Business Liability and Economic Damages

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Abstract

Businesses exist to provide goods and services to customers, and in doing so they take risks. Among these risks is the chance of losing money in lawsuits filed by customers, employees, and others negatively impacted by the business. Insurance provides some protection against these liabilities, but lawsuits still take their toll. This book covers the subject of economic damages and its role in insurance claims and lawsuits against businesses. After reading and understanding this book, the reader will be able to identify economic damages as a component of business liability, describe the business risk posed by economic damages, explain the key determinants of economic damages, and estimate economic damages and business loss in a variety of cases.

Keywords

Contents

Preface

Let's be honest. There's not a business anywhere that is without problems. Business is complicated and imperfect. Every business everywhere is staffed with imperfect human beings and exists by providing a product or service to other imperfect human beings.

—Bob Parsons (Go Daddy founder)

Businesses exist to provide goods and services to customers, and in doing so they take risks. Among these risks is the chance of losing money in lawsuits filed by customers, employees, and others negatively impacted by the business. Insurance provides some protection against these liabilities, but lawsuits still take their toll. This book covers the subject of economic damages and its role in insurance claims and lawsuits against businesses.

Economic damages are a loss to society that can be usually valued in terms of some market equivalent. As such, economic damages are a reasonably objective and predictable component of liability risk. Business managers and students working toward a business degree can and should get a handle on economic damages as a business liability. This book shows you how, by introducing the relevant economic fundamentals and applying them to a range of lawsuit examples, including business interruption, contract disputes, wrongful employment practices, and claims of personal injury and wrongful death.

My goal is for you to be able to do the following, by the end of this book.

1. Identify economic damages as a component of business liability.
2. Describe the business risk posed by economic damages.
3. Explain the key determinants of economic damages.
4. Estimate economic damages and business loss in a variety of cases.

To accomplish these goals we apply economic principles and some understanding of financial, insurance, and labor markets. We identify

roles for statistics and probability to clarify issues of economic damages. Also, the idea of economic damages is part economics and part law, so we need some understanding of legal principles and institutions. It is common these days for economists to discuss legal principles and for legal scholars to discuss economics principles, the confluence of which is the research field known as law and economics. There is even talk of having an economist serve on the U.S. Supreme Court! But I am no lawyer and nothing in this book constitutes legal advice. If you need legal advice, consult a lawyer. Also, the book discusses business decisions as they generally relate to economic damages, but does not contain advice for any specific business faced with a particular liability issue.

This book took much longer to finish than I had intended, and for their great patience and support I thank the folks at Business Expert Press, including Executive Acquisitions Editor Scott Isenberg. I also thank my family (Barbara and Sydney) for their support and forgiveness for stolen nights and weekends devoted to this project.

CHAPTER 1

Business Liability

Liability does apply with respect to the amount of the oil spill.
—Ken Salazar, U.S. Secretary of the Interior, addressing the
Gulf Oil Spill in 2010

Learning Objectives

1. Describe the concept and scope of business liability.
2. Summarize the effects of insurance and business organization on liability.
3. Explain the role of courts, mediation, and arbitration in addressing liability claims.

What Is Business Liability?

For business owners, opportunities to sell goods and services are exciting. But revenue and profit usually require significant resources, and many businesses incur liabilities—*debts or other obligations owed to others*—along the way. Liability includes loans borrowed to finance the business, and other obligations spelled out in business contracts. If a business fails to meet its contractual obligations, a liability remains and those owed will seek compensation so long as it remains profitable to do so.

Sometimes the consequences of business liability are easy to predict and plan for; other times not. For a business loan backed by equity in the business, the lender goes after the equity if the loan goes unpaid—a predictable outcome. Actual debt recovery may take considerable time and expense, but this contingency is relatively easy to plan for. Many other standard business contracts entail liabilities that are fairly easy to foresee, but not all. Furthermore, the scope of business liability extends beyond contracts, and the great reach of potential liability makes it even harder to

foresee. This book focuses on business liabilities whose consequences are relatively hard to predict, but can nevertheless be identified and prepared for in some way.

Business liability comes from many directions, so many that a detailed account of all possibilities is impossible. A business cannot foresee every form of liability, but its managers and owners should develop an intuitive understanding of liability by considering the business's relationships with society. It is not just desired relationships that might be listed in a business plan, but actual ones.

To get a grip on the real scope of business liability, you have to think big, have a big picture in mind, a big idea. One big idea discussed in this book is the *social contract*. For a business owner or manager who wants to avoid a business liability mistake, it is useful to take the view that businesses have liability because they are bound by a social contract to avoid certain harms to others. The social contract does not take the form of a tidy 5-page or 10-page document that a business signs and sends to the government. It does not necessarily stay the same over time, and may or may not ultimately be fair. It does reflect and signify the body of laws and regulations that a business faces, and is colored by the economic, social, and political institutions of the day. A social contract can serve as a theme or umbrella for myriad elements of business liability—and so can serve as a conceptual model to simplify some aspects of liability faced by business owners and managers. As a practical matter, for the purposes of this book a social contract is *an idea or framework that serves to define and limit the rights and responsibilities of society's members.*[1]

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[1] The origins of the philosophical idea of social contract lie in the classical works of Hobbes (1651), Rousseau (1762), Locke (1689), and others, with more recent contributions by Rawls (1971) and Sen (2009). An essential point in this literature is that people collectively enter into a social contract in order to get some benefits from others, while giving up some personal liberties along the way. The existence of a social contract, in these terms, seems obvious, but the existence of a grand, encompassing, and comprehensible social contract is unclear, which sinks the idea that society might actually be actively participating in it. As a practical matter, a social contract necessitates an agreement among members of society, defining and limiting the rights and duties of each. In the narrow focus of business liability, particularly in a given industry, this specialized notion of social contract is intelligible and useful.

The scope of possible liabilities that a typical business faces is mind-boggling. It is key to have some hunch, or intuition, about where liability comes from and the impact it has on businesses. A good hunch about business liability can be formed by thinking about how a business stands in social contract with others. Each business has some implicit social contract with society, with liability for its actions (or inactions) that cause harm or loss to others. Relationships between a business and society are always sources of liability, as shown in Figure 1.1.

In the United States, a social contract is partly framed by the U.S. Constitution and its amendments, as well as other laws introduced by the federal government and upheld by the courts, treaties and agreements with other nations, the laws of state and local governments, and the opinions of the court on cases tried before it. Each of these foundational elements may create rights and duties that collectively frame the social contract. A business that breaches the contract causes a loss to society, a liability.

The American social contract, as a catchall for the various rights and responsibilities we bear to one another, is formidable and far-reaching. Our system of justice, our rule of law, acts to right imbalances and provide opportunity for wrongs to be righted. America's legal system supports the social contract—or rather the rights and responsibilities it is intended to signify—with remarkable commitment and vigilance, despite the system's imperfections. The same is not true in all countries. In the Philippines, a country in southeast Asia, I spent a year in high
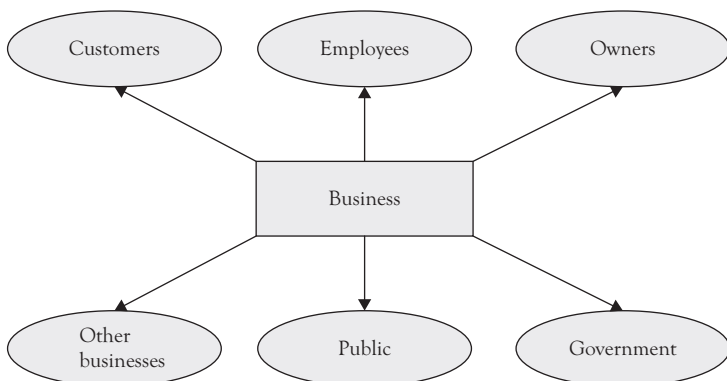

Figure 1.1 Sources of business liability

school in the 1980s and lived with a host family. My host father was a trained lawyer, but could not find work because the legal system had become weak and lawyers were of little use, so he ran a convenience store instead at the University of the Philippines. Matters have improved greatly since that time, but weak legal institutions and corruption continue to be problems for law in the developing world.[2] In many countries a business can bribe its way out of many obligations to society. In America the bribe is less reliable, in part because government officials are better paid and so less benefitted by bribes economically, and also because a centuries-old tradition of government propriety still carries momentum—despite many lapses.

For a business manager pondering the scope of the company's liability, it is useful to develop an intuitive and informed sense of what is owed to society, as if the company were bound by a social contract that could be spelled out, at least in principle. This sense of obligation does not require a knowledge of all U.S. laws—not even lawyers or judges have that. The relevant social contract includes a set of rights and limitations on behavior that protect people from harm, and a basic understanding of the legal scope of harm is a must. As noted in the Preface, the book you are reading is no form of legal advice; but the economics of business liability and damages is framed by the legal system, so a discussion of the legal landscape is inevitable.

A good starting point for assessing business liability is to briefly detail the six relationships shown in Figure 1.1. Loans and other business contracts create business-to-business liability, but each business has customers and—like it or not—potential liability in their customer relationships. Employees are owed paychecks but also owed fair and respectful treatment, a form of liability shaped by the social contract between the employer and the employee. For businesses big enough so that their actions are not one and the same as that of their owners, business owes its owners,

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[2] The Philippines and many other relatively poor countries have relatively high levels of corruption, while the United States and other relatively rich countries like Germany, Japan, and Australia have relatively low levels of corruption. See for example the Corruptions Perception Index 2014 available from Transparency International online.

and so is liable to them. All businesses know about taxes—one sort of debt owed to the government, and some end up with other ties to assets that lie in the government's reach, and so more liability. Furthermore, general members of the public hold a potential relationship with a given business, by sharing the same road space on a given day, the same communication network, water supply, or other component of our common space. All of these relationships carry potential liability.

To illustrate, consider my business activity as the author of this book. I get paid royalties by my publisher, to whom I have sold the rights to this book. The publisher is my customer and our contract spells out my obligations, including publication deadlines, quality guidelines, and book length. I have no ghostwriter or other employees, nor other business owners, so no liability there. I do have liability to other businesses: as I am a university professor and my book counts as a scholarly contribution that my university takes credit for supporting. Shared credit implies some liability on my part, to ensure quality and protect the university's reputation. This book deal on my part is straightforward tax wise, and my liability to the government is otherwise transparent.

Where do you, dear reader, fit into my liability as book author? You are part of the public at large. I am obliged to avoid having boxes of my books fall out of the trunk of my car and smack your car's fender on the roadway. The publisher owns the words you are reading, but I profit from book sales. Do I not also bear obligation to the reader, for the book itself? That is the hardest part of my liability puzzle. I have designed the book to improve your understanding of business liability and economic damages, with no intent to harm anyone. It is advertised as a book of ideas, not advice, so cannot be said to poorly advise. This book contains examples but omits names and identifying details of real people, so it cannot wrongly characterize anyone in the general public. For these reasons my legal duty to you is pretty limited.

Insurance

In this book we will be talking mostly about business liabilities that are hard to anticipate; for example, product defects, which unlike debts and interest payments are hard to predict.

To deal with unexpected liabilities, an elegant solution is insurance— *a contract in which one party meets the obligations of anothe*r*, under specific conditions*. Pay a premium and the nightmare of ruinous mistaken harm vanishes. Indeed, insurance markets have made possible much business activity that could not otherwise take place. But the insurance company is not your friend. It plays a risk game that it wins on average, but you are a risk, not a business partner.

Insurance makes the social contract more workable by lessening the burden on courts to enforce the contract's obligations. Insurance companies can quickly assess damages and provide remedies. Courts cannot. Insurance works so well that it has been assigned a special place in the social contract, an institutional role alongside the courts. All drivers *must* buy automobile liability insurance; many businesses *must* buy workman's compensation insurance, which presupposes the existence of insurance markets. Additionally, the government provides insurance to cover unemployment and disruptions in the market for insurance itself, such as insurance company bankruptcy.

Insurance is good, but insurance markets are like casinos. The insurer's pursuit of profit is good for the social contract and business, but insurers know the contract better than most of their customers do. Big insurance companies have armies of lawyers. They know today's law and anticipate its changes tomorrow.

Insurance companies cover some business liabilities, but not all. The insurance agent will sit down with a business owner and discuss a range of liabilities, touching on some or all of the points shown in Figure 1.1. But liability is a thing to be identified by the business itself, preferably with a lawyer's input, before any meetings with insurance agents. Insurance helps to mitigate the business's risk of liability, but insurers lack the exhaustive knowledge of any specific business that would be needed to fully address this risk. Mitigation is not absolution. The liability buck never gets fully passed from business to its insurer.

Businesses look to their insurance policies for peace of mind, but the insurer sees them as loaded guns. Every policy is written to cover some stated form of liability, but is otherwise designed to minimize liability's scope. This scope is whittled down until it just meets the demands of the

social contract. Anything extra would present more risk for the insurer, and less profit.

When a business causes harm, society comes after it and not after its insurer. I illustrate this in Figure 1.2: Business has an obligation to society, and its insurer has an obligation to the insurer. It is easy to suppose instead that the insurer assumes the business's obligation. For example, in routine car accidents a claim is usually made against a driver's insurer and not against the driver directly. This saves time and money, but the true obligation lies with the party that caused harm. The less a business knows about how this works, and the more it relies on an insurance company to advise and guide it, the more money the insurance company makes and the greater liability the business faces. Insurers do not want businesses to read this book!

Insurance companies want to cultivate ongoing relationships with most businesses they serve, but this good-will dries up for customers who become stand-out risks. Businesses that cause harm become less desirable insurance customers, because they pose a greater perceived risk of future harm. Stand-out risks are lemons to the insurer. For lemons, insurance companies have no good-will, and they will minimally service their policies. They may also drag out the process, with years of court proceedings needed to settle a matter, and regardless of the damage, such proceedings may diminish a business's reputation. In states like New York, where anyone can track almost every lawsuit's progress online, and chat online
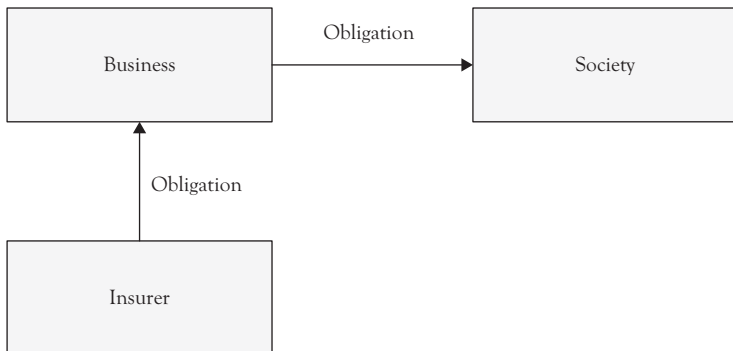

Figure 1.2 Business, society, and the insurer

about it, dragged-out liability disputes carry a potentially huge reputation cost for businesses.

Insurance policies are just business contracts—agreements that can be breached. The insurer will try to avoid breach or risk the ire of regulators. Deep pockets help, but some insurance companies still go belly up. State governments know this and provide some backup insurance funds. These create a possible economic problem of moral hazard—*an excessive shift of risk from one party to another, due to risk avoidance*, by which businesses underinsure with the confidence that the government will pick up the remaining tab. But governments are onto that trick, and woe to the insurer that thinks otherwise. Every business should, however, be aware of any such backups, and should carefully study the financial health and customer satisfaction of would-be insurers, before buying liability insurance.

Business Forms

Business liability is a burden with the potential to cripple innovation and economic growth. Mindful of this, the framers of America's social contract capped financial liability via the corporation. A potential customer or service provider that does commerce with a corporation has limited recourse if commerce goes bad, but the existence of corporations also provides more economic opportunity and choice. The same idea applies to other forms of limited liability business entities, including the limited liability company (LLC), type S corporation, and limited liability partnership (LLP).

The existence of corporations demonstrates a sort of hands-off, or laissez faire, approach of lawmakers to financial gain and loss. With this hands-off approach, lawmakers concede that a full dose of liability in the social contract would be toxic to the economy. But it is an uneasy concession, with limited scope. The corporation's structure protects its owners from losing their homes if a business deal fails, but does not absolve them of responsibility for harms that the corporation may cause. Recalling the diverse forms of liability shown in Figure 1.1, every corporation has liabilities that exceed its financial commitments. All these extra liabilities can potentially pierce the corporate veil and pass through its owners, as shown in Figure 1.3.
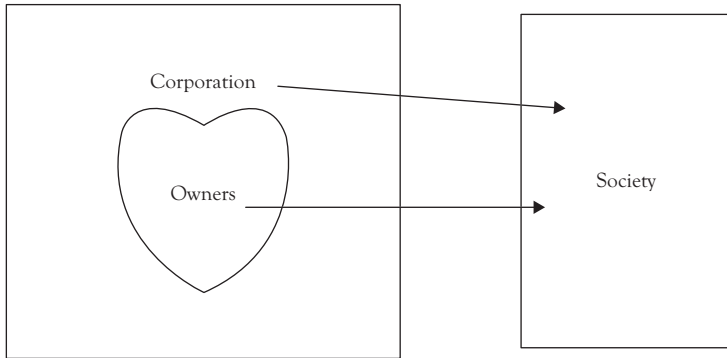
Figure 1.3 Corporate liability to society

The prospect of the corporation's owners bleeding cash from their savings accounts, to cover corporate liabilities, may seem unfair. But the threat of such pass-through liability protects society from having every business formally pose itself as a corporation, or a bunch of them, with modest assets that seriously under-represent the capability of the business to meet its obligations to society. Abuse of corporate structure is a moral hazard, which the corporate veil piercing discourages.

Mindful of chinks in their armor, corporations guard themselves—and their owners—from liability risk via insurance. This double armor provides stability, but not quite peace of mind. As discussed earlier, insurance markets provide only limited protection from liability claims. A corporation's true scope of liability is not known to its insurers, only to itself. Knowing this scope of business liability requires careful self-study and good understanding of the social contract.

The Legal System

Most business liabilities that go unpaid never end up in court. Instead they get negotiated, settled via insurance, or quashed in bankruptcy. But liability negotiations are, in effect, always done on the courthouse steps. If negotiations break down, the courthouse is a step away. Insurance settlement, for sizeable liabilities, is always a negotiation between the claimant and the insurer, and again takes place on the courthouse steps. If the claimant faces a lowball insurance offer, they can hire a lawyer who can

further negotiate or go after the insurer directly in court. The choice of bankruptcy, too, is made with a view to liability claims that might otherwise play out in court.

