses may still continue, such as rent, utilities, leases, interest, taxes, some salaries, insurance premiums, and other overhead costs. Fixed costs and continuing expenses that are not offset by revenues can be sizeable if the shutdown period is lengthy.

Finally, the firm may incur extra expenses during the period of restoration that would not have been incurred if the loss had not taken place. Examples include the cost of relocating temporarily to another location, increased rent at another location, and the rental of substitute equipment.

Cybersecurity and Identity Theft Cybersecurity and identity theft by thieves breaking into a firm's computer system and database are major problems for many firms today. Computer hackers have been able to steal hundreds of thousands of consumers credit records, which have exposed individuals to identity theft and violation of privacy. As a result, commercial banks, financial institutions, and other business firms are exposed to enormous legal liabilities. Other crime exposures include robbery and burglary; shoplifting; employee theft and dishonesty; fraud and embezzlement; piracy and theft of intellectual property; and computer crimes.

Other Risks Business firms must cope with a wide variety of additional risks, summarized as follows:

- *Human resources exposures*. These include job-related injuries and disease of workers; death or disability of key employees; group life and health and retirement plan exposures; and violation of federal and state laws and regulations.
- *Foreign loss exposures*. These include acts of terrorism, political risks, kidnapping of key personnel, damage to foreign plants and property, and foreign currency risks.
- *Intangible property exposures*. These include damage to the market reputation and public image of the company, the loss of goodwill, and loss of intellectual property. For many companies, the value of intangible property is greater than the value of tangible property.
- *Government exposures*. Federal and state governments may pass laws and regulations that have a significant financial impact on the company. Examples include laws that increase safety standards, laws that require reduction in plant emissions and contamination, and new laws to protect the environment that increase the cost of doing business.

BURDEN OF RISK ON SOCIETY

The presence of risk results in certain undesirable social and economic effects. Risk entails three major burdens on society:

- The size of an emergency fund must be increased.
- Society is deprived of certain goods and services.
- Worry and fear are present.

Larger Emergency Fund

It is prudent to set aside funds for an emergency. However, in the absence of insurance, individuals and business firms would have to increase substantially the size of their emergency fund to pay for unexpected losses. For example, assume you have purchased a $300,000 home and want to

accumulate a fund for repairs if the home is damaged by fire, hail, windstorm, or some other peril. Without insurance, you would have to save at least $50,000 annually to build up an adequate fund within a relatively short period of time. Even then, an early loss could occur, and your emergency fund may be insufficient to pay for the loss. If you are a middle- or low-income earner, you would find such saving difficult. In any event, the higher the amount that must be saved, the more current consumption spending must be reduced, which results in a lower standard of living.

Loss of Certain Goods and Services

A second burden of risk is that society is deprived of important goods and services. For example, because of the risk of a liability lawsuit, many corporations have discontinued manufacturing certain products. Numerous examples can be given. Some 250 companies in the world once manufactured childhood vaccines; today, only a small number of firms manufacture vaccines, due in part to the threat of liability suits. Other firms have discontinued the manufacture of specific products, including asbestos products, football helmets, silicone-gel breast implants, and certain birth-control devices, because of fear of legal liability.

In addition, as a result of the September 11, 2001, terrorist attacks, Congress feared that companies manufacturing anti-terrorism technologies (such as airport security devices) would not manufacture their products for fear of being sued if the technology failed. To deal with this risk, Congress included a provision in the Homeland Security Act of 2002, which limits the legal liability of companies that produce anti-terrorism technology. Without this provision, many anti-terrorism technologies would not be produced because the liability risk is too great.

Worry and Fear

The final burden of risk is that of worry and fear. Numerous examples illustrate the mental unrest and fear caused by risk. Parents may be fearful if a teenage son or daughter departs on a ski trip during a blinding snowstorm because the risk of being killed on an icy road is present. Some passengers in a commercial jet may become extremely nervous and fearful if the jet encounters severe turbulence during the flight. A college student who needs a grade of C in a course to graduate may enter the final examination room with a feeling of apprehension and fear.

TECHNIQUES FOR MANAGING RISK

Techniques for managing risk can be classified broadly as either risk control or risk financing. **Risk control** *refers to techniques that reduce the frequency or severity of losses*. **Risk financing** *refers to techniques that provide for the funding of losses*. Risk managers typically use a combination of techniques for treating each loss exposure.

Risk Control

Risk control is a generic term to describe techniques for reducing the frequency or severity of losses. Major risk-control techniques include the following:

- Avoidance
- Loss prevention
- Loss reduction
  - Duplication
  - Separation
  - Diversification

Avoidance **Avoidance** is one technique for managing risk. For example, you can avoid the risk of being mugged in a high-crime area by staying away from high-crime rate areas; you can avoid the risk of divorce by not marrying; and business firms can avoid the risk of being sued for a defective product by not producing the product.

Not all risks should be avoided, however. For example, you can avoid the risk of death or disability in a plane crash by refusing to fly. But is this choice practical or desirable? The alternatives—driving or taking a bus or train—often are not appealing. Although the risk of a plane crash is present, the safety record of commercial airlines is excellent, and flying is a reasonable risk to assume.

Loss Prevention **Loss prevention** is a technique that reduces the probability of loss so that the frequency of losses is reduced. Several examples of personal loss

prevention can be given. Auto accidents can be reduced if motorists take a safe-driving course and drive defensively. The number of heart attacks can be reduced if individuals control their weight, stop smoking, eat healthy diets, and follow an exercise program.

Loss prevention is also important for business firms. For example, strict security measures at airports and aboard commercial flights can reduce acts of terrorism; boiler explosions can be prevented by periodic inspections by safety engineers; occupational accidents can be reduced by the elimination of unsafe working conditions and by strong enforcement of safety rules; and fires can be prevented by forbidding workers to smoke in a building where highly flammable materials are used. In short, the goal of loss prevention is to reduce the probability that losses will occur.

Loss Reduction Strict loss prevention efforts can reduce the frequency of losses; however, some losses will inevitably occur. Thus, another objective of loss control is to reduce the severity of a loss after it occurs. For example, a department store can install a sprinkler system so that a fire will be promptly extinguished, thereby reducing the severity of loss; a plant can be constructed with fire-resistant materials to minimize fire damage; fire doors and fire walls can be used to prevent a fire from spreading; and a community warning system can reduce the number of injuries and deaths from an approaching tornado.

Duplication Losses can also be reduced by **duplication**. This technique refers to having back-ups or copies of important documents or property available in case a loss occurs. For example, back-up copies of key business records (e.g., accounts receivable) are available in case the original records are lost or destroyed.

Separation Another technique for reducing losses is **separation**. The assets exposed to loss are separated or divided to minimize the financial loss from a single event. For example, a manufacturer may store finished goods in two warehouses in different cities. If one warehouse is damaged or destroyed by a fire, tornado, or other peril, the finished goods in the other warehouse are unharmed.

Diversification Finally, losses can be reduced by **diversification**. This technique reduces the chance of loss by spreading the loss exposure across different parties. Risk is reduced if a manufacturer has a number of customers and suppliers. For example, if the entire customer base consists of only four domestic purchasers, sales will be impacted adversely by a domestic recession. However, if there are foreign customers and additional domestic customers as well, this risk is reduced. Similarly, the risk of relying on a single supplier can be minimized by having contracts with several suppliers.

From the viewpoint of society, loss control is highly desirable for two reasons. *First, the indirect costs of losses may be large, and in some instances, can easily exceed the direct costs*. For example, a worker may be injured on the job. In addition to being responsible for the worker's medical expenses and a certain percentage of earnings (direct costs), the firm may incur sizeable indirect costs: A machine may be damaged and must be repaired; the assembly line may have to be shut down; costs are incurred in training a new worker to replace the injured worker; and a contract may be canceled because goods are not shipped on time. By preventing the loss from occurring, both indirect costs and direct costs are reduced.

Second, the social costs of losses are reduced. For example, assume that the worker in the preceding example dies from the accident. Society is deprived forever of the goods and services the deceased worker could have produced. The worker's family loses its share of the worker's earnings and may experience considerable grief and economic insecurity. And the worker may personally experience great pain and suffering before dying. In short, these social costs can be reduced through an effective loss-control program.

Risk Financing

As stated earlier, risk financing refers to techniques that provide for the payment of losses after they occur. Major risk-financing techniques include the following:

- Retention
- Noninsurance transfers
- Insurance

Retention Retention is an important technique for managing risk. **Retention** means that an individual or a business firm retains part of all of the losses that can

result from a given risk. Risk retention can be active or passive.