Whether or not they end up in court, all business liabilities are framed by the legal system. The business manager needs a basic understanding of the system when dealing with each liability claim. The American legal system identifies unpaid liabilities as a harm to society, a breach of the social contract. The civil law system[3] provides opportunities for those harmed to seek a remedy. Anyone seeking a remedy must tell the court which sort of harm is claimed. These include torts—*one party's wrongful harm to another, notwithstanding any business contract between them*, and also breach of contract—*one party's wrongful harm to another caused by failure to uphold a business contract between them.*

Torts are a catchall that covers almost every business liability other than those specified in a business contract. Torts, each a harm inflicted on society, include intentional harm, negligence, nuisance, and trespass, and each works pretty much as its name suggests. A manufacturer that foolishly uses the wrong screws to hold its product together, causing injury to customers, commits negligence. An ageing paper mill that decides to keep operating despite a broken fan system—thereby polluting a nearby town—commits nuisance. If the mill's staff crosses a farmer's land with heavy trucks, in a rush to fix the fans, they commit trespass. Related to the idea of trespass is the wrongful taking or laying hold of property, itself a tort.

The scope of torts is as broad as the sorts of harm that the courts intent to remedy. For example, consider the general idea of property—*anything tangible or intangible that is owned by a person or an entity, and the right to possess, keep, hold, use, enjoy, and dispose of what is owned.* A farmer's land is property, but so is a special method that the farmer may have devised to process his crop for delivery to market[4]—a form of intellectual property.

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[3] Substantively, civil law means the set of laws concerning actions that are noncriminal yet against society's interests.

[4] For example, this nation's first president George Washington developed and implemented improvements on the common sort of drill, plow, barn, and threshing method in his days of farming.

Claims of tort and contract breach are brought to a court, and if deemed in good order will trigger a trial or other court-ordered proceeding. At the trial's end the court will rule on the claim, based on evidence presented by the claimant and defendant legal teams. To make its ruling, the court will weigh and interpret the evidence in light of existing law, and also in light of existing court decisions and commentary on similar past cases—the common law tradition.[5]

For torts and contracts, past cases form an important source of law. The U.S. Constitution, and its 27 amendments, says nothing specifically about torts or business contracts. This is because the framers of these documents saw in the existing court system a sound means of addressing these wrongs. For business liabilities, the claimant acts as plaintiff, bringing the case to common law court, and the business is called to answer in its defense.

Each U.S. state has had, since its inception, a common law court system to deal with torts and contracts, and while states' approaches to these matters vary, the federal government has not found the discrepancies so egregious as to impose a national standard or code.[6] It has, however, supplanted state courts with a system of federal courts. The decisions of both state and federal courts can be challenged by the litigants (plaintiff and defense teams), with appeal to the corresponding appellate court. If unsatisfied there, litigants can further appeal to the corresponding supreme court—state or federal. Some state supreme court cases can be appealed to the federal supreme court.

A legal liability is any situation, identified by law, where an individual, a group, or an organization is found to bear obligation to another. A business's legal liability is then any situation, identified by law, where

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[5] Common law, manifest operationally as a civil procedure, relies on the court's current and past actions to determine case outcomes. This contrasts with the civil law procedure in which the judge relies on written laws—rules and statutes—rather than on past case decisions. In practice, the U.S. legal system's procedures permit judges some latitude in their use of statute versus precedent.

[6] A model code of torts and contracts has been developed by the American Law Institute—a group of legal scholars, lawyers, and judges, over the last 90 years, and is sometimes cited in court decisions.

a business is found to bear obligation to an individual, a group, or an organization. To try a liability claim, the court often spends a lot of time dealing with evidence and protocol, and must complete the challenging task of interpreting liability in terms consistent with the will of Congress and the court's prior opinions. Legal teams, for plaintiff and defense, know that judges look to laws (statutes) and past court opinions (precedent) to decide matters, and so they research statutes and precedents as they prepare their cases. Legal research, preparation of evidence, and performance in court are all costly for the legal teams, and so costly for their clients.

A bench trial—*a trial with a judge and no jury*—is work for the court, a jury trial is more so. The jury examines evidence but knows little of relevant statutes, legal precedent, or court procedure. The judge must instruct the jury so that their opinion, or findings, reflects the logic of the relevant law. If it does then the judge's decision, or holding, generally agrees with the jury's findings, otherwise not.

Our legal system is an expensive way to deal with business liability claims. It is cheaper to settle a case before it reaches trial. In economic terms, the claimant should accept any negotiated offer that leaves them with more money than they would get by going through the court system. The profit-minded business sued for liability should never make an offer that leaves the claimant much better off than they would be if they went through the court system, since a lower offer would still keep the lawsuit out of the courts. The same maxim holds for the business's insurer.

The relatively few business liability cases that end up in court do so because the claimant anticipates a higher net gain from going to trial than any settlement offer they have received from the business or its insurer. Knowing how costly trials are, the business should prefer instead to raise the settlement offer above the threshold value that induces settlement, unless the business believes that the claimant's expected trial outcome is too optimistic. In a simplified economic world where everybody holds the same expectations about what will happen, no business liability case would go to trial!

Substantial differences in expectations, which bring business liability cases to trial, can reflect differences in the information held by plaintiff

and defense teams. However, the court's rules of discovery usually serve to expose secrets and minimize differences in information. The teams might also have different opinions about the legal merits of the positions advanced by each side, or how these positions will be received by the court. This can happen, for example, if the defense lawyer has lots of experience with the judge and court at hand, while the plaintiff lawyer does not.[7]

For business liability claims that do not get settled immediately, the threat of a costly lawsuit often looms above further negotiations, but cheaper forms of dispute resolution exist. Mediation—*dispute resolution facilitated by a neutral nonbinding third party*—is relatively quick and procedurally simple. For business liability mediation to be useful, the business and its liability claimant must have different expectations about the mediation outcome; otherwise their common ground would beg settlement beforehand. Successful mediation leads to discovery of evidence that establishes common ground, so ending the dispute. The same holds true of a court trial, but the court's decision is binding. Between these two forms of dispute resolution is arbitration—*dispute resolution facilitated by a neutral binding third party*, cheaper than a trial and sometimes built into contracts as a required substitute for trials.

Example

In this book we will explore a range of business liability examples, some more complex than others. As a simple starting point, consider a hypothetical company called Rent that rents trailers to construction companies. Rent does business in the Midwest and leases all its trailers from a national manufacturer called Best, with each trailer leased for five years.

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[7] For liability cases that go to trial, a bench trial is quicker and less costly than a jury trial, and carries more uncertainty. To prefer a jury trial, the plaintiff or defense must expect that the jury's findings will deviate favorably from what the judge's holding would be in a bench trial, yet not so much as to cause the judge to set aside the findings.

Over time, Rent gets more and more trailers from Best, but then finds a better deal from a local manufacturer. Rent returns all the Best trailers, most of which have time left on their five-year leases. The lease contract allows such a return, but specifies that all unpaid installments on the trailers are due at the time of return. Rent pays none of these future installments, and so faces a business liability claim equal to the total of all unpaid future installments; suppose this is $500,000.

Best, having a half million dollar claim against Rent, tries to collect. If it has some other form of business engagement or contract with Rent, it may try to prompt payment by business retaliation, or a threat of retaliation. If no such "stick" is in its arsenal, Best will consider filing a lawsuit against Rent, a costly undertaking that will hopefully still net Best a good share of the claimed half million. Contract law provides this opportunity via a claim of contract breach. There is some uncertainty about the lawsuit's outcome: Will the judge find it reasonable that payment for all future (but void) rental periods was actually due at the time of the rental property's return? Will Best collect interest on the debt, and if so at what interest rate?

In this deadbeat renter dispute there is an economic principle—the time value of money—that can help the court decide the outcome. According to this principle, there is usually an advantage to receiving money earlier rather than later, and so the payment of all rent at once leaves the renter in worse shape (and the rental company in better shape) than if rent had been paid on its regular schedule. The value of this extra advantage depends on market rates of interest, and can be estimated. The court might hold that the deadbeat renter pay its due without paying the "extra," or not, depending on the wording of the contract.

This simple example illustrates business liability, with some uncertainty and economics involved, but the liability itself is predictable—a company bails on a rental contract, thereby triggering a liability claim for unpaid rent. In the remainder of this book, I focus more on economic damages that arise in liability cases where the liability claim itself is not so easy to predict. Such cases include personal injury, wrongful death, wrongful termination, and intellectual property loss.

Exercises

1. Two friends set up a bagel bakery—Big O Bagels—in a rented building in a downtown area. The bakery is run as a partnership. It has three employees, and the owners take turns coming into the bakery each day to manage it. Give an example of a liability in each of the following groups, and the debt owed by the business in each case.
   a. Customers
   b. Employees
   c. Owners
   d. Other businesses
   e. Government
   f. General public

2. Suppose that a veterinarian wants to set up a veterinary clinic in Memphis, Tennessee.
   a. With regard to its relationships with customers, employees, and the general public, what forms of liability insurance is it required to hold? (Check online.)
   b. Does the state of Tennessee provide a liability insurance guaranty fund that kicks in if the veterinarian's insurance company goes broke? (Again, check online.)
   c. Find an insurance company online that provides one of the liability insurance types required of the clinic in Memphis. Are a sample insurance policy and pricing available online? Why or why not?

3. U.S. courts have a love–hate relationship with corporations. Concerning the publically traded corporation, courts have refused law offices to take this business form, or even to take on nonlawyer owners. Explain the court's likely intent here, in terms of the social contract.

4. In the Gulf of Mexico oil spill in the year 2010, five million barrels of oil reportedly leaked into the Gulf, due to an oil rig explosion that also reportedly killed 11 people and injured 17 more. Leaked oil also killed fish, birds, and other wildlife, and polluted private and public lands. A claimed cause of the explosion was a defective cement wall on the oil rig.

a. Using appropriate legal terms defind in this chapter, identify the basic types of wrongful actions that may have occurred in the oil spill.

b. Describe the potential scope of business liability for the oil company, in terms of possible harm to society via its constituents:
    i.   Customers
    ii. Employees
    iii. Owners
    iv. Other businesses
    v.   Government
    vi. General public

CHAPTER 2

Economic Loss

The Millers are attempting to use tort law to recover the cost of replacing a defective product sold to them for use in their business. This cost is called in law an "economic loss," to distinguish it from an injury to the plaintiff's person or property (property other than the product itself), the type of injury on which a product's liability suit is usually founded. It would be better to call it a "commercial loss," not only because personal injuries and especially property losses are economic losses, too – they destroy values which can be and are monetized.

—Judge Richard Posner, in his written opinion on the case
Miller versus U.S. Steel Corp.[1]

Learning Objectives

1. Identify and describe economic losses for which businesses may be liable.
2. Apply economic concepts of consumption and utility to describe economic losses.
3. Describe markets as an institution and relate them to economic loss.
4. Define economic damages and explain their role in the legal system.

A business that harms society is liable for it, and the potential scope of harm is as broad as the business's relationships with society. This book focuses on those business liabilities that take an economic

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[1] A case before the U.S. 7th Circuit federal appellate court, year 1990, reference numbers 902 F.2d 573, 574; excerpted from page 179 of *The Quotable Judge Posner: Selections from Twenty-Five years of Judicial Opinions*, edited by Robert F. Blomquist (State University of New York Press, 2010).

form—convertible to dollars and cents.[2] I do not assume that you have had an economics course before, so let us start off with some basics.

Economics is the *social science dealing with the production, distribution, and consumption of goods.*[3] Being a social science, economics is about people and how they behave and interact with each other. People want and need goods, and they use resources to produce them. In advanced economies like ours, different people specialize in the production of different goods—like cars and health care, and then exchange their goods with those of other people. As a result, goods usually do not pile up in a cottage for consumption by a single person, but are instead distributed across the larger population via trade. The end result of production and distribution is the consumption of goods.[4]

Economic loss can happen in at least three ways:

1. Prevention of goods production by businesses
2. For goods produced, prevention of their distribution to consumers
3. For goods received by consumers, prevention of their consumption

For example, a defective auto lift may keep an auto repair shop from fixing cars—preventing production, a bridge collapse may thwart delivery of food to market—preventing distribution, and a faulty sprinkler system at a wedding reception may prevent consumption of an expensive buffet dinner.

Economic Opportunity and Loss

Economic opportunities include the chance to watch a baseball game, start a new business, or buy a car. Directly or indirectly, each economic opportunity is *a means of deriving benefit or utility from consuming goods*

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[2] Not all business liabilities take economic form. A customer's pain and suffering caused by a product defect are wrongful harms against society, and so a liability, but not readily convertible to dollars and cents.

[3] For simplicity, I lump all tangible goods and (intangible) services into a general category of "goods," from which each person consumes a "basket of goods."

[4] Human life and happiness are not all about goods consumption, but economists tend to focus on this particular part of life.

now or in the future. A baseball game is a good to be consumed at a given point in time, a car is an opportunity to enjoy transportation services over a stretch of time, and a business is an opportunity to make money and so afford goods in the future.

Economic loss is the *destruction of economic opportunity*. It occurs when a business[5] prevents or limits the production, distribution, or consumption of goods. A harm that puts a drug company out of business causes a loss of production now and in the future. These are losses of economic opportunity. From society's standpoint, the drug company's lost profit is a social ill because it reduces the goods consumption possibilities of the company's employees and owners, and reduces drug availability and innovation—lowering drug consumption and the health of the general public.[6]

To get a reasonably broad sense of how economic opportunity and loss are manifest, I will list 10 different types or categories. The most immediate of these is an actual collection of goods to be consumed. Let us put that at the top of the list.

1. *Baskets of goods*
   Examples are food, clothing, housing, transportation, and health care. The latter two are services, rather than tangible goods or consumables. Housing too can be measured as a service, but for the purpose of this book I will lump all goods and services into the general category of goods. If a business wrongfully limits someone's basket of goods, they are liable for it. The typical American's basket of goods does not represent a large business liability, but a thousand such baskets may do so.

   The goods in a given basket must be gathered or produced before being placed in the basket, and the acts of gathering and production

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[5] or any person, group, or organization. As this book's focus is on business liability, I will keep referring to business's connection to economic harm.

[6] The Economic Opportunity Act (United States Public Law 88-452) was an organizing effort in the War on Poverty in the 1960s, attempting to create conditions that would raise living standards of many Americans, allowing them to consume more goods.

are themselves economic opportunities. In a modern economy with organized agriculture and manufacturing, we then have a second item on our list.

2. *Farms and factories*

Farms and factories are means of consuming goods, not now but in the future—once farming or manufacturing is done. Wrongful destruction of farms and factories is a big dollar business liability, as is the destruction of service-providing facilities like hospitals.

   The basic economic model of the marketplace is one with many buyers and sellers, such that all buyers pay the same price for the good, and all sellers receive the same price, with no one buyer or seller able to affect the price. In this model, called perfect competition, all companies (firms) are competing against each other for customers and sales. The competitive marketplace facilitates consumption by getting the consumer to the producer on mutually beneficial terms, as so is another form of economic opportunity, third on our list.

3. *Competitive markets*

A business that comes to dominate a market by buying out its competitors, and waging price wars that crush the remaining firms, reduces the market's competitiveness, weakening the consumer's bargaining power and opportunities. Wrongful market takeover creates economic harm by reducing economic opportunity, and so is a business liability.

   Modern economies also feature money, banks, and financial markets. Possession of money, savings in a bank, and financial instruments such as bond and stocks are also economic opportunities, fourth on our list.

4. *Money held as cash, deposited in a bank, or invested in bonds and stocks*

Money held as cash provides opportunity to purchase goods, assuming that such goods are available for sale via cash—which is usually the case in a market-oriented economy like that of the United States.[7] Likewise, bank deposits can be withdrawn and spent, as can investments in bonds and stocks—albeit with less ease or liquidity.

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[7] In the U.S., dollors are legal tender and must be accepted by business as payment for goods.

All financial holdings are economic opportunities, and their destruction is economic loss. Bank fraud that wipes out deposits is a business liability, as is securities fraud that misleads people about their financial holdings. More generally, loss in the value of financial holdings is a possible liability. Since businesses are themselves financial holdings of their owners, if one business causes a loss in value of another business, an economic loss occurs and liability may exist.

It takes work to run farms, factories, and other businesses. Modern economies have well-organized labor markets, and the chance to work is itself an economic opportunity, fifth on our list.

5. *Employment and pensions*

Employment provides earnings, usually a bank deposit, which can then be used to buy goods. Pensions, which supply income during retirement years, provide the opportunity to purchase and consume goods later on.

A business that fires a worker, or denies a person employment, destroys employment opportunities now and in the future—a possible business liability. Furthermore, a business that injures a government worker, rendering them unable to continue work or receive their pension, may also be liable for the lost pension.[8]

Labor is more productive when workers are trained and educated, and these are more economic opportunities, sixth on our list.

6. *Education and human capital*

The War on Poverty in the 1960s and government policy during the recent Great Recession attempted to create more education and training opportunities, so as to ultimately raise human capital—*the value of a worker's skill set*. A business that prevents a person's access to education or training may be liable for the resulting lost productivity and earnings. For example, inappropriately selective admission criteria by a private college might wrongfully limit access to education, as could a manufacturer's inappropriate denial of training to some workers.

Revenue and profit provide money to workers and business owners, so they are economic opportunities, seventh on our list.

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[8] Businesses that offer pension plans to their own workers are liable for them in an obvious way.

7. *Business revenue and profit*

Destruction of revenue, is an economic loss. Consider a long-established restaurant that spreads a (false) rumor—whispered to acquaintances—that a new restaurant has rats in the kitchen. This slander, if believed, may destroy the new restaurant's revenue and also business value, a liability double whammy for the established restaurant.

To produce goods, firms use resources—or factors of production. These include natural resources—collectively called land, as well as labor, tools and other capital goods, and business leadership—also called entrepreneurship. We already noted that labor is an economic opportunity, and so too are the other factors of production, eighth on our list.

8. *Land, capital goods, and entrepreneurship*

Industrial waste dumping that toxifies ground water debases the land of farms dependent on that water. A bad batch of lubricant oil ruins capital goods. The loss of a business manager saps entrepreneurship. All these incidents are possible business liabilities caused by a loss of some factor of production. Less production means fewer consumption possibilities for society at large, a societal loss.