- **Active Retention** *Active risk retention* means that an individual is consciously aware of the risk and deliberately plans to retain all or part of it. For example, a motorist may wish to retain the risk of a small collision loss by purchasing an auto insurance policy with a $500 or higher deductible. A homeowner may retain a small part of the risk of damage to the home by purchasing a homeowners policy with a substantial deductible. A business firm may deliberately retain the risk of petty thefts by employees, shoplifting, or the spoilage of perishable goods by purchasing a property insurance policy with a sizeable deductible. In these cases, a conscious decision is made to retain part or all of a given risk. Active risk retention is used for two major reasons. First, it can save money. Insurance may not be purchased, or it may be purchased with a deductible; either way, there is often substantial savings in the cost of insurance. Second, the risk may be deliberately retained because commercial insurance is either unavailable or unaffordable.
- **Passive Retention** Risk can also be retained passively. Certain risks may be unknowingly retained because of ignorance, indifference, laziness, or failure to identify an important risk. Passive retention is very dangerous if the risk retained has the potential for financial ruin. For example, many workers with earned incomes are not insured against the risk of total and permanent disability. However, the adverse financial consequences of total and permanent disability generally are more severe than the financial consequences of premature death. Therefore, people who are not insured against this risk are using the technique of risk retention in a most dangerous and inappropriate manner.

Self-Insurance Our discussion of retention would not be complete without a brief discussion of self-insurance. **Self-insurance** *is a special form of planned retention by which part or all of a given loss exposure is retained by the firm*. Another name for self-insurance is *self-funding*, which expresses more clearly the idea that losses are funded and paid for by the firm. For example, a large corporation may self-insure or fund part or all of the group health insurance benefits paid to employees.

Self-insurance is widely used in corporate risk management programs primarily to reduce both loss costs and expenses. There are other advantages as well. Self-insurance is discussed in greater detail in Chapter 3.

In summary, risk retention is an important technique for managing risk, especially in modern corporate risk management programs, which are discussed in Chapters 3 and 4. Risk retention, however, is appropriate primarily for high-frequency, low-severity risks where potential losses are relatively small. Except under unusual circumstances, risk retention should not be used to retain low-frequency, high-severity risks, such as the risk of catastrophic medical expenses, long-term disability, or legal liability.

Noninsurance Transfers **Noninsurance transfers** are another technique for managing risk. The risk is transferred to a party other than an insurance company. A risk can be transferred by several methods, including:

- Transfer of risk by contracts
- Hedging price risks
- Incorporation of a business firm

Transfer of Risk by Contracts Undesirable risks can be transferred by contracts. For example, the risk of a defective television or stereo set can be transferred to the retailer by purchasing a service contract, which makes the retailer responsible for all repairs after the warranty expires. The risk of a rent increase can be transferred to the landlord by a long-term lease. The risk of a price increase in construction costs can be transferred to the builder by having a guaranteed price in the contract.

Finally, a risk can be transferred by a **hold-harmless clause**. For example, if a manufacturer of scaffolds inserts a hold-harmless clause in a contract with a retailer, the retailer agrees to hold the manufacturer harmless in case a scaffold collapses and someone is injured.

Hedging Price Risks Hedging price risks is another example of risk transfer. **Hedging** *is a technique for transferring the risk of unfavorable price fluctuations to a speculator by purchasing and selling futures*

contracts on an organized exchange, such as the Chicago Board of Trade or New York Stock Exchange.

For example, the portfolio manager of a pension fund may hold a substantial position in long-term U.S. Treasury bonds. If interest rates rise, the value of the Treasury bonds will decline. To hedge that risk, the portfolio manager can sell Treasury bond futures. Assume that interest rates rise as expected, and bond prices decline. The value of the futures contract will also decline, which will enable the portfolio manager to make an offsetting purchase at a lower price. The profit obtained from closing out the futures position will partly or completely offset the decline in the market value of the Treasury bonds owned. Of course, interest rates do not always move as expected, so the hedge may not be perfect. Transaction costs also are incurred. However, by hedging, the portfolio manager has reduced the potential loss in bond prices if interest rates rise.

Incorporation of a Business Firm **Incorporation** is another example of risk transfer. If a firm is a sole proprietorship, the owner's personal assets can be attached by creditors for satisfaction of debts. If a firm incorporates, personal assets cannot be attached by creditors for payment of the firm's debts. In essence, by incorporation, the liability of the stockholders is limited, and the risk of the firm having insufficient assets to pay business debts is shifted to the creditors.

Insurance For most people, insurance is the most practical method for dealing with major risks. Although private insurance has several characteristics, three major characteristics should be emphasized. First, *risk transfer* is used because a pure risk is transferred to the insurer. Second, the *pooling technique* is used to spread the losses of the few over the entire group so that average loss is substituted for actual loss. Finally, the risk may be reduced by application of the *law of large numbers* by which an insurer can predict future loss experience with greater accuracy. These characteristics are discussed in greater detail in Chapter 2.

Finally, you may be interested in employment in the insurance industry when you graduate. Insight 1.2 discusses employment opportunities when you graduate.

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*)

[1]Insurance Careers Movement, *Insurance Careers Movement Enters Second Phase of Initiative to Empower Millennials as Future Industry Leaders*, March 31, 2016.

INSIGHT 1.2 *(Continued)*

Certified Financial Planner (CFP), and others. *Studies have consistently shown that employees with these professional designations earn substantially higher salaries than rank-and-file employees.* This text provides the basic foundation for many professional designations.

Advantages to Students. Students who study *Principles of Risk Management and Insurance* in a college or university have a major advantage in regard to acquiring knowledge that will enhance their careers. The principles taught in this text are essential for success in the insurance industry and provide tremendous advantages to employees who understand them. Principles discussed in this text explain not only what happens but why it happens so that when you join a company, you will know considerably more than others who do not have your skills and background. Furthermore, if you are taking a state licensing examination to sell insurance and other financial products, information in this text will give you a major advantage over others who do not have a similar background.

Personal Risk Management Program. Even if you never work professionally for an insurance company, the principles you learn in this text will enable you to develop a solid personal risk management program to deal effectively with and manage a wide variety of major risks in your personal life that create great economic insecurity and financial pain if a loss occurs. In addition, as you study this text, you will realize the following educational and practical benefits: (1) enhancement of critical thinking skills; (2) the ability to analyze complex problems and develop analytical skills that require the synthesis of financial and mathematical tools, higher order reasoning, and important technical information; (3) the development of business ethics and social responsibility; and (4) peace of mind that results from a sound personal risk management program based on the principles discussed in the text. These and other subjects will give you the keys to a successful career for a lifetime.

CASE APPLICATION

Michael is a college senior who is majoring in marketing. He owns a high-mileage 2005 Ford that has a current market value of $2,500. The current replacement value of his clothes, television, stereo, cell phone, and other personal property in a rented apartment totals $10,000. He uses disposable contact lenses, which cost $200 for a six-month supply. He also has a waterbed in his rented apartment that has leaked in the past. An avid runner, Michael runs five miles daily in a nearby public park that has the reputation of being extremely dangerous because of drug dealers, numerous assaults and muggings, and drive-by shootings. Michael's parents both work to help him pay his tuition.

For each of the following risks or loss exposures, identify an appropriate risk management technique that could have been used to deal with the exposure. Explain your answer.

a. Physical damage to the 2005 Ford because of a collision with another motorist
b. Liability lawsuit against Michael arising out of the negligent operation of his car
c. Total loss of clothes, television, stereo, and personal property because of a grease fire in the kitchen of his rented apartment
d. Disappearance of one contact lens
e. Waterbed leak that causes property damage to the apartment
f. Physical assault on Michael by gang members who are dealing drugs in the park where he runs
g. Loss of tuition assistance from Michael's father, who is killed by a drunk driver in an auto accident

SUMMARY

- There is no single definition of risk. *Risk* historically has been defined as uncertainty concerning the occurrence of a loss.
- A *loss exposure* is any situation or circumstance in which a loss is possible, regardless of whether a loss occurs. This term is often used as a substitute for "risk," which is an ambiguous term.
- *Objective risk* is the relative variation of actual loss from expected loss. *Subjective risk* is uncertainty based on an individual's mental condition or state of mind.
- *Chance of loss* is defined as the probability that an event will occur; it is not the same thing as risk.
- *Peril* is defined as the cause of loss. *Hazard* is any condition that creates or increases the chance of loss.

- There are four major types of hazards. *Physical hazard* is a physical condition that increases the frequency or severity of loss. *Moral hazard* is dishonesty or character defects in an individual that increase the chance of loss. *Attitudinal hazard (morale hazard)* is carelessness or indifference to a loss that increases the frequency or severity of loss. *Legal hazard* refers to characteristics of the legal system or regulatory environment that increase the frequency or severity of losses.
- A *pure risk* is a risk where there are only the possibilities of loss or no loss. A *speculative risk* is a risk where either profit or loss is possible.
- *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. In contrast, *nondiversifiable risk* is a risk that affects the entire economy or large numbers of persons or groups within the economy, such as inflation, war, or a business recession. It is a risk that cannot be eliminated or reduced by diversification.
- *Enterprise risk* is a term that encompasses all major risks faced by a business firm. *Enterprise risk management* combines into a single unified treatment program all major risks faced by the firm. Such risks include pure risk, speculative risk, strategic risk, operational risk, and financial risk.
- *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.
- *Systemic risk* is the risk of collapse of an entire system or entire market in which the failure of a single entity or group of entities can result in the breakdown of the entire financial system.
- The following types of *pure risk* can threaten an individual's economic security:
  - Personal risks
  - Property risks
  - Liability risks
- *Personal risks* are those risks that directly affect an individual. Major personal risks include the following:
  - Premature death of family head
  - Inadequate retirement income
  - Poor health
  - Unemployment
  - Alcohol and drug addiction
- A *direct loss* to property is a financial loss that results from the physical damage, destruction, or theft of the property.
- An *indirect, or consequential, loss* is a financial loss that results indirectly from the occurrence of direct physical damage or theft loss. Examples of indirect losses are the loss of use of the property, loss of profits, loss of rents, and extra expenses.
- *Liability risks* are extremely important because there is no maximum upper limit on the amount of the loss; a lien can be placed on income and assets to satisfy a legal judgment; and substantial court costs and attorney fees may also be incurred.
- Business firms face a wide variety of major risks that can financially cripple or bankrupt the firm if a loss occurs. These risks include property risks, liability risks, loss of business income, crime risks, and certain other risks.
- *Risk* entails three major burdens on society:
  - The size of an emergency fund must be increased.
  - Society is deprived of needed goods and services.
  - Worry and fear are present.
- *Risk control* refers to techniques that reduce the frequency or severity of losses. Major risk-control techniques include avoidance, loss prevention, loss reduction, duplication, separation, and diversification.
- *Risk financing* refers to techniques that provide for the funding of losses after they occur. Major risk-financing techniques include retention, noninsurance transfers, and insurance.

KEY CONCEPTS AND TERMS

Attitudinal hazard (5)
Avoidance (13)
Chance of loss (4)
Consequential loss (11)
Direct loss (11)
Diversification (14)
Duplication (14)
Diversifiable risk (6)
Enterprise risk (6)
Enterprise risk management (7)

Financial risk (7)
Hazard (5)
Hedging (15)
Hold-harmless clause (15)
Human life value (8)
Incorporation (16)
Indirect loss (11)
Law of large numbers (3)
Legal hazard (5)
Liability risks (11)
Loss exposure (3)
Loss prevention (13)
Moral hazard (5)
Nondiversifiable risk (6)
Noninsurance transfers (15)
Objective probability (4)
Objective risk (3)
Operational risk (6)
Peril (5)
Personal risks (7)
Physical hazard (5)
Premature death (7)
Property risks (10)
Pure risk (5)
Retention (14)
Risk (2)
Risk control (13)
Risk financing (13)
Self-insurance (15)
Separation (14)
Speculative risk (6)
Strategic risk (6)
Subjective probability (4)
Subjective risk (3)
Systemic risk (7)

REVIEW QUESTIONS

1. a. Explain the historical definition of risk.
   b. What is a loss exposure?
   c. How does objective risk differ from subjective risk?
2. a. Define chance of loss.
   b. What is the difference between objective probability and subjective probability?
3. a. What is the difference between peril and hazard?
   b. Define physical hazard, moral hazard, attitudinal hazard, and legal hazard.
4. a. Explain the difference between pure risk and speculative risk.
   b. How does diversifiable risk differ from nondiversifiable risk?
5. a. Explain the meaning of enterprise risk.
   b. What is financial risk?
   c. What is systemic risk?
6. a. What is enterprise risk management?
   b. How does enterprise risk management differ from traditional risk management?
7. Identify the major types of personal risks that are associated with economic insecurity.
8. Describe the major social and economic burdens of risk on society.
9. Explain the difference between a direct loss and an indirect or consequential loss.
10. Identify the major risks faced by business firms.
11. a. Briefly explain each of the following risk-control techniques for managing risk:
       1. Avoidance
       2. Loss prevention
       3. Loss reduction
       4. Duplication
       5. Separation
       6. Diversification
    b. Briefly explain each of the following risk-financing techniques for managing risk:
       1. Retention
       2. Noninsurance transfers
       3. Insurance

APPLICATION QUESTIONS

1. Assume that the chance of loss is 3 percent for two different fleets of trucks. Explain how it is possible that objective risk for both fleets can be different even though the chance of loss is identical.
2. Several types of risk are present in the U.S. economy. For each of the following, identify the type of risk that is present. Explain your answer.
   a. The Department of Homeland Security alerts the nation of a possible attack by terrorists.
   b. A house may be severely damaged in a fire.

c. A family head may be totally disabled in a plant explosion.
d. An investor purchases 100 shares of Microsoft stock.
e. A river that periodically overflows may cause substantial property damage to thousands of homes in the floodplain.
f. Home buyers may be faced with higher mortgage payments if the Federal Reserve raises interest rates at its next meeting.
g. A worker on vacation plays the slot machines in a casino.

3. There are several techniques available for managing risk. For each of the following risks, identify an appropriate technique, or combination of techniques, that would be appropriate for dealing with the risk.
   a. A family head may die prematurely because of a heart attack.
   b. An individual's home may be totally destroyed in a hurricane.
   c. A new car may be severely damaged in an auto accident.
   d. A negligent motorist may be ordered to pay a substantial liability judgment to someone who is injured in an auto accident.
   e. A surgeon may be sued for medical malpractice.

4. Andrew owns a gun shop in a high-crime area. The store does not have a camera surveillance system. The high cost of burglary and theft insurance has substantially reduced his profits. A risk management consultant points out that several methods other than insurance can be used to handle the burglary and theft exposure. Identify and explain two noninsurance methods that could be used to deal with the burglary and theft exposure.

5. Risk managers use a number of methods for managing risk. For each of the following, what method for handling risk is used? Explain your answer.
   a. The decision not to carry earthquake insurance on a firm's manufacturing plant
   b. The installation of an automatic sprinkler system in a hotel
   c. The decision not to produce a product that might result in a product liability lawsuit
   d. Requiring retailers who sell the firm's product to sign an agreement releasing the firm from liability if the product injures someone

INTERNET RESOURCES

- The **American Risk and Insurance Association** (**ARIA**) is the premier professional association of risk management and insurance educators and professionals. ARIA is the publisher of *The Journal of Risk and Insurance* and *Risk Management and Insurance Review*. Links are provided to research, teaching, and other risk and insurance sites. Visit the site at aria.org.
- The **Council of Disability Awareness** (**CDA**) has a personal disability quotient (PDQ) calculator that shows the probability of becoming disabled and the estimated financial impact if you cannot work for three months or longer. The results are based on your age, gender, occupation, anticipated retirement age, state of your health, and certain diseases. Visit the calculator site at disabilitycanhappen.org.
- The **Employee Benefit Research Institute** (**EBRI**) focuses solely on analyzing employee benefits. There is no lobbying or advocacy. EBRI stands alone in employee benefits research as an independent, nonprofit, and nonpartisan organization. EBRI reports research data without spin or an underlying agenda. As such, research results are objective, independent, and nonpartisan and are widely used by private analysts, government policymakers, and the media. Visit this important site at ebri.org.
- The **Insurance Information Institute** is a trade association that provides consumers with valuable information relating to property and casualty insurance coverages and current issues. Visit the site at iii.org.
- Risk Theory Society is an organization within the American Risk and Insurance Association that promotes research in risk theory and risk management. Papers are distributed in advance to the members and are discussed critically at its annual meeting. Visit the site at aria.org/rts.
- The **Society for Risk Analysis** (**SRA**) provides an open forum for all persons interested in risk analysis, including risk assessment, risk management, and policies related to risk. SRA considers threats from physical, chemical, and biological agents and from a variety of human activities and natural events. It is multidisciplinary and international. Visit the site at sra.org.
- **S.S. Huebner Foundation for Insurance Education** supports the advancement of university-level risk management and insurance courses, research, scholarship, and learning. Named for Professor Solomon S. Huebner, the father of

collegiate risk and insurance education, the Huebner Foundation is located at Georgia State University in the J. Mack Robinson School of Business. The Huebner Foundation provides generous graduate fellowships to Ph.D. candidates who are capable of leading and developing risk and insurance programs at universities throughout the world. Visit the site at huebnerfoundation.com.