Earlier we identified competitive markets as an economic opportunity, but too much competition can sometimes be a hindrance. In competitive markets, firms have little incentive to try costly innovation, since other firms can quickly copy the result and reap much of the gains. For example, in the drug industry the development of a new medicine may require billions of dollars of research and development, but copying the drug may require only millions (not billions) of dollars. To encourage innovations that enhance society's consumption possibilities, U.S. law protects new ideas—for a while—via patents. It also protects firms' brands, or trademarks, from use by rivals, both because brands often signify innovation and because they often attract loyal customers who might not receive the same quality of good from a counterfeit brand. Patents, trademarks, and copyrights are all intellectual property vital to creative production of goods, and so are economic opportunities, ninth on our lsit.

9. *Intellectual property*

In the restaurant example given earlier, if a well-known restaurant spreads lies about a new restaurant's cleanliness, there is harm implied by the upstart's lost revenue, but there is not necessarily much loss of brand value if the business is hardly known. If instead the upstart slanders the famous eatery, harm may be great in terms of both revenue and brand value.

Many goods in today's markets require groups of firms to make them. A bicycle may have its frame manufactured by the final seller, but its brakes, seat, gears, and wheels may be made by different companies. These additional, intermediate goods are put on the frame by the final seller, to make the complete product. Bike manufacturers may compete against each other, as may brake manufacturers, but despite this competition against firms positioned horizontally in the supply chain, the final producer may have a sort of team relationship with its suppliers—vertically positioned in the supply chain.

Complex economic goods, produced by a group of firms stacked vertically in the supply chain, create reliance among firms for success. To codify such reliance, firms often commit to contracts. The contracts themselves facilitate coordination along the supply chain, making possible more complex goods. These vertical contracts, or agreements, are therefore economic opportunities, thereby adding them to our list.

10. *Vertical business contracts*

If the brake supplier to a bike company withholds product mid-contract, holding out for a price twice that agreed upon, fewer bikes are available to society, an economic loss. Any breach of business contract that causes a foreseeable reduction in society's consumption possibilities is an economic loss, and so may be a liability for the breaching firm.[9]

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[9] Not all business agreements facilitate greater consumption by society. For firms selling the same product, an agreement to raise prices or cut quantities sold erodes competition and reduces consumption opportunities. Such collusion, and similar forms of horizontal business agreements, is itself a form of economic harm, and a breach of agreement poses no liability in society's view.

Consumption and Utility

The scope of economic loss is as broad as the range of goods that we consume as a society. Any loss of economic opportunity is an economic loss, and all such opportunities give rise to goods consumption. Goods provide utility—*usefulness, the ability to satisfy needs or wants*. We use goods to improve our lives and make ourselves happy. In terms of consumption and utility, economic harm is any act that wrongfully lowers the utility of current consumption or the expected utility of future consumption.

Businesses are liable for any wrongful reduction in the utility of consumption that society derives from goods. Economists often discuss the utility of consumption in mathematical terms, and while this approach is not without controversy, it is also relevant to the modeling of economic harm. Let C represent a list of consumption levels for all goods (and services) consumed by all people in society, at all times present and future, and in all situations or "states of nature." The list C must be a very long one, as it includes your consumption amounts of things like toothpaste and gasoline, my consumption of tennis balls and eyeglasses, and so on. Provided that the items on this list are actually desirable, there is some benefit or utility to them, and the more of each there is, the greater is the utility benefit from having them.[10] With this idea in mind, let $U(C)$ be a number value, called the utility of the list or bundle C. The utility value $U(C)$ depends on how big each of the consumption amounts is in the bundle C: The greater the consumption C, the higher the utility $U(C)$. With $U(C)$ being the utility associated with C, economic harm is any act that wrongfully lowers the utility number $U(C)$.

The distinction between consumption amounts and the utility of consumption is subtle but also important. Society's collective consumption bundle C is made up of many items: It may include a dozen eggs for the

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[10] For many goods, like pizza, there is increasing benefit from consuming more and more units on a given day, but if one consumes too much then overall benefit can drop. For these goods, we say that people reach a satiation point, beyond which consumption is pointless and may be harmful. The existence of such goods raises some interesting issues of business liability, such as cases where a business causes someone to consume beyond their satiation point; see the exercises at the end of this chapter.

Smith family, four pairs of pants for the Gomez family, and so on. The utility $U(C)$ of consumption is a single number value that measures the benefit of consumption to society. There are many possible ways to formulate society's utility function, but the form is less important than the underlying principles, which include the following:

1. Utility rises when goods' consumption amounts C rise.
2. Utility is the same regardless of the units in which consumption C is measured.
3. Utility is the same if consumption amounts by different people are switched.
4. Utility rises at a decreasing rate as a person's consumption of a specific good continues to rise.

The first utility principle says that more is better, the second says that the relevant amount of a good—for utility purposes—is the same when measured in pounds or kilograms, and so on. The third principle is egalitarianism: Society benefits from each person's consumption in the same way. The fourth principle, also called diminishing marginal utility, says that society's benefit—from any one person's consumption of any one good—is positive but grows by smaller amounts as the consumption level gets larger and larger.[11]

> ### Example 2.1 Robinson Crusoe
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> Robinson Crusoe is shipwrecked on an island whose only other inhabitant is named Friday. Both Robinson and Friday consume just two goods: coconuts and water. Let C be the list of amounts consumed by both, made up of C_{11} = Robinson's coconuts consumed per day, C_{12} = Robinson's water (in gallons) consumed per day, C_{21} = Friday's

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[11] Consider, as a possible utility function, the sum of all quantities of all goods consumed by everyone. This function has properties 1 and 3 but not properties 2 and 4. Also, it suffers from an "apples and oranges" problem: The importance of one unit of health care—for social benefit—may be greater than the importance of one unit of clothing, but these distinctions are voided if utility is based on the sum of all goods' quantities consumed.

coconuts consumed per day, and C_{22} = Friday's water consumed per day. Let the utility of consumption be $U(C) = (C_{11}C_{12})^{0.5} + (C_{21}C_{22})^{0.5}$, which is the sum of person-specific utility terms: $(C_{11}C_{12})^{0.5}$ for Robinson and $(C_{21}C_{22})^{0.5}$ for Friday. By design, here utility follows principles 1, 3, and 4 stated earlier. For principle 2, if water consumption is originally measured in liters rather than gallons, a quick conversion of units will get it restated in terms of gallons, at which point $U(C)$ can again be applied.

Society's utility $U(C)$ of consumption is also called a *social welfare function*.[12] Having earlier dwelled on the idea of social contract, and now introducing a social welfare function, the reader might now suspect that this book is a socialist treatise on businesses' liability to the public. However, that is not the case, as social contracts are colored by their social and political institutions—be they free-market or socialist, and a social welfare function is simply a restatement of the social utility of consumption, with no government-run welfare-for-the-poor program in mind.

Social economic loss is any lowering of society's utility $U(C)$. For example, a nuclear war that wipes out all human life on planet earth also eliminates all utility of consumption, even if some goods remain on the planet. Applying these utility principles, economic loss rises with the amounts of lost consumption opportunities. The amount of loss varies with the number of people affected, but does not depend on who is affected per se.[13] These basic tenets could be set forth without explicitly considering a consumption list C, or a utility number $U(C)$ associated with list C, but an effort toward conceiving a relevant list C and its possible utility values puts the spotlight on numbers, which is worth considering when thinking about business liability, since the risk posed by liability typically comes down to numbers—an amount of money owed.

Turning the principle of economic harm around, consider the Robin Hood story where consumption opportunities are taken away

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[12] The idea of a social welfare function was introduced by Abram Bergson in the research article "A Reformulation of Certain Aspects of Welfare Economics." *Quarterly Journal of Economics*, 52(2), February 1938, 310–34.
[13] This is due to egalitarianism, utility property #3.

from high-consuming manor lords and redistributed to low-consuming peasants. Utility principle #4 implies that this transfer of opportunity makes society better off, and so is an economic boon rather than harm. The traditional Robin Hood story rests on this positive note. In modern society, the threat of such takings and transfers discourages business formation and entrepreneurship, and so robs society of some economic resources. For this reason, transfers of consumption opportunity are social economic losses when they cause economic harm to our society.

A different kind of transfer happens when a manufacturer moves their factory overseas. The U.S. factory closing is a loss of economic opportunity to its workers, but production abroad may be done more cheaply, making consumption cheaper for U.S. households broadly. Shipping jobs overseas entails a transfer of opportunity from a small group of workers to the general public. Internationalization may become a business liability if the net effect on society's collective utility $U(C)$ is to lower it.

Economic loss and business liability can happen even if society's consumption possibilities have not been cut at all. The utility $U(C)$ of consumption depends on consumption levels and also on the ability of goods to satisfy human wants and needs. A company that toxifies the environment may decrease this ability of goods to provide utility, and so lowering the social benefit of consumption itself. In other words, pollution may lower the utility number $U(C)$ even if it does not lower goods consumption C itself.

Externalities

To economists, intoxicants and euphoria-inducing drugs are goods: Many people want them, and they satisfy human "wants." Their consumption generates utility, and so raises the utility number $U(C)$ assigned to society's collective consumption of goods. But recreational drug consumption has further consequences. The Temperance Movement, culminating in the Prohibition ban of alcohol in the 1920s, argued that the abusive behavior of drunks created suffering for others that outweighed the drinker's pleasure in drinking. In economic terms, while an increase in alcohol consumption raises society's utility $U(C)$, drunks' abusive behavior causes injury to others that lowers their achievable happiness and so may lower utility. At

the extreme, a drunk who kills someone has ended the victim's chance to consume anything, and so voided their contribution to utility $U(C)$.

The Prohibition of alcohol in 1920, and its subsequent relegalization in 1933, involves a complex relationship between goods and economic harm. Alcohol can carry negative externalities—*costs to people not involved in an activity*—when the alcohol is consumed. This is a negative externality in consumption. Many manufactured goods carry instead negative externalities in their production, due to pollution created in the manufacturing process. All negative externalities are social losses.

For goods with negative externalities, an increase in consumption may actually be bad—lowering society's utility $U(C)$—because of negative spillover effects. If a business causes a loss of opportunity to consume such goods, it is not necessarily liable for economic harm. A furniture company whose delivery truck runs off the road demolishing a crystal methamphetamine drug lab is not liable since crystal meth's consumption carries large negative externalities and societal loss.

Some goods, such as education, carry positive externalities—*benefits to people not involved in the activity*, raising society's utility $U(C)$. All positive externalities are social benefits, and when goods carrying them are lost the societal harm is greater than in their absence. Mining activity in a rural community that causes the local grade school building to collapse entails a loss of positive externalities for the community. This loss would not exist if instead mining collapsed the local bar.

Market Principles

Example 2.2 Farm Loss

To illustrate the markets in their relation to economic loss, suppose a crop duster mistakenly spreads weed killer on a farmland instead of insecticide, ruining the season's soybean crop. The farmer loses the opportunity to harvest and sell the soybeans in the marketplace. The farmer does not know exactly how many beans would be in the crop, or the price at which they would have sold, but seed purchases and historical crop yields provide a crop estimate, and typical prices in local markets proxy for the actual price at which the crop would have sold.

Determining business liability—due to economic loss—requires clear answers to two questions: What economic opportunity has been lost? What mechanism may exist to restore the opportunity? The marketplace, as a mechanism, is pivotal. I will list and discuss six basic properties of markets, useful in estimating business liability. The first is:

1. *Goods that provide the same utility sell at the same price.*
   In the farmer example, while the soybeans that the farmer *would* have grown cannot be priced, comparable soybeans—providing the same utility—can be priced. Similarly, if a home is destroyed by fire due to a faulty electrical work, the price that the home *would* have commanded is unknowable, but the price of comparable homes can be determined, as can the home's replacement cost.

   Complex cases of economic harm can involve losses of multiple economic opportunities. If a CEO is wrongfully terminated by a company's board of directors, the CEO may lose pay that includes salary for current and future years, plus bonus items like stocks and stock options. To handle such cases, we have a second market property.

2. *Baskets of items can be bought piecewise.*
   For the CEO, the items of concern include a stream of salary payments and a bonus-related portfolio of stocks and options. To estimate liability, the different items can be valued separately and then combined at the end.[14]

   When using markets to determine compensation for economic harm, one must use the right market or, when there is ambiguity, information on several markets. A key consideration is that markets at different locations can work differently, and have different outcomes, our third market property.

3. *Market outcomes vary across region.*
   For example, housing prices in Los Angeles, California, are higher than in Atlanta, Georgia, even for identical houses on identically

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[14] Market principles need not apply in every case. In the grocery store the price per bottle for two bottles of ketchup may be less than the price for each bottle if bought separately, so not all baskets of items can be bought piecewise at the same price.

sized lots. This is because the utility afforded by a house in Los Angeles is greater than one in Atlanta: The former supports a life with greater opportunity than does the latter. Similarly, a CEO who loses job in New York City might be expected to get a higher salary on their next job there than if they lived in Miami, Florida.

Some economic harms, like the case of the ruined soybean crop, are one-shot events, while others involve a sequence of losses over time. The fired CEO loses salary now, but possibly also for some time in the future.[15] To determine economic harm and business liability that unfold over a period of time, we can consider a sequence of market outcomes. Adding a time dimension complicates matters because things change over time, our fourth market property.

4. *Market outcomes vary over time, and cannot be perfectly predicted.*
The number of years that a CEO might have continued to work, but for wrongful termination, cannot be perfectly predicted. In general, assessments of business liability should be stated in terms that make clear the uncertain nature of future market outcomes. Despite uncertainty, we can estimate future outcomes, and so estimate economic loss and business liability.

For economic loss that unfolds over time, loss of goods or opportunity at later dates is worth less than loss at earlier dates, our market property #5.

5. *Goods that arrive later are worth less than those that arrive sooner.*
Put differently, the value of future goods is at a discount, relative to current goods, with bigger discount at farther points in the future. The reason for this discounting is that people prefer to receive goods and opportunity sooner rather later. As a consequence, for a CEO whose wrongful termination causes a loss of earnings ability equal to $500,000 for each of the next 10 years, the market value of the earnings in the first year is more than the value of earnings in the second year, and so on. The economic loss, represented by earnings loss, is not $500,000 times 10 years—or $5 million, but something less than that, owing to the discounting of future earnings.

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[15] Even if the CEO finds a new job quickly, the new job may pay less, in which case the pay gap (before versus after) may extend into the future.

Future market outcomes are uncertain, and uncertainty in the arrival of goods makes them less attractive, our sixth market property.

6. *Goods with less certain arrival are worth less than those with more certain arrival.*

If a good is less certain to arrive in the future, then its chance or probability is lower. All else equal, if the probability of goods arrival is lower, then the amount of goods expected to arrive is less.

We have discussed the way in which markets generally work, but have not said whether markets are a very good institution. Economic theory suggests that they are, our seventh and last market property,

7. *Markets are a socially desirable way to allocate society's resources and distribute its goods, most of the time.*

The idea here is that markets provide society with opportunities which, if used wisely, usually provide socially desirable outcomes. More precisely, a marketplace with many buyers and sellers tends to provide a Pareto optimal outcome achieving the highest possible social utility or welfare, and best allocation of resources for society, except in special circumstances. This tenet of economic theory is sometimes called the First Fundamental Welfare Theorem. The theory does not apply in some special circumstances, including cases of markets having very few buyers or sellers, markets for goods that have some externality in their production or consumption, markets with significant frictions or transaction costs, and goods for which markets cannot effectively be formed, such as national defense—a type of public good.

Having discussed some market principles, it is possible to consider how these principles might color or modify the implicit social contract between a business and society at large, and so color business liability. The way that markets work, or do not work, says something about rights and responsibilities, which in turn determine a business's liability. Later in Chapter 3 we will also consider how market principles can be used to determine reasonable compensation for economic harm caused by businesses.

Economic Damages and the Legal System

Markets are an important institution that colors the social contract binding a business to society, and the legal system is another important institution. Chapter 1 briefly surveyed the legal system. For businesses, the courts have the final say over liability for economic loss. In a court case, in which a plaintiff sues a defendant, economic damages are *economic losses that the court finds that the defendant wrongfully imposed on the plaintiff*. If there exist economic damages, they imply wrongful behavior by the defendant, in violation of the law. If a court finds that a business caused economic damages to some person or group, the business is liable to pay them the damages amount specified by the court.[16] The difference between economic loss and economic damages is the legal weight and finality associated with the latter. The title of the book is *Business Liability and Economic Damages*, and the fact that economic damages are involved means that liability is viewed in terms of its economic and legal ramifications.

The role of economic damages in civil law is to compensate the plaintiff for wrongful economic losses caused by the defendant. Imagine here the scales of justice, with a pile of lost economic opportunity on one side of the scale, and a pile of compensating dollar bills on the other side. If the lost opportunity is the chance to work and earn money, the scales of justice might look as follows:

The way that economic damages are paid by a business is often a lump sum—*an amount of money paid all at once*. They can also take the form of a structured settlement—*an amount of money paid over time*.

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[16] The business can typically appeal the court's ruling, and so distance themselves from liability for a while, but with additional legal costs.

A claim of economic losses against a business is brought to the business's attention first, and only later brought as a lawsuit if the claimant and business cannot settle the matter among themselves. The threat of bringing a loss claim to court can strongly influence the way in which the claimant and business negotiate with each other. Some knowledge of the tort legal system is helpful for the business in the negotiating stage.

Large businesses often have in-house legal staff to help with matters of tort and contract law. Provided that a business holds a liability insurance policy that covers the claimant's loss, the negotiation burden can be largely shifted from the business to its insurer. Insurance companies are experts at negotiating loss claims. They have a team that includes claims adjusters, who gather evidence and negotiate claims, and lawyers. The insurance company's in-house lawyers review a claim—or group of claims—in terms of the insurance policy, evidence of loss, and any case law, statutes, and court settlements that shed light on the likely amount of damages that a court would award for the claimed loss. The adjuster then offers the claimant a settlement amount that may be far less than the potential economic damages, but still within a range which might reasonably be considered consistent with the insurance policy. If the claimant takes the offer, the matter is settled, but if not then more negotiations may ensue.

If no insurance deal is worked out, the claimant can turn plaintiff, escalating matters by hiring a lawyer and suing the business. The mere act of filing a lawsuit may prompt the business's insurer to sweeten their deal to the claimant, but more likely the insurer's legal staff will first closely study the opposing team—including the lawyer for plaintiff, and do some research on the lawyer's qualifications, experience, and success at trial. They may also wait for the plaintiff's team to provide additional evidence of loss, as the plaintiff's lawyer is an expert on evidence—just as the insurer's lawyers are.