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Students may take a self-administered test on this chapter at www.pearsonhighered.com/rejda.

NOTES

1. American Academy of Actuaries, Risk Classification Work Group, *On Risk Classification*, A Public Policy Monograph (Washington, DC: American Academy of Actuaries, 2011), note 2, p. 1.
2. *Risk* has also been defined as (1) variability in future outcomes; (2) chance of loss; (3) possibility of an adverse deviation from a desired outcome that is expected or hoped for; (4) variation in possible outcomes that exist in a given situation; and (5) possibility that a sentient entity can incur a loss.
3. George E. Rejda, *Social Insurance and Economic Security*, 7th ed. (Armonk, NY: M.E. Sharpe, 2012), 5–14.
4. U.S. Census Bureau, *Income and Poverty in the United States: 2016*, Current Population Reports, P60-259, September 2017, Table 1.
5. "The 2017 Retirement Confidence Survey: Many Workers Lack Retirement Confidence and Feel Stressed about Retirement Preparations, *EBRI Issue Brief*, No. 431, March 21, 2017, Figure 13.
6. Liana Fox, *The Supplementary Poverty Measurement: 2016* Current Population Reports, P60-261(RV), Revised September 2017, Figure 3.
7. *Disability Benefits*, SSA Publication No.05-10029, January 2017.
8. Bureau of Labor Statistics, "The Employment Situation—October 2017," November 2, 2017.
9. Ibid, Table A-15.
10. Ibid, Table A-12.
11. National Council on Alcoholism and Drug Dependence (NCADD), *Facts about Alcohol*. Available at https://www.ncadd.org/about-addiction/alcohol/facts-about-alcohol. Last modified on July 25, 2015.
12. National Survey on Drug Use, *Facts about Drugs*. Available at https://www.ncadd.org/about-addiction/faq/facts-about-drugs. Last modified on April 26, 2015.

CHAPTER

2

Insurance and Risk

"Insurance: An ingenious modern game of chance in which the player is permitted to enjoy the comfortable conviction that he is beating the man who keeps the table."

Ambrose Bierce

Learning Objectives

After studying this chapter, you should be able to

2.1 **a.** Define insurance based on the definition drafted by the Commission on Insurance Terminology.
b. Explain the basic characteristics of insurance based on the aforementioned definition.

2.2 Explain the law of large numbers.

2.3 **a.** Describe the characteristics of an ideally insurable risk from the viewpoint of a private insurer.
b. Explain whether fire and unemployment meet the requirements of an insurable risk.

2.4 **a.** Understand how adverse selection can lead to higher-than-expected losses and unprofitable business for insurers.
b. Explain the methods insurers use to control adverse selection.

2.5 **a.** Show how insurance is not the same thing as gambling.
b. Understand how insurance differs from hedging as a technique for treating risk.

2.6 **a.** Identify the major types of private insurance companies operating in the United States today.
b. Identify important social insurance programs in the United States.
c. Identify other government insurance programs in the United States at the federal and state levels.

2.7 **a.** Explain the social and economic benefits of insurance to society.
b. Explain the costs of insurance to society.

Jennifer, age 24, graduated from a large southern university with a degree in nursing. She accepted a position as a nurse in the emergency unit of a large community hospital in Dallas, Texas. Her immediate financial goal was to pay off a sizeable student loan of $50,000. After moving into a rented apartment, she carelessly started a fire when she was barbecuing hamburgers on the apartment deck. Her apartment and an adjacent apartment were severely damaged. The management company sued Jennifer for the property damage to the apartments and was awarded damages of $100,000. In addition, Jennifer owned personal property valued at $25,000 that was totally destroyed. Like many renters, Jennifer did not own a homeowners policy, which would have paid a substantial amount of the total loss. Jennifer's goal of early repayment of the student loans received a serious financial setback.

Jennifer learned in a painful way the financial problem of being uninsured for the risk of fire and personal liability. In Chapter 1, we identified major and commercial risks that can cause great economic insecurity. Consequently, you should understand how insurance works.

This chapter discusses the basic characteristics of insurance, characteristics of an ideal insurable risk, major types of private insurance and government insurance programs, and the social benefits and costs of insurance to society. The appendix discusses basic statistics and the law of large numbers.

DEFINITION OF INSURANCE

There is no single definition of *insurance*. Insurance can be defined from the viewpoint of several disciplines, including law, economics, history, actuarial science, risk theory, and sociology. But each possible definition will not be examined at this point. Instead, we will examine the common elements that are typically present in any insurance plan. However, before proceeding, a working definition of *insurance*—one that captures the essential characteristics of a true insurance plan—must be established.

After careful study, the Commission on Insurance Terminology of the American Risk and Insurance Association has defined insurance as follows.[1] **Insurance** *is the pooling of fortuitous losses by transfer of such risks to insurers, who agree to indemnify insureds for such losses, to provide other pecuniary benefits on their occurrence, or to render services connected with the risk*. Although this lengthy definition may not be acceptable to all risk managers and insurance scholars, it is useful for analyzing the common elements of a true insurance plan.

BASIC CHARACTERISTICS OF INSURANCE

Based on the preceding definition, an insurance plan or arrangement typically includes the following characteristics:

- Pooling of losses
- Payment of fortuitous losses
- Risk transfer
- Indemnification

Pooling of Losses

Pooling or the sharing of losses is the essence of insurance. **Pooling** *is the spreading of losses incurred by the few over the entire group, so that in the process,*

average loss is substituted for actual loss. In addition, pooling involves the grouping of a large number of exposure units so that the law of large numbers can operate to provide a substantially accurate prediction of future losses. Ideally, there should be a large number of similar, but not necessarily identical, exposure units that are subject to the same perils. Thus, pooling implies (1) the sharing of losses by the entire group and (2) the prediction of future losses with some accuracy based on the law of large numbers.

The primary purpose of pooling, or the sharing of losses, is to reduce the variation in possible outcomes as measured by the standard deviation or some other measure of dispersion, which reduces risk. For example, assume that two business owners each own an identical storage shed valued at $50,000. Assume there is a 10 percent chance in any year that each building will be destroyed by a peril, and that a loss to either building is an independent event. The expected annual loss for each owner is $5,000 as shown here:

$$\begin{aligned}\text{Expected loss} &= .90 \times \$0 + .10 \times \$50{,}000 \\ &= \$5{,}000\end{aligned}$$

A common measure of risk is the standard deviation, which is the square root of the variance. The standard deviation (SD) for the expected value of the loss is $15,000, as shown here:

$$\begin{aligned}\text{SD} &= \sqrt{.90(0-\$5{,}000)^2 + .10(\$50{,}000-\$5{,}000)^2} \\ &= \$15{,}000\end{aligned}$$

Suppose instead of bearing the risk of loss individually, the two owners decide to pool (combine) their loss exposures, and each agrees to pay an equal share of any loss that might occur. Four possible outcomes exist under this scenario:

Possible Outcomes	*Probability*
Neither building is destroyed	**.90 × .90 = .81**
First building is destroyed, second building suffers no loss	**.10 × .90 = .09**
First building suffers no loss, second building is destroyed	**.90 × .10 = .09**
Both buildings are destroyed	**.10 × .10 = .01**

If neither building is destroyed, the loss for each owner is $0. If one building is destroyed, each owner pays $25,000. If both buildings are destroyed, each owner must pay $50,000. The expected loss for each owner remains $5,000 as shown here:

$$\begin{aligned}\text{Expected loss} &= .81 \times \$0 + .09 \times \$25{,}000 \\ &\quad + .90 \times \$25{,}000 + .01 \times \$50{,}000 \\ &= \$5{,}000\end{aligned}$$

Note that while the expected loss remains the same, the probability of the extreme values, $0 and $50,000, have declined. The reduced probability of the extreme values is reflected in a lower standard deviation as shown next:

$$\begin{aligned}\text{SD} &= \sqrt{\begin{aligned}&.81(0-\$5{,}000)^2 + .09(\$25{,}000-\$5{,}000)^2 \\ &+ .09(\$25{,}000 - \$5{,}000)^2 \\ &+ .01(\$50{,}000 - \$5{,}000)^2\end{aligned}} \\ \text{SD} &= \$10{,}607\end{aligned}$$

Thus, as additional individuals are added to the pooling arrangement, the standard deviation continues to decline while the expected value of the loss remains unchanged. For example, with a pool of 100 insureds, the standard deviation is $1,500; with a pool of 1,000 insureds, the standard deviation is $474; and with a pool of 10,000, the standard deviation is $150.