Courts often provide opportunities for opposing parties to reach an agreement before trial, via settlement hearings, and most claims of economic loss against business do get settled by this stage. The terms of these settlements are stuck by plaintiff and defense lawyers—in consultation with their clients, and the lawyers have in the back of their minds estimates of the economic damages that the court would hand out at trial.

For this and similar reasons, economic damages are the bottom line for business liability, even though most liabilities get settled before a court ever determines economic damages.

For a business facing an economic loss claim in court, the attorneys for the business and its insurer may hire an economic expert to examine the claim and its foundations. Economics experts, acting as consultants for defense counsel, are especially useful when the claimed economic losses are complex, involving losses over multiple years, or economic opportunities that are harder to quantify. Similarly, plaintiff's counsel may hire its own economic experts.[17] Each expert may prepare a written report, and may provide testimony at deposition—*an interrogation by opposing counsel, while under oath, before trial.* If the case does not settle, the experts may also testify at trial. The author's own experience as economic consultant and expert in court cases inspired the writing of this book, to give businesses a better understanding of how business liability relates to economic damages.

Exercises

1. Economic opportunity is a means of deriving benefit or utility from consuming goods now or in the future. Businesses face liability for economic loss if they wrongly deprive someone of economic opportunity. For each of the following items, explain how it facilitates consumption and how a business may face liability if it causes the item to be lost:

   a. Medicine that extends a person's lifespan.

   b. A worker's pay raise.

   c. Company profit that provides income to employees and the company's owners.

2. Consider the Robinson Crusoe situation in Example 2.1. In that example, Robinson and his neighbor Friday are the only island inhabitants, and consumption C is a list of consumption levels for

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[17] Lawyers may hire various experts who provide opinions on evidence, including economists, accountants, doctors, engineers, life care planners, and vocational rehabilitation counselors.

both people, each consuming coconuts and water. With C_{11} and C_{12} being Robinson's consumption levels for coconuts and water (in gallons), respectively, and with C_{21} and C_{22} being the corresponding consumption levels for Friday, the utility of consumption is $U(C) = (C_{11}C_{12})^{0.5} + (C_{21}C_{22})^{0.5}$.

a. Compute utility $U(C)$ when both Robinson and Friday consume one unit each of coconuts and water, and compare this utility number to that which results from having both Robinson and Friday consume two units each of coconuts and water. Does utility principle 1 (more is better) hold here?

b. Now suppose both Robinson and Friday consume three coconuts daily. They also each consume three liters of water daily. With each liter equal to 0.264 gallons, compute utility $U(C)$. Does utility principle 2 (irrelevance of units) hold here?

c. Compute utility $U(C)$ when Robinson consumes two units each of coconuts and water, while Friday consumes one unit each of coconuts and water. Compare this to the situation where Robinson consumes one unit each of coconuts and water, while Friday consumes two units each of coconuts and water. Does utility principle 3 (interchangeability of people's consumption) hold here?

d. Continuing part b, now compute utility $U(C)$ when both Robinson and Friday consume three units each of coconuts and water, and compare this utility number to that which results from having both Robinson and Friday consume one or two units each of coconuts and water. Does utility principle 4 (diminishing marginal utility) hold here?

3. Consider again the Robinson Crusoe situation in Example 2.1, but suppose that both Robinson and Friday can only eat and drink so much on a given day, else they get sick. In this case, they reach a satiation point at some level of consumption; suppose this happens whenever they consume more than five coconuts or more than five gallons of water. Let the utility of consumption be $U(C) = -(C_{11} - 5)^2 - (C_{12} - 5)^2 - (C_{21} - 5)^2 - (C_{22} - 5)^2$.

a. Compute utility $U(C)$ in the case where both Robinson and Friday consume five units each of coconuts and water, and compare this utility to that which results from their consuming

six units each of coconuts and water. In which situation are they better off?

b. Using this Robinson Crusoe scenario as a metaphor, consider a bar that serves alcohol, and suppose that the typical customer travels to and from the bar by car. Customers who consume more than two drinks per hour run a serious risk of injury if they try to drive home from the bar. Relate the ideas of utility and satiation point to this case, and discuss them in the context of the bar's liability for drunk driving.

4. The vapor store is a relatively new sort of business that offers its patrons the opportunity to buy tobacco-free nicotine dispensed in the form of vapor.

a. Compare the vapor store to a tobacco store, in terms of externalities associated with the products it sells.

b. What sort of business liabilities might a vapor store have in terms of economic costs imposed on the public?

CHAPTER 3

Compensation for Loss

If we will be quiet and ready enough, we shall find compensation in every disappointment.

—Henry David Thoreau

Learning Objectives

1. Describe the court's approach to compensation for economic loss.
2. Apply market principles to derive estimates of economic loss.
3. Estimate economic loss associated with earnings streams.
4. Estimate economic loss associated with options.

Compensation for economic loss is an economic transfer of opportunity, from one party to another. Earlier we noted that economic transfers are, in themselves, often socially undesirable. The reason that transfers work as compensation for economic loss or harm is that they act as a counterbalance that enforces the social contract, generating desirable deterrence for future would-be harm causers.

A modern market-based economy relies on mutually beneficial transactions for the production and distribution of goods. Despite the stark difference between transfers and transactions, markets are vital to achieving transfers that properly compensate for economic harm. If an action by a business wrongfully lowers economic opportunity for some group, a subsequent action in the marketplace may exist that can restore opportunity. The effort and resources needed to carry out the market action are the compensation for economic harm.

To get a better understanding of how much compensation for economic loss a business may face, it is useful to consider in more detail the transfer implied by compensation and also the role of markets in achieving transfers. To this end, we will first consider the court's approach to loss

compensation, and then its connection to market principles. We will use market principles extensively to develop some formulas for market prices that can be used to determine compensation for economic loss. Formulas are not everyone's favorite subject, and the reader will notice that the complexity of formulas increases as we move through the chapter. If at some point the formulas look more like modern art than a computational tool, that is okay; the important point is that there are some commonly used formulas for estimating economic loss compensation, and that those formulas are built up from a simpler set of economic principles.

The Court's Approach to Loss Compensation

For a business that faces a liability claim that has made it to the court via a lawsuit, the court must determine an amount of loss compensation, if any, either a lump sum of money or a structured settlement. In this chapter we will focus on the lump sum approach, and assume that the business has been found liable.[1] If the trial is a bench trial then the judge sets the amount of compensation, including any economic damages, while in a jury trial the jury sets the compensation unless the judge intervenes.

Exactly how much should a court charge a business as compensation for wrongful economic loss caused by the business? In any given trial, many factors may influence the ultimate amount of compensation decreed by the court, including the background of jury members, the likeability of the plaintiff and the defendant, and the conduct and demeanor of the lawyers arguing the case. A possible guiding principle is to suppose that the court tends to produce a form of social justice, which maximizes social welfare in the wake of a business's wrongful act. Implicit in this reasoning is that the wrongful act does indeed reduce social welfare.

Recalling our discussion of utility and social welfare in the previous chapter, if a business injures someone, then the overall societal utility of consumption $U(C)$ falls, thereby lowering social welfare. If the business is ordered by the court to pay the injured person some money, this results in fewer consumption possibilities by the business's owners and more

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[1] In Chapter 4, we will turn to the question of whether or not a business is liable at all.

consumption possibilities by the injured person. Ceteris paribus, such a transfer of consumption opportunities need not improve the overall societal utility of consumption, and may instead lower it. However, the court can also factor in the fact that mandated payments for wrongful economic loss are likely to discourage similar wrongful acts in the future, providing a deterrent that results in fewer injuries and an increase in societal utility or welfare.

The best possible compensation rule that the courts could muster might ideally maximize social utility $U(C)$ by handing out additional dollars of compensation till the last dollar of transfer creates a small drop in social utility while the additional deterrence creates a small increase in social utility, with the two effects exactly offsetting each other. This sort of thought experiment can be framed in terms of social utility numbers $U(C)$, but only in very abstract terms, and with great complexity.[2] As a transfer of consumption from a rich company owner to a poor injured person may end up raising the utility of short-term consumption over-all—due to the Robin Hood effect on social welfare—a court trying to maximize or optimize social utility might force a very rich company to pay more than a less rich company, but this would neglect the possible long-term consumption consequences of economic transfers from the richer to the poorer, which include a disincentive for entrepreneurs to innovate and get rich, thereby lowering economic growth and consumption prospects for everyone.

A court trying to achieve social justice should consider the short- and long-term societal consequences of a given award for economic damages, but as a practical matter the goal of numerically maximizing a social utility function $U(C)$ in a given court case is hopeless, even if the judge or jury were to enlist a staff of economists and legal scholars to assist in the effort.

The idea of social welfare, and also the idea of some sort of social contract that binds a business to the community, are likely relevant and

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[2] Alternatively, the court might choose a value for economic compensation that achieves the lowest cost to society, but if such costs ultimately rely on utility arguments then the result should be the same as when the court tries to maximize social utility or welfare $U(C)$.

fruitful reference points, but these are not enough to tally compensation for economic loss. Instead, some simplification must be added to the mix.

A simplifying assumption is that the court is interested only in the utility or welfare of the person suffering an economic loss, and that the court acts so as to restore that person to the utility level they had before being wronged.[3] The court must still know enough about the wronged party to assess their utility of consumption—possibly at all dates and in all states of nature, which may prove impossible. But it is also common sense that if a person first loses a good and then receives it back, their utility level first drops and then goes back to its original level.[4] Given this observation, in many cases the court need not know so much about the wronged party, only what sorts of economic opportunities they have lost. If these economic opportunities can be bought in the marketplace, the cost of that purchase can represent a reasonable compensation for economic loss.[5]

Markets as an economic institution provide a means of tallying compensation for economic loss, with some hope of a socially just result. Courts can attempt to harness or mimic this institution and achieve results that might otherwise be considered desirable from an economic standpoint. In the previous chapter we mentioned the first fundamental welfare theorem of economics, which states that markets typically provide society with opportunities which, if used wisely, provide socially desirable outcomes. Markets can provide Pareto optimal outcomes for society—achieving the highest possible social utility, except in special circumstances.

If markets provide socially optimal outcomes, and if compensation for economic loss can be likened to some market transaction, then there is hope that courts can optimally rely on market principles to determine compensation. The idea here is that the court adds a market

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[3] This is one interpretation of the "make whole" principle in tort law; see the following discussion.

[4] While common sense, it may be that an injured party's utility cannot be restored to its pre-injury level, as when a commercial truck causes catastrophic and permanent injury to another driver on the road.

[5] Even if the specific economic opportunity is not available for sale in the marketplace, there may be a close substitute available.

transaction—or something like it—that was missing from those already taking place to get a plaintiff paid by the defendant. Adding some missing pieces like this to the market puzzle may allow markets themselves to be closer to socially optimal. If so, the court can hand out loss compensation that really does some good—as much good as might be hoped for, most of the time.

The idea that courts serve to complete the market system, and save society from a not-so-optimal outcome, is somewhat artificial or naïve but not a bad starting point in thinking about the court's social impact when tallying economic compensation in tort and contract disputes.[6] A possible objection to this view is that whatever market transactions the courts might deliver could be achieved by society without a court system, provided that businesses and everyone else could negotiate deals of compensation prior to any economic harm. Implicit in this view is the assumption that the social contract—or all the rights and responsibilities it signifies—is clearly and comprehensively known to everyone, and that frictionless markets can be set up to handle every possible situation of economic harm. The impracticality of this complete set of frictionless markets leaves a gap in the economic web, which the courts can usefully fill—at least in principle.

The particular way that the courts approach economic compensation depends on the area of law in question. In tort cases, a common approach is the make-whole principle—*the legal principle whereby a wrongdoer should make the wronged party "whole"*—that is restore them as nearly as possible to the condition they were in before they were wronged. This approach may deliver outcomes that resemble a market transaction if the process of making the wronged party whole is to deliver them the

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[6] In stark contrast to this idyllic rational economic interpretation of the court's approach to liability and economic damages is the "reptile theory of trial strategy" in which the plaintiff's lawyers may try to appeal to the reptilian part of jurors' brains and shock them into focusing on public safety rather than economic losses in a particular case. While a popular tactic, defense lawyers are now used to dealing with it. On the whole, the idea of a rational and economics-oriented court remains a central theme in the law and economics school of thought, and is a fruitful perspective on cases of business liability.

opportunity to buy goods at market prices. In some cases, as when a tabloid magazine slanders or defames a movie star, the harm cannot be undone in an obvious way, and the make-whole principle can produce only a monetized interpretation of what was lost, but with this stricture the court can still pursue the make-whole principle.

In contract dispute cases the court's approach to resolving the dispute is typically to compel the parties to follow the court's interpretation of the contract, and to compensate any party that has suffered a wrongful loss due to contract breach. Written contracts can be lengthy, but if they cover complex situations that will happen in the future, then it is nearly impossible to specify in the contract how each party should act in all future situations. Without clear guidance from the contract, the parties may interpret the contract differently and take actions whose fidelity to the contract becomes disputed, triggering a lawsuit. The court, by interpreting the parties' actions in light of the contract and the law, may be able to arrange economic compensation that simulates a market trade or sale of those economic opportunities lost by contract violation.

The Market Approach to Loss Compensation

If a business wrongfully imposes a loss of economic opportunity on some person or group, and if that economic opportunity can be valued via market principles, then the court can set loss compensation equal to the market value. With this approach, the court essentially orders a purchase of economic opportunity by the business from the injured or wronged party. In reality, the purchase does not take place in a market, and in fact there is payment but not a purchase in the usual sense. Nevertheless, the market principle has theoretical appeal—as previously discussed—and may also be quite pragmatic.

To that end, the legal system awards compensation for economic loss, paid from the offender's pocket, to achieve the best economic outcome—which in principle is the highest utility $U(C)$ of consumption for society as a whole. If a business causes a wrongful loss of economic opportunity to some group of people, fair compensation will transfer that loss to the offender.

Example 3.1 Farm Loss, Continued

To illustrate the market-based model of compensation, suppose a crop duster mistakenly spreads weed killer on a farmland instead of insecticide, ruining the season's soybean crop. The farmer loses the opportunity to harvest and sell the soybeans in the marketplace. The farmer does not know exactly how many beans would be in the crop, or the price at which they would have sold, but seed purchases and historical crop yields provide a crop estimate, and typical prices in local markets proxy for the actual price at which the crop would have sold. Multiplying expected price times expected quantity, we get an estimate of the farmer's lost revenue. The lost revenue estimate is based on a hypothetical market transaction.

If not for the wrongful crop destruction, the farmer would have had to use resources to further cultivate the crop, harvest it, and deliver it to the market. The lost economic opportunity is the farmer's lost profit—*revenue minus cost*. While the profit that the farmer would have received is not exactly known, we can estimate it as expected revenue minus expected cost. Nationwide and regional data on soybean prices, yield per acre, and costs are available. Given such data, plus information from the farmer's business and tax records, suppose that the farmer had planted 1,000 acres, with an expected crop yield of 30 bushels per acre, such that each bushel would sell for $14. Suppose also that costs of further maintaining, harvesting, and delivering the soybeans would be $90 per acre. Revenue, based on these inputs, takes the form

$$\text{revenue} = \text{acres} \times \left(\frac{\text{bushels}}{\text{acre}} \right) \times \left(\frac{\text{price}}{\text{bushel}} \right)$$

Plugging in assumed values for acres and so on, expected revenue is

$$\text{revenue} = 1000 \times 30 \times 14 = \$420{,}000$$

Similarly, expected cost is

$$\text{cost} = \text{acres} \times \left(\frac{\text{cost}}{\text{acre}} \right) = 1000 \times 90 = \$90{,}000$$

The expected profit is then revenue minus cost

profit = revenue – cost = 420,000 – 90,000 = $330,000

The farmer's lost economic opportunity is $330,000, and this is the crop duster's liability for economic harm.

In the farm example (Example 3.1), a market transaction plays a pivotal role in determining business liability. The transaction itself is hypothetical: The farmer never gets to sell soybeans at the market because the crop was ruined by the crop duster. The transaction is relevant, though, because the farmer—but for the crop disaster—would likely have brought the soybeans to the market. The steps in getting the dollar value $330,000 for business liability are illustrative, and they leave out supporting details needed for a real-life harm assessment. A full assessment would cite evidence from relevant business documents and market reports, and would include discussion of various ways to figure costs.[7]

Price Formulas

We can use market principles, as spelled out in Chapter 2, to estimate the business liability of economic loss, and for this it is helpful to state some of these principles as formulas. We will be getting to one such formula, labeled Equation 3.9, that shows the price of a set of scheduled earnings or payments, otherwise known as an earnings stream. This is an asset pricing formula, which is valid under fairly general conditions, but also takes some patience to understand.[8] We will get there by first developing some simpler pricing formulas.

The second of the market principles in Chapter 2 is familiar to all who shop at a grocery store: Items in the shopping basket can be bought all at

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[7] In Chapter 3, we will discuss evidence and proof of economic harm.

[8] In the literature on asset pricing, this formula is sometimes called the law of one price. Different statements of this fundamental result include equation (22.2) of *Principles of Financial Economics* (by Stephen Leroy and Jan Werner 2001, 228), equation (5.14) of *Asset Pricing Theory* (by Costis Skiadas 2009, 150), and the equation on page 26 of *Asset Pricing* (by John Cochrane 2001).

once, or individually. While obvious, the principle is also powerful and usefully stated as a formula

$$\text{price(basket)} = \text{price(item}_1) + \text{price(item}_2) + \ldots + \text{price(item}_n) \quad (3.1)$$

A delivery truck that tips over and destroys 10 different cars has destroyed a basket of goods, and business liability for the basket equals the sum of prices for all 10 cars.[9]

Items in a basket of goods may not all have known prices, in part because some goods may be held in quantities for which prices are not normally assigned. A delivery truck that overturns and destroys a van carrying 20 computers has caused a loss of value, but the price for a batch of 20 computers is not normally posted. Instead, the price per computer is posted, and the price for a batch is the price per computer times the number of computers. For a basket of n items, each of which represents a quantity of a good, let $q_1, q_2, \ldots q_n$ be the quantities of the different goods. The price of the basket is then the sum of "price times quantity" for each item. Denoting by the prices $p_1, p_2, \ldots p_n$, the basket's pricing formula is

$$\text{price}(q_1, q_2, \ldots, q_n) = p_1 q_1 + p_2 q_2 + \cdots + p_n q_n \quad (3.2)$$

For economic harm that unfolds over time, our fifth market principle says that a good scheduled to arrive in the future is worth less, today, than the same good arriving now. Scheduled future arrivals are at a discount, relative to current arrivals. Let us state this as a formula

$$\text{price}\left(\text{item, arriving in t periods}\right) = \text{price}\left(\text{item, now}\right) \times \text{discount}(t)$$

$$(3.3)$$

where discount(t) is the relevant discount factor, determining the amount of discount applied to items scheduled to arrive t periods from now. A discount factor equal to 1 means that future scheduled arrivals are undiscounted, relative to current arrivals. A discount factor less than 1 means

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[9] On the right-hand side of this formula is the number (3.1) that labels it. I will sometimes refer to formulas by their labels, when applying them later on.

future arrivals are discounted, which is usually the case. If, say, the discount factor equals 0.99 for goods arriving 1 period from now, they are worth less than current goods by an amount of 1 – 0.99 = 0.01 or 1 percent.

To determine appropriate discount factors, we can use posted prices in the market for riskless zero-coupon bonds. For a bond promising payment of $1,000 after t years, the face value is $1,000. The discount factor, discount(t), is then the ratio of the bond's current price to its face value. Generally, the formula is

$$\text{discount}(t) \; = \; \frac{\text{price}(\text{bond})}{\text{facevalue}(\text{bond})} \tag{3.4}$$

While the discount factor formula (3.4) is often handy enough, market outcomes for bonds are sometimes stated in terms of yields rather than prices. With r_{f0t} being the yield to maturity on a zero-coupon risk-free bond issued at time 0 and maturing t periods in the future, we can restate our discount factor in terms of bond yields

$$\text{discount}(t) \; = \; \frac{1}{\left(1 + r_{f0t}\right)^t} \tag{3.5}$$

Let us apply what we have learned so far to determine the economic harm caused by destruction of a stream of values in future years. Let y_t be the value at time t of goods that were scheduled in that period, if not for economic harm. Using our formulas (3.2), (3.3), and (3.5), the harm associated with future losses is

$$\text{price(stream)} = \sum_{t=1}^{T} \frac{y_t}{(1 + r_{f0t})^t} \tag{3.6}$$

For example, a factory's accidental toxic spill may destroy a farmer's ability to plant crops for 10 years, and the economic harm includes profits y_t that would have been earned in each future year.

Business liability for economic harm is greater when the market discounts future earnings less, with lower bond yields r_{f0t}. Conversely,

liability is less when yields are higher. Over time, bond market conditions change and yields drift up and down, and these economic fluctuations affect business liability—particularly for economic harm that extends farther into the future.

Risk

We do not know exactly what will happen in the future, and economic harm is a business liability that is often not exactly known either.

Risk-Neutral Preferences

A simple way to handle uncertainty is to base projected future losses on expected values. Let $E[y_t]$ represent today's expected value of an uncertain future value y_t.[10] The risk-neutral preference model, for pricing earnings streams, is

$$\text{price(stream)} = \sum_{t=1}^{T} \frac{E[y_t]}{(1 + r_{f0t})^t} \qquad (3.7)$$

With risk-neutral preferences, uncertainty about the future affects price only through its effect on expected values $E[y_t]$. This pricing model is appropriate if risk in the future earnings stream is considered unharmful, as is the case if such risk can be fully diversified by savvy investors.[11]

Liability is big if a business causes the loss of a superstar's salary for a year, but it can also be big if an ordinary salary is lost for a long period

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[10] With y_t being a random variable and unknown today, the expected value $E[y_t]$ is nonrandom and known today. In the language of probability and statistics, $E[y_t]$ is the mean value of random variable y_t. If y_t can take only one of finitely many possible values, then $E[y_t]$ is the probability-weighted average of those values.

[11] Another interpretation of risk-neutral asset pricing is that the relevant market participants have perfect foresight about future market conditions, resulting in perfect foresight equilibrium. For discussion see "The Value of Future Earnings in Perfect Foresight Equilibrium" (*Journal of Forensic Economics*, Volume 21, Number 1, 2010) by the author (Scott Gilbert).

Example 3.2 Pop Star Loss

In an economy with a single future year of earnings ($T = 1$), let the interest rate be 5 percent, and suppose that an advertising company does economic harm to a client—a popular music performer—in terms of future earnings, with a future loss equal to $1 million with 50 percent chance, and $2 million with 50 percent chance. Suppose also that the earnings risk is fully diversifiable, and hence disregarded by financial markets. Applying the risk-neutral preference model (3.7), the current price of the lost future earnings is

$$\text{price(stream)} = \frac{E[y_1]}{(1 + r_{f01})}$$

Expected earnings are

$$E[y_1] = \text{prob}(y_1 = 1) \times 1 + \text{prob}(y_1 = 2) \times 2$$

and since the probabilities $\text{prob}(y_1 = 1)$ and $\text{prob}(y_1 = 2)$ are each ½, $E[y_1] = 1.5$. The riskless bond yield r_{f01} is just the interest rate, equal to 0.05, so the price of future earnings is

$$\text{price(stream)} = \frac{1.5}{(1 + 0.05)} = 1.43$$

Business liability, due to economic harm, is then $1.43 million.

of time. For example, when a business causes physical injury to someone, making them unable to continue working, the economic loss extends to the end of their expected working life. To evaluate the dollar amount of economic loss in such cases, one can use the pricing model (3.7) together with some assumptions of the expected amount of future earnings and the yields on short- and long-term riskless bonds.

Example 3.3 Blue Collar Loss

A construction worker is injured on a job site by a cement truck with a faulty cement chute. The injury is disabling, preventing future work. The worker's earnings would have been expected to grow by 3 percent each year, for the next 30 years. The yield on riskless bonds is 2 percent for future years 1 through 15, and 4 percent for future years 16 through 30. Applying formula (3.7), economic loss associated with future earnings is

$$\text{price(stream)} = \sum_{t=1}^{15} \frac{30,000 \times (1.03)^t}{(1 + 0.02)^t} + \sum_{t=16}^{30} \frac{30,000 \times (1.03)^t}{(1 + 0.04)^t} \quad (3.8)$$

The expression (3.8) involves the sum of 30 year-specific numbers. The calculation can be done using a pocket calculator, but a computer and high-precision mathematical software are more efficient and less prone to error. In this and all subsequent examples in this book, the author uses Stata software to set up calculations and create tables of results.

Table 3.1 shows the year-by-year expected earnings, for early years $t = 1, 2,\ldots,5$ and later years $t = 26, 27,\ldots,30$, with earnings in a given year equal to $30,000 \times (1.03)^t$. It also shows the discount factor for each year, equal to $1/(1 + r_{f0t})^t$, by which expected earnings are reduced to expected loss in each year.[12] The final column shows the cumulative loss in each year, equal to the losses in that year and all previous years. The final value in the cumulative column is the total loss, equal to $847,607.

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[12] That is, "expected loss" in Table 3.1 equals "expected earnings" times "discount factor."

Table 3.1 Economic loss, blue collar worker

Year	Expected earnings	Discount factor	Expected loss	Cumulative loss
1	30,900	0.98	30,294	30,294
2	31,827	0.961	30,591	60,885
3	32,782	0.942	30,891	91,776
4	33,765	0.924	31,194	122,970
5	34,778	0.906	31,500	154,470
...	...	...	...	...
26	64,698	0.361	23,336	756,486
27	66,639	0.347	23,111	779,597
28	68,638	0.333	22,889	802,487
29	70,697	0.321	22,669	825,156
30	72,818	0.308	22,451	847,607

Risk-Averse Preferences

Some value streams carry risk that could not be diversified away by investors who spread money across many earnings streams. Such risk is called undiversifiable, or systematic, risk. The risk-neutral preference model tends to overprice earnings streams that carry systematic risk. The presence of such risk makes the streams less attractive, and the model misses this. The model can be generalized to account for systematic risk, as follows

$$\text{price(stream)} = \sum_{t=1}^{T} \frac{E[w_t \, y_t]}{(1 + r_{f0t})^t} \tag{3.9}$$

where w_t, $t = 1,2,\ldots,T$ are random weights, the same for all earnings streams. The weights w_t take on positive number values, and like y_t are uncertain, but their expected value is always the same and equal to 1.[13]

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[13] That is, $E[w_t] = 1$. The reason for this restriction is that, for riskless earnings streams the expected product $E[w_t y_t]$ equals the product $E[w_t]E[y_t]$ of expected values, and since the risk-neutral model (3.7) then holds, a match of equations (3.7) and (3.9) requires $E[w_t] = 1$.

The pricing model (3.9) is general in the sense that it does not rely on risk-neutral preference toward risk. It is also more complicated, owing to the presence of expectations and the weight variable, but the extra effort is worthwhile when there is important uncertainty about future earnings.

To further interpret the general pricing model, for each future period t one can interpret the expected value $E[w_t\, y_t]$ as the *certainty equivalent* of risky earnings y_t—*the amount of certain, or sure, earnings that a risk-averse investor would be willing to accept in trade for risky earnings*. If y_t is unrelated to systematic risk then the certainty equivalent of y_t coincides with its expected value $E[y_t]$. If instead y_t is related to systematic risk then its certainty equivalent $E[w_t\, y_t]$ may fall below $E[y_t]$ or exceed it, depending on whether the risk relationship is negative or positive.

The random weights w_t in the pricing model (3.9) reflect investors' attitudes toward risk. The relationship between w_t and y_t determines the impact of risk on the present value of earnings. For risky earnings in a future year t, if the certainty equivalent $E[w_t\, y_t]$ equals expected earnings $E[y_t]$, then the weight variable w_t and earnings variable y_t are *uncorrelated—having no linear statistical relationship with each other*. On the other hand, if the certainty equivalent falls below expected earnings then the weight and earnings variables are negatively correlated—having a negative linear relationship. If the certainty equivalent exceeds expected earnings then the weight and earnings variables are positively correlated.

Example 3.4 Blue Chip Loss

Let the setup be the same as in Example 3.2, but suppose the advertiser's economic harm is to a Blue Chip big business client rather than a pop music star, and that all earnings loss is systematic and undiversifiable. Investors fear systematic risk, and this causes the price of future earnings to be less than the risk-neutral value 1.43 found in Example 3.2 without such risk.

To price the risky earnings, consider what a reasonable person or institution would pay for the opportunity to collect next year either $1 million or $2 million, each with 50 percent chance. The riskless financial alternative pays 5 percent interest. Is $1.25 million a

reasonable price for the risky earnings opportunity? It is cheaper than the $1.43 million risk-neutral price, by 13 percent. This risk discount is a substantial reduction in liability for the advertising company that caused the earnings loss. Whether it is cheap enough, to adjust for risk, depends on how much people fear financial risk—we will return to that point later on.

Right or wrong, the $1.25 million price for future risky earnings is consistent with the general pricing model (3.9). To show this, it is enough to find values for the random weight variable w_1 such that a price of 1.25 on the left side of Equation 3.9 matches the value on the right side. Let s_1 and s_2 denote the two random outcomes, or "states of nature," with future earnings of $1 million in the first state and $2 million in the second state. The random weight w_1 takes on two possible values, the first in state 1 and the second in state 2, denoted by w_{11} and w_{12}, respectively. Similarly, let y_{11} and y_{12} be the state-specific values of random future earnings y_1. The general pricing model provides the formula

$$\text{price(stream)} = \frac{\text{prob}(s_1 = 1)w_{11}y_{11} + \text{prob}(s_2 = 1)w_{12}y_{12}}{(1 + r_{f01})} \tag{3.10}$$

Plugging in values for price, probabilities, the interest rate, and state-specific weight and earning values, formula (3.10) reduces to an equation in the weight values w_{11} and w_{12}

$$1.25 = \frac{\dfrac{1}{2}w_{11} \times 1 + \dfrac{1}{2}w_{12} \times 2}{(1 + 0.05)} \tag{3.11}$$

There are infinitely many pairs of numbers (w_{11}, w_{12}) that satisfy condition (3.11), but not all fit the situation at hand. The weight's expected value equals 1, by assumption, in which case

$$E[w_1] = \text{prob}(s_1)w_{11} + \text{prob}(s_2)w_{12} = 1$$

The two state probabilities are each assumed to be equal to ½, and so the weight values must satisfy

$$\frac{1}{2}w_{11} + \frac{1}{2}w_{12} = 1 \qquad (3.12)$$

The two weight restrictions (3.11) and (3.12) have a single common solution, this being

$$w_{11} = 1.38, \; w_{12} = 0.63 \qquad (3.13)$$

These weight values are positive, and otherwise fit the setup of the general pricing model.

Table 3.2 summarizes the inputs to the pricing exercise, with risky and riskless earnings in different states, and random weights. With this specification the model implies a price of $1.25 million for random future earnings.

Table 3.2 Earnings and returns, risky and riskless

State	Probability	Riskless earnings	Risky earnings	Random weight	Riskless return	Risky return
1	0.5	1	1	1.38	0.05	−0.2
2	0.5	1	2	0.63	0.05	0.6

The output of the pricing formula (3.10) is a price for earnings streams. To understand this conversion of inputs to output, restate the formula in terms of the risky earning's certainty equivalent

$$\text{price(stream)} = \frac{E[w_1 y_1]}{(1 + r_{f01})} \qquad (3.14)$$

With the expression $E[w_1 y_1]$ being the certainty equivalent of risky earnings y_1

$$\text{E}[w_1 \, y_1] = \text{prob}(s_1)w_{11}y_{11} + \text{prob}(s_2)w_{12}y_{12} \qquad (3.15)$$

Plugging in unknowns, earnings' certainty equivalent is

$$E[w_1 y_1] = \frac{1}{2}(1.38)(1) + \frac{1}{2}(0.63)(2)$$

which equals 1.344. By comparison, expected earnings are

$$E[y_1] = \frac{1}{2}(1) + \frac{1}{2}(2) = 1.5$$

a larger number: Earnings' expected value exceeds its certainty equivalent. A seemingly different, but logically equivalent, statement is that the weight variable w_1 and earnings variable y_1 are negatively correlated. This negative correlation exists since the weight variable's value is higher in state 1 than in state 2, while the opposite is true of the earnings variable—the weight and earnings variables move in opposite directions.

Business liability for the loss of future earnings is lowered by the presence of systematic risk, by an amount of $1.43 – 1.25 = $0.18 million. Risk causes earnings' certainty equivalent to be less than its expected value, and this in turn lowers the price of future earnings. Risk also causes the weight variable w_t to be negatively correlated with earnings, an equivalent condition that again lowers earnings price.

A lower price for future earnings makes them more attractive, all else equal. It also raises the return on investment, this being profit (earnings minus price) divided by price

$$\text{return} = \frac{\text{earnings} - \text{price}}{\text{price}}$$

In Table 3.2, riskless earnings equal $1 million in each state of nature. The market price of the riskless opportunity is 0.95, so the return is $(1 – 0.95)/0.95 = 1.05$ in each state. On the other hand, risky earnings equal 1 in state 1 and 2 in state 2, and with price being 1.25, the investment return is $(1 – 1.25)/1.25 = –0.2$ in state 1 and $(2 – 1.25)/1.25 = 0.6$ in state 2.

*Table 3.3 Mean and standard deviation,
earnings, and returns*

Variable	Mean	Standard deviation
Riskless earnings	1	0
Risky earnings	1.5	0.5
Riskless return	0.05	0
Risky return	0.2	0.4

Earnings opportunities are more attractive when their expected returns are higher. The expected return, also called mean return, is the probability-weighted sum of return values, analogous to expected earnings. Expected returns are higher when expected earnings are higher and when the earning stream's price is lower.

For the Blue Chip case (Example 3.4), Table 3.3 shows mean earnings and returns for the riskless bond and risky business earnings. The mean return is higher for the risky opportunity than for the riskless one. The difference here between the risky and riskless returns is 0.2 – 0.05 = 0.15, or 15 percent, a *risk premium* for bearing risk. Compared to a broad portfolio of risky assets, a 15 percent risk premium is pretty high. Commonly cited risk premium values, for stock portfolios, are in the range of 5 to 10 percent.[14] If in fact the Blue Chip company's earnings are synonymous with systematic risk, then a 15 percent risk premium seems excessive, in which case the fair market price may not be $1.25 million but instead some higher number. For instance, if price is $1.35 million then the risk premium is 0.061 or 6.1 percent. A higher price for earnings means greater harm in their loss, and more liability to the business that causes the loss.

A higher expected return on risky earnings, versus riskless ones, is compensation for risk. One measure of risk in earnings y is variance, this being the expected squared difference between earnings and their mean value

$$\text{Var}[y] = E[(y - E[y])]^2$$

[14] The historical average excess return on a broad portfolio of U.S. stocks is 7.74 percent, for the period July 1926 to November 2013, based on market excess return data provided online by Kenneth French, and the author's calculation.

Variance measures the spread, or dispersion, in the values of the random variable y. A closely related measure of risk is standard deviation

$$\text{Std}[y] = \sqrt{\text{Var}(y)}$$

Standard deviation takes variance as input and converts it into a number that has the same units as the variable y. Risky earnings have positive variance, riskless earnings have zero variance. The same principle holds for risky and riskless returns; they too have some variance $V[r]$ and standard deviation $Std[r]$. In Table 3.2, the risky return has positive variance which, once converted to standard deviation, equals 0.4, whereas the riskless return has standard deviation equal to 0.

The price of risky earnings must be low enough so that expected return sufficiently compensates for positive variance. A useful measure of the tradeoff between risk and expected return is the Sharpe ratio—*the ratio of expected excess return to the standard deviation of return*, with excess return being the difference between the risky asset's return and the riskless asset's return. Its formula is

$$\text{Sharpe} = \frac{E[r] - r_f}{\text{Std}[r]}$$

A higher Sharpe ratio indicates more compensation for risk-bearing. A lower price for risky earnings drives up both the mean and standard deviation of risky return, and also drives up the Sharpe ratio. For a business causing the wrongful loss of earnings, a lower earnings price means less liability and a higher Sharpe ratio.

For the Blue Chip case (Example 3.4), the Sharpe ratio is

$$\text{Sharpe} = \frac{0.2 - 0.05}{0.4} = 0.375$$

If instead price is $1.35 million then the implied Sharpe ratio is lower, equal to 0.165. To put these numbers in historical perspective, for a broad market portfolio of U.S. stocks the long-term historical average excess return is 7.74 percent while the historical sample standard

deviation of returns is 64.91 percent,[15] producing a Sharpe ratio of 7.74/64.91, or 0.12.