In addition, by pooling or combining the loss experience of a large number of exposure units, an insurer might be able to predict future losses with greater accuracy. From the viewpoint of the insurer, if future losses can be predicted, objective risk is reduced. Thus, another characteristic often found in many lines of insurance is risk reduction based on the law of large numbers.

LAW OF LARGE NUMBERS

The **law of large numbers** *states that the greater the number of exposures, the more closely will the actual results approach the probable results that are expected from an infinite number of exposures*.[2] For example, if you flip a balanced coin into the air, the *a priori* probability of getting "heads" is 0.5. If you flip the coin only 10 times, you might get heads eight times. Although the observed probability of getting heads is 0.8, the true probability is still 0.5. If the coin were flipped 1 million times, however, the actual number of heads would be approximately 500,000. Thus, as the number of random tosses increases, the actual results approach the expected results.

A practical illustration of the law of large numbers is the National Safety Council's prediction of the

number of motor vehicle deaths during a typical holiday weekend. Because millions of vehicles are on the road, the National Safety Council has been able to predict with some accuracy the number of motorists who will die during a typical Fourth of July weekend. For example, assume that 500 to 700 motorists are expected to die during a typical Fourth of July weekend. Although individual motorists cannot be identified, the actual number of deaths for the group of motorists as a whole can be predicted with some accuracy.

However, for most insurance lines, actuaries generally do not know the true probability and severity of loss. Therefore, estimates of both the average frequency and the average severity of loss must be based on previous loss experience. If a large number of exposure units exist, the actual loss experience of the past might be a good approximation of future losses. As we noted earlier, as the number of exposure units increases, the relative variation of actual loss from expected loss will decline. Thus, actuaries can predict future losses with a greater degree of accuracy. This concept is important because an insurer must charge a premium that will be adequate for paying all losses and expenses during the policy period. The lower the degree of objective risk, the more confidence an insurer has that the actual premium charged will be sufficient to pay all claims and expenses and provide a margin for profit.

A more rigorous statement of pooling and the law of large numbers appears in the appendix at the end of this chapter.

Payment of Fortuitous Losses

A second characteristic of private insurance is the payment of fortuitous losses. Most insurance policies exclude intentional losses. A **fortuitous loss** *is one that is unforeseen and unexpected by the insured and occurs as a result of chance*. In other words, the loss must be accidental. The law of large numbers is based on the assumption that losses are accidental and occur randomly. For example, a person may slip on an icy sidewalk and break a leg. The loss would be fortuitous.

Risk Transfer

Risk transfer is another essential element of insurance. With the exception of self-insurance, a true insurance plan always involves risk transfer. **Risk transfer** *means that a pure risk is transferred from the insured to the insurer, who typically is in a stronger financial position to pay the loss than the insured*. From the viewpoint of the individual, pure risks that are typically transferred to insurers include the risk of premature death, excessive longevity, poor health, disability, destruction and theft of personal and commercial property, and personal and professional liability lawsuits.

Indemnification

A final characteristic of insurance is indemnification for losses. **Indemnification** *means that the insured is restored to his or her approximate financial position prior to the occurrence of the loss*. Thus, if you carry adequate property insurance, and your home burns in a fire, a homeowners policy will indemnify or restore you to your previous financial position, less a relatively small deductible. If you are sued because of the negligent operation of an automobile, your auto liability insurance policy will pay those sums that you are legally obligated to pay. Similarly, if you become seriously disabled, a disability-income insurance policy will restore at least part of the lost wages.

CHARACTERISTICS OF AN IDEALLY INSURABLE RISK

Private insurers generally insure only pure risks. However, some pure risks are not privately insurable. From the viewpoint of a private insurer, an insurable risk ideally should have certain characteristics. There are ideally six characteristics of an **insurable risk**:

- There must be a large number of exposure units.
- The loss must be accidental and unintentional.
- The loss must be determinable and measurable.
- The loss should not be catastrophic.
- The chance of loss must be calculable.
- The premium must be economically feasible.

Large Number of Exposure Units

The first requirement of an insurable risk is a large number of exposure units. Ideally, there should be a large group of roughly similar, but not necessarily identical, exposure units that are subject to the same peril or group of perils. For example, a large number of wood-frame dwellings in a city can be grouped together for purposes of providing property insurance on the dwellings.

The purpose of this first requirement is to enable the insurer to predict losses based on the law of large

numbers. Loss data can be compiled over time, and losses for the group as a whole can be predicted with some accuracy. The loss costs can then be spread over all insureds in the underwriting class.

Accidental and Unintentional Loss

A second requirement is that the loss should be accidental and unintentional; ideally, the loss should be unforeseen and unexpected by the insured and outside of the insured's control. Thus, if an individual deliberately causes a loss, he or she should not be indemnified for the loss.

Several reasons exist for this requirement. First, the loss should be accidental because the law of large numbers is based on the random occurrence of events. A deliberately caused loss is not a random event because the insured knows when the loss will occur. Thus, prediction of future experience might be highly inaccurate if a large number of intentional or nonrandom losses occur. Second, **moral hazard** is increased if the insured deliberately intends to cause a loss. Moral hazard is dishonesty or character defects in an individual that increase the frequency or severity of loss. Finally, it is poor public policy to allow insureds to collect for intentional losses.

Determinable and Measurable Loss

A third requirement is that the loss should be both determinable and measurable. This means the loss should be definite as to cause, time, place, and amount. Life insurance, in most cases, meets this requirement easily. The cause and time of death can usually be readily determined, and if the person is insured, the face amount of the life insurance policy is the amount paid.

Some losses, however, are difficult to determine and measure. For example, under a disability-income policy, the insurer promises to pay a monthly benefit to the disabled person if he or she meets the definition of *disability* stated in the policy. Some dishonest claimants might deliberately fake sickness or injury to collect from the insurer. Even if the claim is legitimate, the insurer must still determine whether the insured satisfies the definition of disability stated in the policy. Sickness and disability are highly subjective, and the same event can affect two persons quite differently. For example, assume two accountants who are insured under separate disability-income contracts are injured in an auto accident, and both are classified as totally disabled. One accountant, however, might be more determined to return to work. If that accountant undergoes rehabilitation and returns to work, the disability-income benefits will terminate. Meanwhile, the other accountant would still continue to receive disability-income benefits according to the terms of the policy. In short, determining when a person is actually disabled is often difficult. However, all losses ideally should be both determinable and measurable.

The basic purpose of this requirement is to enable an insurer to determine whether the loss is covered under the policy, and if it is covered, how much should be paid. For example, assume that Shannon has an expensive fur coat that is insured under a homeowners policy. It makes a great deal of difference to the insurer if a thief breaks into her home and steals the coat, or the coat is missing because her husband stored it in a dry-cleaning establishment but forgot to tell her. The loss is covered in the first example but not in the second.

No Catastrophic Loss

The fourth requirement is that ideally the loss should not be catastrophic. This means that a large proportion of exposure units should not incur losses at the same time. As we stated earlier, pooling is the essence of insurance. If most or all of the exposure units in a certain class simultaneously incur a loss, then the pooling technique breaks down and becomes unworkable. Premiums must be increased to prohibitive levels, and the insurance technique is no longer a viable arrangement by which losses of the few are spread over the entire group.

Insurers ideally want to avoid all catastrophic losses. In reality, however, that is impossible, because catastrophic losses periodically result from floods, hurricanes, tornadoes, earthquakes, forest fires, and other natural disasters. Catastrophic losses can also result from acts of terrorism.

Several approaches are available for meeting the problem of a catastrophic loss. First, reinsurance can be used by which insurance companies are indemnified by reinsurers for catastrophic losses. **Reinsurance** *is an arrangement by which the primary insurer that initially writes the insurance transfers to another insurer (called the reinsurer) part or all of the potential losses associated with such insurance*. The reinsurer is then responsible for the payment of its share of the loss. Reinsurance is discussed in greater detail in Chapter 6.