The contrast between the Pop Star and Blue Chip cases (Examples 3.2 and 3.4) illustrates the potential impact of systematic risk on business liability. Liability is greater in the Pop Star case because the star's earnings bear no systematic risk, unlike the Blue Chip company's. What if, instead, the pop star's future earnings bear some systematic risk, due to the public's concern about buying expensive concert tickets in trying economic times? Then the advertiser's business liability for the pop star's lost earnings should be somewhere between the risk-neutral value of $1.43 million and the value that compensates for purely systematic risk—$1.25 million (see Example 3.4). Percentage-wise, the amount of risk discount—off the risk-neutral value—should be somewhere between 0 and 13 percent. A risk discount of, say, 7 percent would make business liability equal to $1.33 million.

Earnings streams that bear systematic risk are priced at a discount relative to those that do not, a fact that we can express as follows:

$$\text{price(stream)} = (1-d)\text{price}_{\text{risk-neutral}}(\text{stream}) \tag{3.16}$$

With price(stream) being the stream's price according to the general model (3.9), price$_{\text{risk-neutral}}$(stream) being the price according to the risk-neutral model (3.7), and d being a risk discount factor. In the Blue Chip case (Example 3.4), $d = 0.013$ or 13 percent. Earnings that bear no systematic risk have no such discount and so $d = 0$, as in the Pop Star case.

The idea of a risk discount makes it relatively simple to evaluate business liability for loss of risky future earnings. To find the amount of liability, one can take two steps.

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[15] The annualized historical average excess return on a broad portfolio of U.S. stocks is 7.74 percent, for the period July 1926 to November 2013, based on market excess return data provided online by Kenneth R. French at Dartmouth University, and the author's calculation. The historical standard deviation (of monthly returns, annualized) is 64.91 percent over this same period.

1. Find the risk-neutral price of future earnings.
2. Discount the risk-neutral price to adjust for risk and find economic loss.

The amount of risk discount, in the second step, depends on the extent to which lost earnings bear systematic risk. Determining the risk discount, and business liability for earnings loss, requires an understanding of the extent of risk and financial markets' attitude toward it. A simple starting point is to assume that the risk is entirely systematic, and coincides with the risk of a well-balanced portfolio of risky assets, in which case a reasonable risk discount can be gleaned from earnings' expected return and variance. One can then adjust the risk discount, up or down, to reflect a more complex relationship between earnings and the general market for risk.

For future earnings in two or more future periods, the two-step liability calculation works, just as in the case of one future period. Finding a reasonable risk discount factor d again requires careful thought about the tradeoff between risk and expected return. In principle, the relevant value of d may depend on the time horizon T, but such dependence disappears if one makes the following simplifying assumption:

$$E[m_t y_t] = (1-d)E[y_t] \qquad\qquad (3.17)$$

for some d and all t = 1,2,…,T. An equivalent assumption is that the ratio of certainty equivalent to expected earnings is the same for all future periods t. The appendix to this chapter discusses conditions under which this assumption holds.

Risk Hedges

Some earnings streams run counter to the overall economy. They counter systematic risk, and act as a hedge—*taking random values that offset the ups and downs of overall market value fluctuation*. An example is the profit stream of a rum company, with the idea that people drink more hard alcohol during economic recessions than in economic expansions. A hedge earnings stream is priced higher than a stream that bears—rather than counters—systematic risk. For a hedge, the earnings stream's price

exceeds that of a stream that bears no relation to systematic risk. The pricing relationship (3.17) works for a hedge, but the risk discount factor *d* is a negative number.

Example 3.5 Rum Ruin

Two rum companies merge and, with their combined resources, are able to slash price and withstand losses while their remaining competitor is driven out of business. Their actions reduce economic competition and so cause economic harm. To describe this harm, suppose as in Example 3.3 that there are a single future period and two states of nature—states 1 and 2. In state 1 the ruined rum company would have earned $2 million next year, but for the wrongful act. In state 2, it would have earned $1 million. These earnings are counter to those of the general economy—which is stronger in state 1 than in state 2. Investors can use these earnings to hedge against systematic risk, and for this the rum company's earnings would have been priced at premium. Assuming as earlier a 5 percent interest rate, the risk-neutral price is the same as for the Blue Chip company, equal to $1.43 million. Applying the general pricing formula (3.9) with the weight values *w* appearing in Table 3.2, the risk-adjusted price of the rum company's future earnings is 1.61, this being the business liability of the newly merged companies. The risk-adjusted price is 13 percent above the risk-neutral price, and so the pricing relationship (3.16) applies with d = –0.13.

For a hedge, the certainty equivalent of future earnings exceeds expected earnings. Investors are willing to pay extra to get risky earnings rather than riskless ones, because the risk here offsets systematic risk elsewhere. Casting the certainty equivalent in terms of the weight variables w_t introduced earlier, for a hedge the weight variable w_t is positively correlated with earnings y_t.[16] For a business that causes the wrongful loss of

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[16] Since a hedge is supposed to generate earnings that move in the opposite direction of the general market, it may seem puzzling that they also move in the *same* direction as the weight variable w_t. In the appendix to this chapter this puzzle is explained by casting w_t as the inverse—so to speak—of general market conditions.

someone's earnings, if earnings are a hedge then they are priced higher than without the hedge, and business liability is greater.

To recap, if a business causes a wrongful loss of someone's earnings stream, uncertainty in that stream can do one of three things to business liability: (a) it can decrease liability if the earnings stream carries systematic risk, (b) it can increase liability if the stream counters systematic risk, and (c) it can leave liability unchanged if the stream bears no relation to systematic risk.

Implicit Rate of Return

The present value of a future earnings stream depends on expected earnings, bond yields, and exposure to systematic risk. Present value is higher when expected earnings are higher, bond yields are lower, and systematic risk is either absent or offset by earnings variation. With multiple influences on present value, the pricing formulas (3.6), (3.7), and (3.9) are complex.

A relatively simple way to describe the impact of risk on the price of earnings stream is to find a discount rate (call it r^*), for which the price of the stream matches the risk-neutral pricing model (3.7), assuming that all bond yields equal r^*:

$$\text{price(stream)} = \sum_{t=1}^{T} \frac{E[y_t]}{(1+r^*)^t} \tag{3.18}$$

The discount rate r^* is the implicit rate of return—*the hypothetical discount rate at which the present value of expected earnings matches the earnings' market price.* Higher values of the riskless bond yields r_{f0t}, and more exposure to systematic risk, raise the implicit rate of return. Because the implicit rate of return generates a present value that matches market price, it is also called the required rate of return—*the smallest rate of return that investors would accept to buy the earnings stream.* If the earnings stream represents a claim to a company's earnings, the implicit rate of return is also the company's *cost of capital—the expected rate of return that the market requires in order to attract funds to the company.*

To illustrate the idea of implicit return, consider again the Blue Chip earnings loss (Example 3.4). The earnings stream has a price of $1.25 million and expected earnings of $1.5 million. The implicit rate of return r^* solves the equation

$$1.25 = \frac{1.5}{1 + r^*} \tag{3.19}$$

in which case $r^* = 0.20$, higher than the riskless bond yield $r_{f01} = 0.05$ due to systematic risk. The Blue Chip implicit return is the same as the expected return.

For a business that causes a wrongful loss of future earnings to others, business liability is higher when earnings' implicit or required return is *lower*, since then there is less discounting of earnings.

Options

Business liability includes the economic harm associated with earnings lost in the past and present, and those expected in the future. Liability extends to some situations where earnings *could* have been made, but for the business's harm, regardless of the likelihood that they *would* be made. In other words, economic harm can arise by depriving people of the option to pursue economic opportunities, whether or not the option is actually chosen. So long as the option has market value, and hence can be exchanged for other opportunities, the holder of the option is made worse off by being deprived of it.

The options available to businesses, to pursue future earnings opportunities, are called real options, as they come up in the real day-to-day operation of business.[17] By contrast, the options available to everyone for buying and selling publically traded stocks and commodities are called financial options. A wrongful loss of financial or real options is a business liability, but so too is the loss of any option to pursue economic opportunity in the future.

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[17] Examples of real options include the right to deliver products to Canada and the right to exclusive production afforded by a patent.

Determining the value of options is sometimes easy, sometimes not. Prices for regularly traded stock and commodity options are posted each business day in the newspaper. Less frequently traded financial options present more of a valuation problem. For any economic option, with or without a posted market price, economic theory provides a pricing model via formula (3.9). To apply this model one must first determine the underlying economic opportunity and the nature of the option to seize it. The underlying opportunity, bundled with the option details, begets a derived—or derivative—earnings opportunity.[18]

If the underlying opportunity is earnings y_1 for future years $t = 1,2,\ldots,T$, then the derivative opportunity is also a sequence of future earnings; call them y_t^*. Applying formula (3.9) to y_t^* in place of y_t provides the option's value.

Example 3.6 Land developer

A construction company buys an option to develop a piece of land. The option guarantees the developer exclusive right to buy the land next year, for $10 million. If the company buys the land in year 1, it builds an office complex and sells it in year 2 for $15 million. At time 0, riskless bond yields are 1 percent for 1-year and 2-year maturities. A competing construction company learns of the option agreement and makes the land owner a better offer. The land owner breaches the original option contract, causing economic harm.[19]

The underlying economic opportunity is the $15 million of earnings available in year 2. To get that opportunity the construction company pays $10 million in year 1 and also pays the option price in year 0. Underlying earnings are $y_2 = 15$ million and derived earnings are $y_1^* = -10$ million and $y_2^* = 15$ million. The option value is the price

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[18] If it did not, the option would be worthless.

[19] The economic harm is not the transfer of opportunity from the first developer to the second. Indeed, the second developer may be better able to add economic value to the land. The harm is the damage to contracts generally, owing to breach of a given contract, weakening contracts and their ability to facilitate economic opportunity.

of the earnings stream y_t^*, to which the general pricing formula (3.9) applies. Neither the underlying nor derived earnings are uncertain, so the pricing formula takes the simpler form (3.7). The option's price is

$$\text{price(option)} = \frac{y_1^*}{(1+r_{f01})} + \frac{y_2^*}{(1+r_{f02})} \tag{3.20}$$

Plugging in values for y_1^*, y_2^*, r_{f01}, and r_{f02} into (3.20) yields

$$\text{price(option)} = \frac{-10}{(1.01)} + \frac{15}{(1.01)^2} \tag{3.21}$$

which equals 4.8. If the developer had paid $4.8 million for the option then this dollar amount would also be the economic harm caused by the option's loss. If the developer paid less, say $2 million, then economic harm would again be $4.8 million because the developer lost both the option's purchase price (2 million) and the savings afforded by buying below the option's approximate market price (4.8 million).

In Example 3.6, a business is wrongfully deprived of a real option. The mechanics of the option are similar to that of a customer's layaway plan for buying a big-ticket item at a retail store: The customer pre-pays a portion of the purchase price, hence guaranteeing ultimate delivery. A modern variant of this is the warehouse shopping club—with an annual fee and discounted consumer prices, as is the issuance of "frequent customer" points by a business to loyal customers—with points redeemable as a discount off future purchases.

Example 3.7 Warehouse Club Bust

A consumer "warehouse club" company charges $50 per member, and each member gets a 20 percent discount off market prices for consumer items for a whole year. The club has 10,000 paying members, but is destroyed by a tornado, causing the company to breach its contract permanently, just after all members renewed for another

year. The total loss to all customers is the savings that would have been afforded by the club in the coming year. Let x_1 be the total amount customers would have spent, but for the contract breach. Given the loss of their 20 percent discount, they will now have to spend an extra

$$y_1 = \frac{x_1}{1 - 0.2} - x_1$$

to get the same goods at regular prices. Supposing, for simplicity, that all spending would have been done at the end of the year, the price at time 0 of the savings opportunity is also the price of the customers' option to buy at discount

$$\text{price(option)} = \frac{E[w_1 \, y_1]}{(1 + r_{f01})} \tag{3.22}$$

Suppose that x_1 is unrelated to systematic risk, in which case y_1 is also. Let expected spending $E[x_1]$ be \$50 million and let the interest rate be 1 percent. Then expected savings is $E[y_1] = ((1/.8) - 1) E[x_1] = 12.5$ and the option's value is

$$\text{price(option)} = \frac{12.5}{1.01} = 12.38 \tag{3.23}$$

The economic harm, caused by contract breach, is \$12.38 million. This dollar amount is likely to exceed the funds collected as annual fees, since shoppers expect to recoup the fee and get additional savings by being club members. With a \$50 fee and 10,000 members, the total fee is \$500,000, much less than the economic harm.

If a shopper spending x_1 carries systematic risk, then one can reapply pricing formula (3.22) but with a discount for risk. A risk discount of, say, 13 percent would reduce economic harm to \$10.8 million.

The shopping club example is about an option available to consumers, but like the land developer example it presupposes that the option—once purchased—will certainly be exercised. Once a club member, shoppers

will buy club goods; once land is optioned, it will be developed. Any uncertainty comes from the underlying earnings.

Some options carry value even though there is a significant chance that they will not be exercised. A land developer that options a piece of land now may not yet have funds a year hence to build, and so may not seize the option to buy and build on the land. Furthermore, poor economic conditions may lower the developer's expected earnings from the project, making the option's exercise unprofitable.

Example 3.8 Land developer, revisited

Assume the situation in Example 3.6, but now suppose that the profitability of land development changes over time. With a land option purchased at time 0, subsequent events at time 1 affect the profitability of developing the land and selling the finished project at time 2. At time 1, one of two states of nature occur, either state s_1 or s_2. At time 0, denote the probabilities of these states' occurrences as $prob(s_1)$ and $prob(s_2)$, respectively. If at time 1 state s_1 happens, then the developer's expected period-2 earning from the project is $E_1[y_2] = \$25$ million. If instead s_2 happens, then $E_1[y_2] = \$10$ million.

At time 1, the developer will seize the option to buy and build only if the economic opportunity generates positive value. If period-2 earnings are unrelated to systematic risk, then the period-1 value generated by the buy-and-build choice is

$$\text{price}_1(y_1^*, y_2^*) = y_1^* + \frac{E_1[y_2^*]}{1 + r_{f12}} \qquad (3.24)$$

with derived earnings y_1^* equal to -1 times the land's purchase price and y_2^* equal to period-2 project earnings, and with r_{f12} being the yield in year 1 for a bond maturing in year 2. The developer exercises the build option in year 1 if $\text{price}_1(y_1^*, y_2^*)$ is positive. Stepping back to year 0, the choice to build is uncertain since $E_1[y_2^*]$ is unknown at that time. Another possible unknown is the next-period bond yield r_{f12}, but for simplicity suppose this is known to be 1 percent. Plugging in inputs to (3.24), in state s_1 the build choice has time-1 value

$$\text{price}_1(y_1^*, y_2^*) = -10 + \frac{25}{1+.01} = 14.75 \qquad (3.25)$$

While in state s_2 it has value

$$\text{price}_1(y_1^*, y_2^*) = -10 + \frac{10}{1+.01} = -0.01 \qquad (3.26)$$

The developer will buy and build in the first state, as value is positive, but not in the second.

At time 0, expected derived earnings in year 1 are the probability-weighted sum of possible values

$$E[y_1^*] = \text{prob}(s_1) \times (-\text{price}_{\text{land}}) + \text{prob}(s_2) \times 0 \qquad (3.27)$$

Which simplifies to

$$E[y_1^*] = -\text{prob}(s_1) \times \text{price}_{\text{land}} \qquad (3.28)$$

Expected derived earnings in year 2 are

$$E[y_2^*] = \text{prob}(s_1) \times 25 + \text{prob}(s_2) \times 0 \qquad (3.29)$$

At time 0, the option's value is

$$\text{price(option)} = \frac{E[y_1^*]}{(1+r_{f01})} + \frac{E[y_2^*]}{(1+r_{f02})^2} \qquad (3.30)$$

Let the probabilities $\text{prob}(s_1)$ and $\text{prob}(s_2)$ each equal 50 percent. Applying formulas (3.28) and (3.29), expected derived earnings are $E[y_1^*] = -5$ and $E[y_2^*] = 12.5$. With bond yields each equal to 1 percent, formula (3.30) provides the option price

$$\text{price(option)} = \frac{-5}{(1+.01)} + \frac{12.5}{(1+.01)^2} \qquad (3.31)$$

which equals 7.30. In this revised version of the building developer example, economic harm associated with the option's loss is now $7.3 million.

Financial options, on stocks and other assets, carry uncertainty about the underlying asset's value and also about the future choice to exercise (or not) the option. The future exercise choice itself may depend on future market conditions, but ultimately options are just another type of earnings stream, and so can be priced using the general formula (3.9). The task can be simplified if one makes stronger assumptions about the underlying economic opportunities. Popular models, which incorporate such assumptions, include the binomial option pricing model for stocks and other financial assets, which assumes two uncertain states of the world in each future period, similar to Example 3.6. Similar to the binomial model is the Black–Scholes model, which assumes that economic opportunity unfolds over a continuum of dates t rather than over a discrete set of years or months and so on, but gives near-identical results when the period length is short.

Use of binomial and Black–Scholes option pricing models simplifies option valuation, provided that models' assumptions are appropriate. Business liability, for the wrongful loss of an option, is more easily determined in such cases. In general, the all-purpose pricing model (3.9) of earnings streams is available to price options and all other earnings streams, but the end result sometimes requires considerable thought, analysis, and computer work.[20]

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[20] The mathematics of the binomial and Black–Scholes option pricing models is advanced and beyond the intended scope of this book. For a segue between the asset pricing models discussed in this book and the mathematics of multiperiod option pricing models, see the article "The Valuation of Uncertain Income Streams and the Pricing of Options" (*The Bell Economics Journal*, Volume 7, Number 2, 1976) by Mark Rubenstein.

Exercises

1. Redo Example 3.1 (Farm Loss) assuming that price per bushel is $10 rather than $14. Is the crop duster's liability for economic loss higher or lower, with the new price per bushel?

2. Redo Example 3.2 (Pop Star Loss), with an interest rate of 1 percent. Is the advertising company's liability for economic loss higher, or lower, with the new interest rate?

3. Redo Example 3.3 (Blue Collar Loss) with worker earnings growing at 2 percent per year. Is the cement truck owner's liability for economic loss higher, or lower, with the new earnings growth rate?

4. For Example 3.4 (Blue Chip Loss), show that a price of $1.35 million for the earnings stream is consistent with the asset pricing formula (3.9) in the text.

5. Redo Example 3.5 (Rum Ruin) with the rum company's profit equal to $3 million in state 1. Is the economic loss from anti-competetive activity higher, or lower, with the new profit assumption?

Appendix

Chapter 3 explored economic loss manifest as a loss of some earnings stream or a sequence of scheduled payments. It also explored losses manifest as options. A fundamental formula, for pricing an earnings stream, is the law of one price which, in Chapter 3, is stated as formula (3.9). This formula is based on simplifying assumptions, essentially that markets are efficient and well-working, but otherwise applies to many situations. Because it is a general formula, (3.9) takes some work in getting it focused to any particular application. In Chapter 3, follow-up formulas (3.17) and (3.18) are attempts to bring (3.9) to bear in more practical terms. But to get these follow-up formulas to work, some additional motivation or explanation is needed at some point. The technical material in all these formulas may breach the boundaries of some readers' math comfort zone, and a more in-depth discussion of them is likely to stray further in that direction. For this reason, the in-depth discussion appears here in the appendix to Chapter 3, as a resource to those readers who want it.

Risk-Averse Asset Pricing

The law of one price, manifest as formula (3.9) in the text, is a standard asset pricing formula from financial economics. It accommodates the fact that the typical individual facing a stream of risky future earnings is likely to be averse to risk. The formula gives a price for risky earnings streams, with discounts for earnings risk. If one risky activity has higher earnings risk than another, the discount for risk will be higher for the more risky activity, ceteris paribus. Similarly, if some activity has higher than average risk then it may have a higher than average discount for risk. On the other hand, if people can diversify away a given earnings stream's risk by holding many investments in a portfolio, then they may not be worried about the risk. With diversification, only undiversifiable or systematic risk is priced in the marketplace.

Assuming that people dislike financial risk, earnings streams are worth less if they carry systematic risk than if they do not. In the general pricing model (3.9), the price effect of systematic risk is reflected in the expected products $E[w_t y_t]$. Without systematic risk, these products are the same as expected earnings $E[y_t]$, but with such risk they are less:

$$E[\mathrm{w}_t \mathrm{y}_t] < E[\mathrm{y}_t] \qquad (3A.1)$$

Since the random weight w_t itself equals 1 on average, the inequality (3A.1) can happen only if the value of w_t tends to move in the opposite direction as that of y_t; in other words, if there is negative correlation between w_t and y_t. This negative correlation lowers the price of earnings stream. One can make this fact more explicit by rewriting the pricing model in terms of correlation[21]

$$\mathrm{price(stream)} = \sum_{t=1}^{T} \frac{E[y_t] + Corr[\mathrm{w}_t, y_t]\, \mathrm{Std}[\mathrm{w}_t]\, \mathrm{Std}[y_t]}{(1 + r_{f0t})^t} \qquad (3A.2)$$

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[21] For this we apply the assumption $E[\mathrm{w}_t] = 1$ to get $E[\mathrm{w}_t \mathrm{y}_t] = E[y_t] + Corr[\mathrm{w}_t, y_t]\, \mathrm{Std}[\mathrm{w}_t]\mathrm{Std}[\mathrm{y}_t]$.

Where $\text{Corr}[w_t, y_t]$ is the correlation, $\text{Std}[w_t]$ is the standard deviation of w_t, and $\text{Std}[y_t]$ is the standard deviation of y_t. With systematic risk in the earnings stream the random future values w_t and y_t are negatively correlated, and so $\text{Corr}[w_t, y_t] < 0$, whereas with no such risk there is no correlation, and so $\text{Corr}[w_t, y_t] = 0$ and pricing coincides with the risk-neutral model (3.7) in the text.

To carry out risk-adjusted pricing of earnings streams, one needs more information about the random weights w_t that appear in either formula (3.9) or its restatement (3A.2). The weights reflect society's aversion to risk, and so carry with them some economic theory about risk aversion. The general theory of risk aversion is beyond the scope of this book, but a simple form of this theory identifies the weights w_t in terms of market return—*the investment return on a fully diversified portfolio of assets.* Denoting by R_{m0t} the gross multiperiod return on the market portfolio between dates 0 and t, under simplifying assumptions the weights w_t are determined by R_{m0t} as follows

$$w_t = \frac{R_{m0t}^{-b}}{E[R_{m0t}^{-b}]} \qquad (3A.3)$$

for some positive constant b. If one can observe market returns R_{m0t} and determine their expected values, then one can find the weights w_t and the prices of earnings streams. There remains the problem of getting a value for the constant b, but for this economic theory again proves useful. Denoting by R_{mt} the gross 1-period return on the market portfolio between dates $t-1$ and t, and by R_{ft} the gross 1-period riskless return on a bond, the theoretical value of b is

$$b = \frac{1}{2} + \frac{E[\ln(R_{mt})] - \ln(R_{ft})}{Var[\ln(R_{mt})]} \qquad (3A.4)$$

Where "ln" denotes natural logarithm and "*Var*" denotes variance. The value of b is at least ½ because, according to the theory, the single-period expected (log) return exceeds the (log).

Applying these ideas from financial economics, consider the market value of a firm's owners' equity in the firm. In theory, this value should equate to the price of the firm's expected risk-adjusted future income stream.

Example 3A.1 Closely held corporation, not publically traded. Current projections are that the company's future earnings y_t are expected to be $1 million per year, with standard deviation $100,000 and a correlation 0.20 (20 percent) with the asset pricing kernel m_t, which itself has standard deviation 0.05. Consider the present value of the company's earnings opportunities through year $T = 20$, assuming that bond yields r_t are 0.02 (2 percent) for each future year $t = 1,2\ldots,20$. Applying formula (3A.3), the expected product $E[m_t y_t]$ is

$$E[m_t y_t] = (0.05^2) \times (100,000)^2(0.20)^2 + 1,000,000 = 1,010,000$$

We then apply (A1.2) to compute the present value of future earnings as

$$PV = \sum_{t=1}^{20} \frac{1,010,000}{(1.02)^t} = \$18,813,725$$

CHAPTER 4

Evidence of Loss

Let us be clear—online piracy is a real problem that harms the American economy, threatens jobs for significant numbers of middle class workers and hurts some of our nation's most creative and innovative companies and entrepreneurs. It harms everyone from struggling artists to production crews, and from startup social media companies to large movie studios.

> —Victoria Espinel, Aneesh Chopra, and Howard Schmidt[1]

Learning Objectives

1. For a business faced with liability for economic loss, describe how evidence of loss is handled by insurance companies and the courts.
2. Describe some basic factors that influence the court's opinion on a business's liability.
3. Apply evidence and price formulas from Chapter 3 to estimate economic damages.
4. Describe the impact that taxes, statistical evidence, and economics expert witnesses may have on the determination of economic damages.

Each year American businesses face thousands of claims asserting economic harm. Some claims are valid, and sometimes a business can easily distinguish between valid and invalid ones. In other cases though, the evidence is unclear.

To illustrate the problem of evidence, consider the unsanctioned sharing of music files between people via the Internet. Plummeting record

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[1] Government staff in the Obama administration; the comment appeared on the White House Blog online (January 14, 2012).

sales during the last decade plus documented cases of music file sharing point to economic harm. Businesses that facilitate such file sharing face big-time claims of harm by the music industry. But has file sharing *caused* a decline in the purchase of music? And if it has, how much has the music industry lost because of it?[2]

Most businesses are not experts at gathering and analyzing evidence of economic harm, when faced with a liability claim. The business usually passes on the problem of evidence to their insurance company—who handles the claim. If the claim is not settled then the evidence may come before an insurance mediator or arbitrator, who may take their own view of the evidence. If it is an arbitrator then they settle the dispute, but if it is a mediator who cannot get the parties to agree, the case may go to trial, and a judge or jury make take their own view of evidence also. Along the way, at the insurance, arbitration or mediation, and trial stages, experts on evidence may be hired by the business, the insurance company, or the claimant to help with discovery—*evidence gathering*, evidence analysis, and estimation of economic loss.

For the business that wants to prepare for possible liability claims, it is useful to know something about how others view evidence of economic loss. The view taken by an insurance company, an arbitrator or a mediator, evidence experts, jury, and judge can have a big influence on how much compensation is paid out for economic loss. If a business's insurance company is covering the liability bill, there may seem little point in having a business pore over the minutia of liability evidence, but the interests of the business and its insurer are not the same, and the business may face some additional costs if there is a big award for economic damages at trial. In particular, as court judgments are a matter of public record, a big judgment against a business in court may be bad for the business's reputation. In addition, the terms of the insurance contract may not sufficiently cover legal costs to make a strong defense costless for the business. Longer term, a business that is found liable for a big economic loss is not typically the favorite sort of client for the insurance company, leading to higher future insurance costs.

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[2] Tim O'Reilly—tech guru—has asked for evidence of harm to the music and related industries.

We next turn to evidence of economic loss seen through the eyes of different participants in the process of resolving a business liability claim.

Evidence as Seen Through the Insurer's Eyes

The pursuit of profit drives most businesses to deny and refuse claims of economic loss liability, whenever possible. If they face a significant reputation cost, or if the claim takes the form of a lawsuit, then they will likely pass the claims of unintentional harm to their insurer. The insurance company, like its client, has a profit motive to deny claims, but is bound by policy contracts and government regulation to honor claims that meet certain standards. Legal standards establish thresholds of evidence: Only claims that pass the threshold are honored, and only to the degree mandated by the standard.

A business beset by a claim of economic harm can often rely on their insurer to scrutinize the claim for evidence—or lack of it. Insurers accept evidence only if it meets the requirements of the insurance contract, and they interpret the contract's evidentiary demands in the strongest terms that are consistent with the legal notion of acting in *good faith*.[3]

Liability insurance is a form of third-party insurance—*insurance owned by one party that covers losses incurred by another party*. By comparison, insurance that covers a business's own property is first-party insurance—*insurance owned by one party that covers losses incurred by that party*. Liability claims are made by either the allegedly harmed party or their lawyers, and neither is the insurance company's client. An important question is: How does the insurance company gather evidence about the claimed loss? For this, the claims adjuster is usually called upon. The insurance company can use an in-house adjuster or claims service representative, or instead hire an outside independent claims adjuster to check out the evidence. The latter may be more cost-effective for the insurer if the location or type of loss is far from the insurer's in-house team's location or expertise. The claimant can also hire their own expert, called a public adjuster, to assess

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[3] Without a show of good faith, the insurer crosses the line and runs afoul of contract law, via contract breach, and also faces regulatory penalties.

evidence of economic loss and advocate on behalf of the claimant.[4] In principle, it is possible to have three different views from various claims adjusters looking at the same evidence of economic loss.

Claims adjusters are not the only experts who may provide opinions on loss in an insurance claim. The claimant, the insurer, or their lawyers may also hire additional experts in specialized fields, such as economics, accounting, statistics, medicine, accident reconstruction, or engineering, to provide opinions on specific sorts of loss. These other experts may prepare their own reports, and these may serve as inputs to the negotiation between the claimant and the business's insurance company. The business itself may or may not be aware of all the opinions and negotiations, but a basic understanding of what is going on is a good idea, and a review of evidence—as it builds up—will help the business to anticipate and possibly alter the outcome of the dispute.

The whole process by which insurance claims of economic loss are handled by insurance companies is regulated by the government. In somewhat grandiose but relevant terms, insurance regulation is part of the societal framework for assessing claims of economic harm. Insurance regulation enforces statutes that guide the proper conduct of insurers. If an insurer wrongly refuses or egregiously under-compensates a claim, the claimant can in principle call the insurer out as a violator of some regulation. However, much of insurance regulatory law is targeted at first-person insurance claims by policy holders, and certain third-party claims such as worker's compensation.[5] Many third-party types of claims against businesses, passing to the business's liability insurance,[6] are not

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[4] For simple third-party claims, such as a fender bender car accident where the driver at fault has third-party liability insurance that pays to fix the other driver's fender, an independent adjuster or public claims adjuster would likely be a wasted resource as the evidence is fairly obvious.

[5] Insurance regulation covers much more than oversight of the claims adjustment process, but in terms of claims adjustment the government is particularly worried about American families who lose their homes or cars, or are sick or injured, and who then encounter a dishonest, manipulative, or predatory insurance company who wrongfully prevents recovery.

[6] A fairly general sort of business liability insurance policy is called commercial general liability insurance.

regulated in very exacting terms, particularly if the nature of the claim is more complex. This lack of regulatory specificity creates the potential for profound disagreements between the party claiming loss and the business accused of causing the loss. Such disagreements may multiply, rather than settle, in light of insurance claims adjusters' estimates of liability and economic loss, particularly if more than one adjuster is involved. To handle such disagreements, the claimant and the insurer can take the evidence to an insurance mediator or arbitrator, or instead the claimant can morph into the plaintiff by filing the case as a complaint with the court.

Evidence as Seen Through the Court's Eyes

Courts have their own evidentiary standards—*standards of evidence.* Such standards are necessary, as the court is beset with large numbers of complaints, some with very scanty or ill-conceived bodies of evidence. Standards of evidence are a part of procedural law—*laws that specify how litigants may present their cases before the court*, separate from substantive law—*laws that specify how courts may reach a decision on a case, based on the evidence*. The courts' standards of evidence contribute the societal framework for assessing economic harm, just as insurance regulation does.

For a business facing liability for economic harm, the key issue about evidence is whether it is substantial enough to merit payment or damages. Insurance companies pay when the evidence meets their standards and courts award economic damages when evidence meets theirs. To illustrate, consider a tort case of negligence by a business. The court will award economic damages against a business if it deems that the business failed to exercise due care. Suppose that the business activities create the possibility that one of its customers suffers an economic loss of size L, and let p be the probability of that loss. The expected amount of loss, created by the business, is then the product pL of probability times loss value. The business is required by law to take due precautions to protect the public from harm inflicted by the business's operations. If the business spends an amount D on public protection against the loss in question, and if D is at least as large as the expected loss pL, then the business might be considered to have taken adequate steps to prevent the loss, and hence performed its duty of care. If instead $D < pL$ then the business might be

considered liable for negligence. This calculus of negligence is known as the Hand rule, after Judge Learned Hand.[7] Let us restate the Hand rule, for later reference: A business is liable for negligence only if they have not spent enough to prevent harm or injury to others:

$$D < pL. \tag{4.1}$$

Example 4.1 Hidden Spiders

Bananas imported from tropical countries sometimes carry uninvited passengers, including tarantula spiders. The tarantula's bite, while not usually fatal, is quite painful and requires a doctor's care. For a grocer in the United States who sells imported bananas, one liability risk is that a customer is bitten by a tarantula when trying to buy bananas from the grocer. Applying the Hand rule, if in fact a customer is so bitten the court determines liability by finding out if the grocer spent enough money D on tarantula bite prevention, relative to the expected loss resulting from the bite. Suppose that the annual probability p that a customer is bitten is 0.0001, or 0.01 percent, and that the total loss to the bitten customer is $10,000. The expected loss is then $0.0001 \times 10,000 = \$1$, so if the grocer spends at least $1 of resources annually checking its fruit for insects then the dollars spent $D = 1$ exceed the expected loss pL, and the Hand rule says that the grocer is not liable for negligence concerning tarantulas in its produce department.

Business liability implies a fault or responsibility on the part of the business, but not necessarily an intent or disposition to cause harm. The court may find that a business did not intend harm but nevertheless bears strict liability—*the responsibility for causing harm, regardless of intent or disposition*—in which case the court may go lighter on the business then if it finds that the business committed an intentional tort, contract breach, or taking of property. Furthermore, if a business is one of several entities that may have caused a given harm, the court may assign to the parties joint and several liability—*liability shared by two or more parties*—which again may lessen the damages the court levies on the business in question.

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[7] See the federal court case *United States v. Carroll Towing Company*.

Sometimes a court may find that a business is liable for harm, not necessarily as the cause in fact—*the exclusive and conclusive cause of harm*, but instead the proximate cause—*an event sufficiently related to the harm in question to be held as its cause*. A proximate cause is less damning than a cause in fact, and the court may treat it as such when determining liability and damages.

Part of the evidence in a lawsuit against a business goes toward whether the business is liable for the claimed loss. A separate point is the extent of loss, assuming that liability exists. The court's standards of evidence are designed to make it as easy as possible for the judge or jury to make decisions about liability and the amount of loss, based on the evidence presented. A judge or jury is unlikely to be expert on specific sorts of evidence—such as economic or financial issues, or medical reports— and may have limited ability to tell whether expert opinions included as evidence are of any value or credibility.

To protect the judge and jury against meritless opinions by irrelevant or would-be experts, the court's evidentiary standards include special rules by which the court can refuse to acknowledge or hear some expert opinions. These special rules include the U.S. Federal Rules of Evidence,[8] which allow the court to bar expert opinion if it is deemed to have insufficient probative value—*the ability of proffered evidence to prove something important in a trial*. At the least, an expert's opinion should be distinguishable from mere speculation—*an opinion lacking foundation in fact or evidence*. Also, if a judge or jury could themselves reasonably come to the same conclusion as an expert, based on the same evidence, then the expert is not really adding useful insight, and so is not a useful witness. Even if the expert comes to nonobvious conclusions, his or her methodology must also be considered reliable.[9]

The standards by which evidence and experts are held depend somewhat on the state in which a lawsuit is brought. If a business were sued in the state of Illinois, for example, the standard of evidence may be

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[8] An online copy of these Rules of Evidence, most recently updated in the year 2014, is available at www.uscourts.gov

[9] Federal guidelines for the admissibility of expert witness testimony include Rule 702 of the afore-mentioned Federal Rules of Evidence.

less stringent and demanding than if it were sued in Indiana. A reason for such differences is that while federal standards for the admissibility of evidence have become more stringent over time, not all states have attempted to model or follow the newly toughened standards. States that have not done so are sometimes called "Frye" or "Frye plus" states, as their rules for state courts are based on standards that precede the Federal Rules of Evidence statute and subsequent case law, and are based instead on legal precedent that includes a federal court of appeal's opinion in the case *Frye v. United States*, in the year 1923, about the admissibility of a polygraph test as evidence. Currently, the Frye states are California, Illinois, Maryland, Minnesota, New Jersey, New York, Pennsylvania, and Washington.