Second, insurers can avoid the concentration of risk by dispersing their coverage over a large geographical area. The concentration of loss exposures in a geographical area exposed to frequent floods, earthquakes, hurricanes, or other natural disasters can result in periodic catastrophic losses. If the loss exposures are geographically dispersed, the possibility of a catastrophic loss is reduced.

Finally, financial instruments are now available for dealing with catastrophic losses. These instruments include catastrophe bonds, which are designed to help fund catastrophic losses. Catastrophe bonds are discussed in Chapters 4 and 6.

Calculable Chance of Loss

Another requirement is that the chance of loss should be calculable. The insurer must be able to calculate both the average frequency and the average severity of future losses with some accuracy. This requirement is necessary so that a proper premium can be charged that is sufficient to pay all claims and expenses and yields a profit during the policy period.

Certain losses, however, are difficult to insure because the chance of loss cannot be accurately estimated, and the potential for a catastrophic loss is present. For example, floods, wars, and cyclical unemployment occur on an irregular basis, and prediction of the average frequency and severity of losses is difficult. Thus, without government assistance, these losses are often difficult for private carriers to insure.

Economically Feasible Premium

A final requirement is that the premium should be economically feasible. The insured must be able to afford the premium. In addition, for the insurance to be an attractive purchase, the premiums paid should be substantially less than the face amount of insurance or policy limit.

To have an economically feasible premium, the chance of loss must be relatively low. One view is that if the chance of loss exceeds 40 percent, the cost of the policy will exceed the amount that the insurer must pay under the contract.[3] For example, an insurer could issue a $1,000 life insurance policy on a man who is age 99, but the pure premium would be close to that amount, and an additional amount for expenses would also have to be added. The total premium would exceed the face amount of insurance.

Based on the preceding requirements, most personal risks, property risks, and liability risks can be privately insured because the ideal characteristics of an insurable risk generally can be met. In contrast, most market risks, financial risks, production risks, and political risks are difficult to insure by private insurers.[4] These risks are speculative, and calculation of a correct premium might be difficult because the chance of loss cannot be accurately estimated. For instance, insurance that protects a retailer against loss because of a change in consumer tastes, such as a style change, generally is not available. Accurate loss data are not available. Thus, calculating an accurate premium would be difficult. The premium charged might or might not be adequate to pay all losses and expenses. Because private insurers are in business to make a profit, certain risks are difficult to insure because of the possibility of substantial losses.

TWO APPLICATIONS: THE RISKS OF FIRE AND UNEMPLOYMENT

You will understand more clearly the characteristics of an insurable risk if you can show how the principles discussed earlier apply to a specific risk. For example, consider the risk of fire to a private dwelling. This risk can be privately insured because the requirements of an insurable risk are generally fulfilled (see Exhibit 2.1).

Consider next the risk of unemployment. How well does the risk of unemployment meet the ideal requirements of an insurable risk? As is evident in Exhibit 2.2, the risk of unemployment does not completely meet the requirements.

First, predicting unemployment is difficult because of the different types of unemployment and labor. There are professional, highly skilled, semiskilled, unskilled, blue-collar, and white-collar workers. Moreover, unemployment rates vary significantly by occupation, age, gender, education, marital status, city, state, and a host of other factors, including government programs and economic policies that frequently change. In addition, the outsourcing of jobs to foreign countries by major corporations is another major problem in the United States, which makes the risk of unemployment more difficult to measure and

EXHIBIT 2.1
Fire as an Insurable Risk

Requirements	*Does the risk of fire satisfy the requirements?*
1. Large number of exposure units	Yes. Numerous exposure units are present.
2. Accidental and unintentional loss	Yes. With the exception of arson, most fire losses are accidental and unintentional.
3. Determinable and measurable loss	Yes. If there is disagreement over the amount paid, a property insurance policy has provisions for resolving disputes.
4. No catastrophic loss	Yes. Although catastrophic fires have occurred, all exposure units normally do not burn at the same time.
5. Calculable chance of loss	Yes. Chance of fire can be calculated, and the average severity of a fire loss can be estimated in advance.
6. Economically feasible premium	Yes. Premium rate per $100 of fire insurance is relatively low.

EXHIBIT 2.2
Unemployment as an Insurable Risk

Requirements	*Does the risk of unemployment satisfy the requirements?*
1. Large number of exposure units	Not completely. Although a large number of employees exist, predicting unemployment is often difficult because of the different types of unemployment and different types of labor.
2. Accidental and unintentional loss	Not always. Some unemployment is due to individuals who voluntarily quit their jobs.
3. Determinable and measurable loss	Not completely. The level of unemployment can be determined, but the measurement of loss might be difficult. Most unemployment is involuntary because of layoffs or because workers have completed temporary jobs. However, some unemployment is voluntary; workers voluntarily change jobs because of higher wages, a change in careers, family obligations, relocation to another state, or other reasons.
4. No catastrophic loss	No. A severe national recession or depressed local business conditions in a town or city could result in a catastrophic loss.
5. Calculable chance of loss	Not completely. The different types of unemployment in specific occupations make it difficult for actuaries to calculate accurately the chance of loss.
6. Economically feasible premium	Not completely. Adverse selection, moral hazard, policy design, and the potential for a catastrophic loss could make the insurance too expensive to purchase. Some plans, however, will pay unemployment benefits in certain cases where the unemployment is involuntary, and the loss payments are relatively small, such as waiver of life insurance premiums for six months, or payment of credit card minimum payments for a limited period.

insure privately. Also, the duration of unemployment varies widely among the different groups. Because a large number of workers can become unemployed at the same time, a potential catastrophic loss is also present. Also, because certain types of unemployment occur irregularly, calculating the chance of loss accurately might be difficult. For these reasons, the risk of widespread unemployment is difficult to insure by private insurers. However, unemployment can be insured by social insurance programs. Social insurance programs are discussed later in the chapter.

ADVERSE SELECTION AND INSURANCE

When insurance is sold, insurers must deal with the problem of adverse selection. **Adverse selection** *is the tendency of persons with a higher-than-average chance of loss to seek insurance at standard (average) rates, which, if not controlled by underwriting and policy provisions, results in higher-than-expected loss levels and unprofitable business*. For example, smokers have higher mortality rates than non-smokers and must pay substantially higher rates for life insurance. Some smokers might conceal or provide false information to obtain life insurance at a lower rate. Other examples of adverse selection are high-risk drivers with poor driving records who seek auto insurance at standard rates, and persons with serious health problems who seek life or disability income insurance at standard rates. If the applicants for insurance with a higher-than-average chance of loss succeed in obtaining the coverage at standard rates or even preferred rates, we say that the insurer is "adversely selected against."

Adverse selection is due, at least in part, from asymmetries in insurance information. This means that applicants for insurance might have greater knowledge about the risk to be insured than the insurance company, or might even have knowledge about the risk that is unknown to the insurer. The insurance company might have incomplete or inaccurate information; the applicant for insurance might provide false information or conceal material facts that should have been provided; or the applicant might purchase the insurance with the intention of deliberately causing a loss to collect the policy proceeds.

Adverse selection can be controlled by careful underwriting. **Underwriting** *refers to the process of selecting and classifying applicants for insurance*. Applicants who meet the underwriting standards are insured at standard or preferred rates. If the underwriting standards are not met, an extra premium must be paid; the coverage offered might be more limited; or coverage might be denied. Insurers frequently sell insurance to applicants who have a higher-than-average chance of loss, but such applicants must pay higher premiums. The problem of adverse selection arises when applicants with a higher-than-average chance of loss succeed in obtaining the coverage at standard or average rates.

Policy provisions are also used to control adverse selection. For example, the suicide clause in a life insurance policy excludes payment of the policy proceeds if the insured commits suicide within one or two years after purchasing the insurance. This prevents an applicant from purchasing life insurance with the primary intention of committing suicide, and this intention is not known to the insurer when the policy is purchased.

Policy provisions that deal with adverse selection are discussed in greater detail later in the text when specific insurance contracts are analyzed.

INSURANCE AND GAMBLING COMPARED

Insurance is often erroneously confused with gambling. Two important differences exist between them. *First, gambling creates a new speculative risk, whereas insurance is a technique for handling an already existing pure risk*. Thus, if you bet $500 on a horse race, a new speculative risk is created, but if you pay $500 to an insurer for a homeowners policy, which includes coverage for a fire, the risk of fire is already present. No new risk is created by the transaction.

The second difference is that gambling can be socially unproductive, because the winner's gain comes at the expense of the loser. In contrast, insurance is always socially productive, because neither the insurer nor the insured is placed in a position where the gain of the winner comes at the expense of the loser. Both the insurer and the insured have a common interest in the prevention of a loss. Both parties win if the loss does not occur. Moreover, frequent gambling transactions generally never restore the losers to their former financial position. In contrast, insurance contracts restore the insureds financially in whole or in part if a loss occurs.

INSURANCE AND HEDGING COMPARED

In Chapter 1, we discussed the concept of hedging, by which risk can be transferred to a speculator through the purchase of a futures contract. An insurance contract, however, is not the same thing as hedging. Although both techniques are similar in that risk is transferred by a contract, and no new risk is created, some important differences exist between them. *First, an insurance transaction typically involves the transfer of pure risks because the characteristics of an*

insurable risk generally can be met. However, hedging is a technique for handling speculative risks that might be uninsurable, such as protection against a decline in the price of agricultural products and raw materials.

A second difference between insurance and hedging is that moral hazard and adverse selection are more severe problems for insurers than for speculators who buy or sell futures contracts. Purchasers of insurance contracts can directly influence the profit or loss on the transaction because of intentional losses, fraudulent claims, or inflated claims. In contrast, individual entities, such as corn or wheat producers, generally cannot directly influence the financial outcome of the transaction when a futures contract is used to hedge a potential price decline.

TYPES OF INSURANCE

Insurance can be classified as either private or government insurance. *Private insurance* includes life and health insurance as well as property and liability insurance. *Government insurance* includes social insurance programs and other government insurance plans.

Private Insurance

Life Insurance At the end of 2016, 797 life insurers were doing business in the United States, down from a peak of 2,343 in 1988.[5] The decline is the result of mergers and consolidations in the insurance industry to reduce general overhead and operating costs and to increase efficiency. **Life insurance** *pays death benefits to designated beneficiaries when the insured dies*. The benefits pay for funeral expenses, uninsured medical bills, estate taxes, and other expenses. The death proceeds can also provide periodic income payments to the deceased's beneficiary. Life insurers also sell annuities, individual retirement account (IRA) plans, 401(k) plans, and individual and group retirement plans. Some life insurers also sell (1) individual and group health insurance plans that cover medical expenses because of sickness or injury, (2) disability income plans that replace income lost during a period of disability, and (3) long-term care policies that cover care in nursing facilities.

Health Insurance Although many of the life insurers we described also sell some type of individual or group health insurance plan, the health insurance industry overall is highly specialized and controlled by a relatively small number of insurers. Medical expense plans pay for hospital and surgical expenses, physician fees, prescription drugs, and a wide variety of additional medical costs. Health insurance plans are covered in greater detail in Chapters 15 and 16.

Property and Liability Insurance In 2016, there were 2538 property and liability insurers (including territories) operating in the United States.[6] **Property insurance** *indemnifies property owners against the loss or damage of real or personal property caused by various perils, such as fire, lightning, windstorm, or tornado*. **Liability insurance** *covers the insured's legal liability arising out of property damage or bodily injury to others; legal defense costs are also paid*.

Property and liability insurance is also called property and casualty insurance. In practice, nonlife insurers typically use the term *property and casualty insurance* (rather than property and liability insurance) to describe the various coverages and operating results. **Casualty insurance** *is a broad field of insurance that covers whatever is not covered by fire, marine, and life insurance; casualty lines include auto, liability, burglary and theft, workers compensation, and health insurance.*

Exhibit 2.3 identifies the major property and casualty coverages sold today. Although some overlap

EXHIBIT 2.3
Property and Casualty Insurance Coverages

1. Personal lines
   - Private passenger auto insurance
   - Homeowners insurance
   - Earthquake insurance
   - Federal flood insurance
2. Commercial lines
   - Commercial auto insurance
   - Workers compensation and excess workers compensation insurance
   - Other liability insurance
   - Product liability insurance
   - Commercial and farmers multiple peril insurance
   - Medical malpractice insurance
   - Fire and allied lines insurance
   - Accident and health insurance
   - Inland marine and ocean marine insurance
   - Surety bonds and fidelity bonds
   - Mortgage guaranty insurance
   - Financial guaranty insurance
   - Burglary and theft insurance
   - Boiler and machinery insurance
   - Crop insurance
   - Warranty insurance

exists, the various coverages can be grouped into two major categories—personal lines and commercial lines.[7]

1. *Personal Lines.* **Personal lines** *refer to coverages that insure the buildings and personal property of individuals and families or provide them with protection against legal liability.* Major personal lines include the following:
   - *Private passenger auto insurance* protects the insured against legal liability arising out of auto accidents that cause property damage or bodily injury to others. Auto insurance also includes physical damage insurance on a covered auto for damage or loss resulting from a collision, theft, or other perils. Medical expense coverage and uninsured motorist coverage are also available.
   - *Homeowners insurance* is a package policy that provides property insurance and personal liability insurance in one policy. A number of homeowners policies are available that cover the dwelling, other structures, and personal property against loss or damage from numerous perils, including fire, lightning, windstorm, or tornado. The policies also include theft coverage and personal liability insurance. A homeowners policy is an example of a *multiple-line policy*, which refers to state legislation that allows insurers to write property and casualty lines in one policy.
   - *Earthquake insurance* covers damage that can result from the shaking and cracking of buildings and damage to personal property in an earthquake. Homeowners policies and business insurance policies do not cover damage from earthquake. However, coverage can be obtained by an endorsement to the policy or by a separate policy.
   - *Federal flood insurance* is a federal program that provides coverage for flood losses to homeowners and business firms in flood zones. Flood losses are excluded under standard homeowners and renters policies. Flood insurance is typically sold by participating property and casualty insurers but is insured and subsidized by the federal government.
2. *Commercial Lines.* **Commercial lines** *refer to property and casualty coverages for business firms, nonprofit organizations, and government agencies.* Major commercial lines include the following:
   - *Commercial auto insurance* covers the legal liability of business firms arising out of the ownership or operation of business vehicles. It also includes physical damage insurance on covered business vehicles for damage or loss resulting from a collision, theft, or other perils.
   - *Workers compensation insurance* covers workers for a job-related accident or disease. The insurance pays for medical bills, disability-income benefits, rehabilitation benefits, and death benefits to the dependents of an employee whose death is job related.
   - *Excess workers compensation insurance* is designed for employers that self-insure and covers excess losses that exceed a specified dollar amount.
   - *Other liability insurance* covers legal liability arising out of negligence, carelessness, or failure to act that cause personal injury or property damage to others. It includes coverage for legal liability arising out of errors and omissions, liquor liability, and umbrella liability.
   - *Products liability insurance* is a separate line that covers manufacturers, distributors, or sellers from legal liability arising out of defective products or conditions that cause personal injury or damage to users of the product.
   - *Commercial multiple peril insurance* is a package policy that includes coverage for property damage, boiler and machinery losses, general liability coverages, and crime insurance.
   - *Farmers multiple peril insurance* is similar to homeowners insurance and covers farmers and ranchers for a number of *named* perils and liability exposures.
   - *Medical malpractice* insurance covers doctors, other professionals, and facilities for legal liability arising out of the treatment of patients.
   - *Fire insurance* covers losses caused by fire and lightning; it is usually sold as part of a package policy, such as a commercial multiple-peril policy. *Allied lines* refer to coverages that are usually purchased with fire insurance, such as coverage for windstorm, hail, and vandalism. Indirect losses can also be covered, including the loss of business income, rents, and extra expenses.

- *Accident and health insurance* is sold by some property and casualty insurers. This line is similar to the health insurance coverages sold by life and health insurers.
- **Inland marine insurance** covers goods being shipped on land, which include imports, exports, domestic shipments, and instrumentalities of transportation (for example, bridges, tunnels, and pipelines). Inland marine insurance also covers personal property such as fine art, jewelry, and furs.
- **Ocean marine insurance** covers ocean-going vessels and their cargo from loss or damage because of perils of the sea; contracts are also written to cover the legal liability of shippers and owners.
- **Surety bonds** provide for monetary compensation in the case of failure by bonded persons to perform certain acts, such as failure of a contractor to construct a building on time.
- **Fidelity bonds** cover loss caused by the dishonest or fraudulent acts of employees, such as embezzlement and the theft of money.
- *Mortgage guaranty insurance* (also known as private mortgage insurance or PMI) pays the mortgage lender for loss from a property foreclosure up to certain limits if the borrower defaults on the mortgage. The insurance is purchased by the borrower but protects the lender. Banks typically require PMI if the down payment is less than 20 percent of the home price.
- *Financial guaranty insurance,* also known as bond insurance, guarantees the principal and interest payments on municipal obligations, such as bonds issued by a city to build a new school. The insurer's higher credit rating results in a lower interest rate to investors in municipal bonds, which enables the city to borrow more for the same outlay of funds.
- *Burglary and theft insurance* covers the loss of money, securities, and other property because of burglary, robbery, theft, and other crime perils.
- *Boiler and machinery insurance (also known as mechanical breakdown, equipment breakdown, or systems breakdown coverage*) is a highly specialized line that covers losses due to the accidental breakdown of covered equipment. Such equipment includes steam boilers, air conditioning and refrigeration equipment, and electrical generating equipment.
- *Crop-hail insurance* is sold by private insurers and only covers crop losses from hail, fire, and wind. Multiple peril crop insurance sponsored by the federal government includes coverage for additional perils. The insurance, however, is serviced by the private market, but is subsidized and reinsured by the federal government.
- *Warranty insurance* pays the cost of repairing or replacing defective products after the warranty period guaranteed by the manufacturer expires.
- *Other coverages* include *aircraft insurance*, which provides physical damage insurance on covered aircraft and liability coverage for legal liability arising out of the ownership or operation of aircraft. *Directors and officers (D&O)* liability insurance provides financial protection for the directors and officers and the corporation if the directors and officers are sued for mismanagement of the company's affairs. *Credit insurance* covers manufacturers and wholesalers against loss because an account receivable is uncollectible.

Government Insurance

Numerous government insurance programs are in operation at the present time. Government insurance can be divided into social insurance programs and other government insurance programs.

Social Insurance

Social insurance programs *are government insurance programs with certain characteristics that distinguish them from other government insurance plans.* These programs are financed entirely or in large part by mandatory contributions from employers, employees, or both, and not primarily by the general revenues of government. The contributions are usually earmarked for special trust funds; the benefits, in turn, are paid from these funds. In addition, the right to receive benefits is ordinarily derived from or linked to the recipient's past contributions or coverage under the program; the benefits and contributions generally vary among the beneficiaries according to their prior earnings, but the benefits are heavily weighted in favor of low-income groups. Moreover, most social insurance programs are compulsory. Covered workers and employers are required by law to pay contributions and participate in the programs. Finally, eligibility requirements and benefit rights are usually prescribed exactly by statute, leaving little room for administrative discretion in the award of benefits.[8]

Major social insurance programs in the United States include the following:

- *Old-Age, Survivors, and Disability Insurance,* commonly known as Social Security, is a massive public income-maintenance program that provides retirement, survivor, and disability benefits to eligible individuals and families.
- *Medicare* is part of the total Social Security program and covers the medical expenses of most people age 65 and older and certain disabled people younger than age 65.
- *Unemployment insurance* programs provide weekly cash benefits to eligible workers who experience short-term involuntary unemployment. Regular state unemployment benefits are typically paid up to 26 weeks after certain eligibility requirements are met. In recent years, temporary emergency unemployment programs have also been enacted to provide additional weeks of benefits to beneficiaries who have exhausted their regular benefits during severe business recessions. In addition, extended benefits also may be available to unemployed workers in states with high unemployment who exhaust their regular benefits. Unemployment insurance is discussed in greater detail in Chapter 18.

As stated earlier, *workers compensation insurance* covers workers against a job-related accident or disease. Although workers compensation is a casualty line sold by private insurers, it is also an important form of social insurance. The social insurance aspects of workers compensation are discussed in Chapter 18.

- In addition, *compulsory temporary disability insurance,* which exists in five states, Puerto Rico, and the railroad industry, provides for the partial replacement of wages that might be lost because of a temporary nonoccupational disability.[9]
- The *Railroad Retirement Act* provides retirement benefits, survivor benefits, and disability income benefits to railroad workers who meet certain eligibility requirements.
- Finally, the *Railroad Unemployment Insurance Act* provides unemployment and sickness benefits to railroad employees.

Other Government Insurance Programs Other government insurance programs exist at both the federal and state levels. However, these programs do not have the distinguishing characteristics of social insurance programs. Important federal insurance programs include the following:

- The *Federal Employees Retirement System (FERS)* provides retirement, survivor, and disability benefits to federal employees hired after 1983.
- The *Civil Service Retirement System* provides retirement, survivor, and disability benefits to federal employees hired before 1984.
- The *Federal Deposit Insurance Corporation (FDIC)* provides insurance on checking and savings accounts in commercial banks, credit unions, and savings and loan association.
- The *Pension Benefit Guaranty Corporation (PBGC)* is a federal corporation that guarantees (up to certain limits) the pension benefits of workers if a private defined-benefit pension plan is terminated.
- The *National Flood Insurance Program (NFIP)* makes property insurance available (up to certain limits) to homeowners and business firms who reside in flood zones.
- *Other federal programs* include various life insurance programs to veterans, federal crop insurance, war risk insurance, and numerous additional programs.

A wide variety of insurance programs also exist at the state level. They include the following:

- As stated earlier, *state workers compensation programs* provide medical, disability, rehabilitation, and survivor benefits if workers are injured or die as a result of a job-related accident or disease.
- *State children's health insurance programs (SCHIP)* are joint state-federal programs that provide low-cost health insurance to low-income children and families.
- *Residual market plans (also called shared or involuntary market plans)* exist in a number of states, which provide insurance to high-risk policyholders in certain states who might have difficulty in obtaining basic insurance in the standard markets. These plans include (1) FAIR (Fair Access to Insurance) Plans, which provide basic property insurance to high-risk policyholders; (2) Beach and Windstorm Plans, which provide windstorm and hurricane coverage to

property owners along the Atlantic and Gulf Coast seaboard; (3) Citizens Property Insurance Corporation, a nonprofit, tax-exempt government insurer created by the Florida Legislature in 2002, which provides insurance protection to Florida policyholders who are entitled to but are unable to find property insurance coverage in the private markets, (4) Louisiana Citizens Property Insurance Corporation, a nonprofit corporation that provides insurance to residential and commercial applicants in Louisiana who are unable to procure insurance in the private markets, and (5) Automobile Insurance Plans operated by private insurers, which provide auto insurance to high-risk drivers who cannot obtain protection in the voluntary markets.

- *Other state programs* include the California Earthquake Authority, the Florida Hurricane Catastrophe Fund, the Maryland Automobile Insurance Fund, and the State Life Insurance Fund in Wisconsin.

BENEFITS OF INSURANCE TO SOCIETY

The major social and economic benefits of insurance include the following:

- Indemnification for loss
- Reduction of worry and fear
- Source of investment funds
- Loss prevention
- Enhancement of credit

Indemnification for Loss

Indemnification permits individuals and families to be restored to their former financial position after a loss occurs. As a result, they can maintain their financial security. Because insureds are restored either in part or in whole after a loss occurs, they are less likely to apply for public assistance or welfare benefits, or to seek financial assistance from relatives and friends.

Indemnification to business firms also permits firms to remain in business and employees to keep their jobs. Suppliers continue to receive orders, and customers receive the goods and services they desire. The community also benefits because its tax base is not eroded. In short, the indemnification function contributes greatly to family and business stability and therefore is one of the most important social and economic benefits of insurance.

Reduction of Worry and Fear

A second benefit of insurance is that worry and fear are reduced. This is true both before and after a loss. For example, if heads of families have adequate amounts of life insurance, they are less likely to worry about the financial security of their dependents in the event of premature death; persons insured for long-term disability do not have to worry about the loss of earnings if a serious illness or accident occurs; and property owners who are insured enjoy greater peace of mind because they know they are covered if a loss occurs. Worry and fear are also reduced after a loss occurs, because the insureds know that they have insurance that will pay for the loss.

Source of Investment Funds

Insurance companies perform an important role as financial intermediaries in the economy. The insurance industry is an important source of funds for capital investment and accumulation. Premiums are collected in advance of the loss, and funds not needed to pay immediate losses and expenses can be loaned to business firms. These funds typically are invested in shopping centers, hospitals, factories, housing developments, and new machinery and equipment. The investments increase society's stock of capital goods and promote economic growth and full employment. Insurers also invest in social investments, such as housing, nursing homes, and economic development projects. In addition, because the total supply of loanable funds is increased by the advance payment of insurance premiums, the cost of capital to business firms that borrow is lower than it would be in the absence of insurance.

Loss Prevention

Insurance companies are actively involved in numerous loss-prevention programs and also employ a wide variety of loss-prevention personnel, including safety engineers and specialists in fire prevention, occupational safety and health, and products liability. Some