Most states have adapted or applied some version of the modern Federal Rules of Evidence, which were clarified in the courts via some additional case law, including the case *Daubert v. Merrell Dow Pharmaceuticals* in the year 1993, *General Electric Co. v. Joiner* in the year 1997, and *Kumho Tire Co. v. Carmichael* in the year 1999. These states are sometimes called Daubert states, in reference to the Daubert case just cited. States like California and Illinois that have not adopted the Daubert standard of evidence are not necessarily more prone to error in assessing liability and damages, but judges in these states take on added responsibility for preventing such errors when considering the admissibility of evidence and expert witnesses.

If a business is sued for some harm or injury to others, and the plaintiff intends to introduce evidence of harm, the business's lawyers can ask the judge to deny that evidence by a special filing called a motion in limine. Denial of evidence, at that stage, is based on the relevant legal standard, such as the Federal Rules of Evidence. The court can reject experts, as well as evidence itself, at this stage. The same legal move is available to the plaintiff's lawyers, to suppress evidence presented by the business.

Evidence and Economic Damages

For a business found liable for economic loss imposed on others, in both the insurance and trial stages of dispute there ultimately must be some evidence-based determination of the dollar amount of economic loss.

At the insurance stage, estimates of economic loss are informed by evidence, the insurance policy, and insurance regulations. At the trial stage, estimates of loss are informed by case law and statutes related to the loss in question—such as tort, contract violation, or property loss. At trial, the court-determined amount of economic loss is called economic damages, as discussed earlier. Also, the way that economic losses are tallied in insurance claims negotiations is informed by the way in which the relevant courts determine economic damages, the reason being that insurance disputes that do not settle often end up as cases in court. For these reasons, the determination of economic damages—based on evidence and economic thought—is a useful way to think about the sort of economic losses a business may face when confronted by a liability claim.

Economic damages provide a plaintiff with some compensation, remedy, relief, or award for economic loss. The court often imposes noneconomic damages also, including compensation for pain and suffering, and punitive damages for intentional harm. Economic damages are sometimes called special or pecuniary or "hard" damages, while noneconomic damages are sometimes called general or "soft" damages. While this book does not dwell on noneconomic damages, noneconomic damages can end up as some multiple of economic damages, with the multiplier depending on additional factors, in which case an understanding of economic damages is useful for understanding noneconomic damages too.

The way in which a court determines economic damages depends on the nature of the loss imposed by the defendant—assumed here to be a business—on the plaintiff. Assuming that what is lost is the enjoyment of some economic opportunity, generally the opportunity itself can be valued if it has some reasonable proxy among those opportunities currently existing in the marketplace. Evidence provides the foundation for identifying exactly what opportunity has been lost, and additional evidence identifies the market proxy and its price, when available. In Chapter 3 we discussed pricing formulas for opportunities, which take the form of earnings or payment streams over time, and these are appropriate for determining the price of earnings streams once a market proxy is found.

A loss of economic opportunity is a contrast between the opportunity that the harmed or injured party currently has and the one they would have had but for the harm. The dollar value associated with economic loss

is then the market value of the pre-injury opportunity minus the value of the post-injury opportunity. Let us label the pre-injury opportunity as Opp1, and the post-injury opportunity as Opp2. Then the value of the lost opportunity is the difference in price between Opp2 and Opp1:

$$\text{price}(\text{LostOpp}) = \text{price}(\text{Opp1}) - \text{price}(\text{Opp2}) \qquad (4.2)$$

Sometimes the value of a lost opportunity is fairly obvious. For example, if a commercial truck plows into a parked Honda Accord car, destroying it, then for the owner of the car the property loss is the current market value of a Honda Accord minus the value of the destroyed car—which is likely its scrap value at the junk or metal yard. Honda Accords have an active used car market, so market value has a straightforward estimate or proxy, and a check of scrap value is likewise easy to complete. The Honda Accord's owner may have suffered some other harm from the car's destruction, in terms of economic opportunity, but barring this complication there is no problem determining economic loss or damages.

Some people may be less impacted by a given accident or destructive event than others are, either because they are better able to cope with the event or they have some insurance or community support that helps them deal with it. Such special resources are often considered as protected and confidential information—and hence not evidence—in court cases, and called a collateral source of recovery. A collateral source may improve the post-event opportunities (Opp2, earlier); they do not lower economic damages because the court ignores them—the idea being that the injured party should not be penalized for being exceptionally prepared for calamity.

Economic damages get more complicated when the opportunities in question are themselves complex or lacking an obvious market proxy. In the example just discussed, if the crushed car was not an ordinary Honda Accord but instead one of comedian Jerry Seinfeld's famous collector cars, its market value might take more time to estimate, both because a collectible car may not have a very active and visible market, and also because a car owned by Jerry Seinfeld might sell at a premium, relative to other cars. Determining the value of such a car may require the specialized knowledge of an expert in the celebrity car market.

Economic damages are complex when the opportunities in question take place over multiple periods, some of which extend off into the future. We can use the pricing formulas in Chapter 3 to estimate these sorts of damages. In fact, Chapter 3 provided numerous examples of economic loss, and estimated the amount of economic loss in each case. With attention to the issue of evidence, consider another example.

Example 4.2 Lost Contract

Suppose that a bakery hires a truck delivery company to deliver its baked goods to restaurants, under a five-year contract. One year into the contract, the bakery realizes it could save money by delivering the goods itself, and stops using the delivery company's services. One more year goes by, and the delivery company files a lawsuit for breach of contract by the bakery. Evidence supports the idea that the bakery paid the delivery company 15 percent of sales, and that sales in the first year of the contract were $200,000. What are the reasonable economic damages in this case? More information may be needed to project any trend in bakery sales, but suppose that sales would have been $200,000 annually in years 2, 3, 4, 5 of the contract, and that delivery expenses would have been 5 percent of sales, yielding a profit of $200,000 \times 0.15 - 200,000 \times 0.05 = 20,000$. Also, at the time the lawsuit was filed, suppose that the interest rate on low-risk bonds was 2 percent while the premium for holding risky assets was 6 percent. A discount rate of $6 + 2 = 8$ percent can then be applied to future earnings, which at the time of trial are those earnings in the third, fourth, and fifth year of the contract. The present value of earnings in all loss years—which here are years 2 through 5 of the contract, is the price of the opportunity Opp1. Interpreting the discount rate of 8 percent to be the implicit rate of return on the delivery business opportunity, formula (3.18) from Chapter 3 gives the opportunity's price:

$$\text{price(Opp1)} = 20,000 \times (1+1+0.08)^{-1} + (1+0.08)^{-2} + (1+0.08)^{-3}$$

which is $71,541.94. Given the bakery's contract violation, the distributor likely still has opportunities to deliver items for other bakeries or similar companies, but has lost the profit stream from

the bakery contract in question, making the price of the remaining opportunity in that deal equal to zero:

$$\text{price(Opp2)} = 0$$

In this case economic damages are, according to formula (4.2), the difference in opportunity prices, this being $71,541.94 − 0 = $71,541.94.

In a trial situation, a case like Example 4.2 would need some additional evidence to support prices or rates that serve as inputs to the analysis. For example, an assumed interest rate or risk premium in financial markets should be substantiated by reference to current rates or premia available in the markets. An alternative approach, sometimes seen in court cases, is to use an average of rates, premia, or prices observed over a stretch of time in the past: The immediate effect of such averaging is to render the market data somewhat dated, but as courts often test the reasonableness of price or rate assumptions based on whether they lie within the range historically observed, the use of historical averages at trial for financial rates or premia may pass some basic test of admissibility.[10]

Another issue of evidence, inspired by the bakery delivery example (Example 4.2), concerns the sketchiness of data. An estimate of economic damages should be based not only on data of good quality, but also on data plentiful enough to make the estimate reasonably reliable. In the bakery delivery example, is one year of recorded bakery sales enough to form a reliable estimate or forecast of subsequent years' sales? Economic forecasts are themselves often inaccurate, but a well-founded forecast is expected to do better than a sketchy one. A better forecast of bakery sales might be available if more past years of sales are brought into the analysis.

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[10] Historical averages of earnings growth rates may be preferred to a current growth rate if the goal is to estimate the future rate of growth in coming periods, so the use of historical averages does not always imply that the resulting analysis is somehow dated. For interest rates, the use of current versus historical average rates at trial is a topic of debate among economists; see, for example, the article "Dueling Economists in Personal Injury and Wrongful Death Litigation," published in the *Illinois Bar Journal*, 2014, by Scott Gilbert.

Just as data on the bakery may be sketchy in Example 4.2, data on the bakery's distributor may be sketchy as well. What sort of other deliveries has the distributor been able to do, in the absence of the bakery's contract? What if the bakery's contract cancellation freed the distributor up to sign another—more lucrative—contract with a different company? In that case, the lost contract would still represent a loss of profit associated with the contract itself, but there would be no (positive) opportunity cost—*the difference in value between a given opportunity and the next best available opportunity*. Instead, there would be an opportunity gain following the contract violation, and economic damages would be zero.[11]

A Taxing Matter

Rules of evidence can affect the estimation of economic damages in some surprising ways. For instance, in lost profit cases like Example 4.2 the court often interprets profit to be after-tax, a simple reason being that profits are usually taxed, so any loss of actual profit is likely on an after-tax basis. Since the difference between profit before and after tax can be substantial, with after-tax profit sometimes being 70 percent or less of before-tax profit, the issue of tax adjustment can be a big deal.

On the other hand, for a personal injury case like Example 3.3 where a person suffers a physical injury and loses wages because of it, courts typically interpret earnings loss on a before-tax basis. A possible rationale here is that the U.S. federal government does not ordinarily tax economic damage awards received by people as compensation for their personal physical injuries,[12] granting a sort of windfall to the injured party, and a like-minded court may grant the same windfall. The granting of a

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[11] It is possible the actions of the defendant in a court case end up improving the economic opportunities of the plaintiff, contrary to a claim of lost opportunity. In such cases, damages formula (4.2) suggests that damages should be negative, implying that the plaintiff should pay the defendant for opportunities gained. This reversal of fortune does not play out in court, though, so long as the plaintiff has no obligation to pay for such gains.

[12] See Internal Revenue Service (IRS) Code Section 104(a)(2), available online from IRS. The tax-free status of economic damage awards covers compensation for economic loss, but not some other awards such as punitive damages.

windfall may be an act of mercy to people who have sustained wrongful physical injuries and are using the economic damage proceeds to recover their lives and livelihoods. A good chunk of such proceeds, between 30 and 40 percent, is typically paid to the injured party's lawyers, leaving a much reduced sum which taxation would further reduce—substantially if the damage award is substantial.[13] The windfall itself is exceptional, as a person's income or wage is ordinarily taxable.[14]

The windfall granted to personal injury plaintiffs may mean that a business pays more when found liable for a certain amount of economic harm if that harm is caused by physical injury to a person rather than by some other means—such as business interruption, contract violation, or property rights infringement. There is another distinction of this sort, in terms of present value and discounting. While future lost profits in a case like Example 4.2 are typically brought to present value using a discount rate that reflects the risk of business activity and profit, future lost labor earnings—or front pay—for a person physically injured are typically brought to present value using a lower discount rate—for a low-risk investment. The effect of this contrast in discount rates is to increase economic damages in a personal injury case relative to those in a commercial case—lost profit and so on.

The rationale for using a relatively low discount rate on future labor earnings is perhaps twofold. First, labor earnings tend to be more stable over time than business profit, and so do not need as much discounting

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[13] A large damage award that contributes to a person's income would tend to put them in a higher tax bracket, and so make their overall earnings taxable at a higher percentage rate, if not for the personal injury exception in the IRS code. Currently, the highest tax bracket on personal income is about 40 percent of income, and kicks in when an individual earns about $400,000 or more.

[14] While a personal injury award may not be taxable when received, interest earned when that income is invested on bonds and so on may be taxable, in which case an injured person's manifest compensation for the loss of an earnings stream need not be wholly tax free. For relevant discussion, see the articles "Taxes and the Present Value Assessment of Economic Losses in Personal Injury Litigation: Comment" (*Journal of Legal Economics*, 19(2): pp. 27–42) and "A Theory of Tax Effects on Economic Damages" (*Journal of Legal Economics*, 20(1–2): pp. 1–13), both by the author (Scott Gilbert).

for risk. Second, the court may desire that the physically injured party have the opportunity to enjoy a stable and predictable income based on safe investments, to aid in their recovery, even if their actual labor earnings were not so predictable.[15]

If there are two advantages granted to personal injury plaintiffs, in terms of tax treatment and future loss discounting, there is one disadvantage, namely that any losses of past earnings are usually counted as a straight sum part of the economic damage award, with no allowance for interest on past earnings. By contrast, a damages award for past lost profit often includes an allowance for the interest that could have been earned on the lost profit, from the time it was generated until the time of trial.[16] The absence of accumulated interest on personal injury past earnings—or "back pay"—makes them less expensive to the liable business than the wrongful loss of past profit, all else equal. A reason for this difference is that businesses normally reinvest a portion of their profits into ongoing business activity, earning a return on past profit, while an individual is normally assumed to consume most of their labor income, leaving little upon which to earn a return.

The Economist's Voice

Given the complexity involved in determining economic damages, both in terms of economic principles and issues of evidence, it is not surprising that economists are sometimes called upon to voice their opinions on economic loss or damages at trial and also at pre-trial stages of dispute.

If the plaintiff's counsel views the evidence as a slam dunk in terms of establishing the pecuniary loss, the defendant's cause of the loss, and the total dollar amount of loss, then plaintiff's counsel would only waste time and money by using an economics expert to opine on the matter.

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[15] The U.S. Supreme Court has weighed in on the issue of discounting in personal injury (and related) cases. Important cases include *Chesapeake and Ohio v. Kelly* (1916) and *Jones & Laughlin Steel Corp. v. Pfeifer* (1983).

[16] In Example 4.2, for simplicity no mention was made of interest owed on past lost profit. The actual amount of interest may depend on the court—which may set its own rules for the relevant interest rate.

Likewise, If the defendant's counsel views the evidence as a slam dunk, defense counsel has no use for an economics expert. In order for a lawyer to benefit from using an economics expert, there must be some uncertainty or risk in the lawyer's own ability to estimate economic damages. The uncertainty may arise because the defendant's causative role in pecuniary loss is unclear, or because the pecuniary value is unclear.

Faced with uncertainty, there is still no point in using an economics expert unless the expected amount of economic damages is sufficiently large. This is because the economics expert, often an economist with a doctorate (PhD) degree, typically charges an hourly rate on par with lawyers, and so adds a cost to the case, which can only be justified if there are sufficient dollars at stake in the case. Experts of this sort are frequently called forensic economists, with the adjective "forensic" capturing the idea of someone who can see, produce, or interpret evidence in a way that clarifies its meaning to the parties in a dispute.

For the lawyer with a high-stakes case and some uncertainty about economic damages, the economics expert serves to reduce uncertainty. The economist does so via the credibility of his or her opinions on the nature, cause, and extent of pecuniary damages. The expert's opinion need not be the same as the retaining attorney's initial view of damages, and may well be substantially different. However, if the expert and the lawyer are ultimately on the same page, then the lawyer enjoys more confidence and certitude about economic damages. This adds value so long as the lawyer is risk-averse. Even if the lawyer is risk-neutral he or she may act in a risk-averse way if their client is risk-averse.[17]

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[17] In Chapter 3 we discussed the preferences of financial market participants toward risk, introducing the idea of risk-neutral and risk-averse investors, and applied these ideas to the valuation of earnings streams and economic loss. Since law firms are usually profit-making business entities, ideas of risk preference also apply to lawyers. The author's experience with lawyers suggests that they often describe themselves as conservative and risk-averse, but some are involved in business pursuits beyond the courtroom, and those representing a plaintiff in a big personal injury suit may take on significant costs before any payment is received, a risky venture.

High-stakes cases include class-action lawsuits with many millions of dollars at stake, and antitrust cases involving proposed mergers of corporate giants. But stakes need not be that high to justify the use of economics experts. Consider, for example, a simple divorce case with one spouse a physician and the other spouse demanding sufficient resources to generate a $100,000 yearly income after the divorce. Can this demand be met, given the couples' wealth and the doctor's current and future earnings? An economist could usefully opine on this issue, significantly reducing uncertainty, at a cost of perhaps $1,000 to $2,000 or so.

Furthering the divorce theme, suppose that in 2013 an attorney divorces his spouse and the judge tasks him with paying for his child's college education 10 years hence, at a price of $30,000 yearly in year-2013 dollars. Fast-forwarding 10 years, suppose he refuses to pay for college, leaving the bill to his ex-wife. How much can she demand of him in that year (2023) in terms of college dollars? An economist could usefully opine on the kind of college education affordable for $30,000 in 2013, and the cost of such an education in 2023, reducing uncertainty, at a cost of $1,000 or so.

Moving from divorce to tort law, consider the high-stakes personal injury or wrongful death case. Suppose that plaintiff's counsel is pursuing a claim in court that includes an estimated $750,000 of economic damages. It is a big number, and as such defense counsel will rightfully work hard to discover any fault in its foundation. In addition, with the prospect of big errors surrounding big numbers the responsible judge will want to facilitate vigorous scouring of the foundations. An economics expert has more work to do here than in the divorce cases described earlier and charges more money, but delivers considerable assurance at a cost of a few thousand dollars. Plaintiff's counsel may consider this a bargain and the defense may hire their own economics expert for similar reasons.

This raises the prospect of dueling economics experts, with conflicting opinions, which would seem to nullify the risk-reducing role of economists at trial. However, differences in economics expert opinions are likely to be small relative to the risk initially surrounding economic damages. That is, disagreements among economists about economic loss are likely smaller than the range of values that a jury or judge might assign to economic damages.

Consider also the high-stakes tort case of wrongful termination from work. An openly gay vice president of a bank is terminated by the bank's new president, and the vice-president sues the bank on grounds of discriminatory wrongful termination. Here there may be uncertainty about the cause of termination and also about the amount of earnings that the plaintiff might reasonably have expected to earn but for the termination. On both points an economics expert, particularly one with expertise in economics and statistics, can opine in a manner that reduces uncertainty.

Contract law is also replete with high-stakes cases, in the millions or billions of dollars, in which economics experts can clear some fog away from the numbers. An equipment company in a rural area leases some equipment to a contractor who then starts work on an office building. The equipment breaks, the leasor fails to repair, and the contractor sues for business interruption and loss of reputation. The economics expert, particularly one with a background in financial matters, can reduce uncertainty about the extent of economic damages.

Infused in the foregoing examples are two simple economic ideas about civil courts and how they work. The first idea is that both plaintiff and defense seek an outcome for their case that leaves their pocket books in the best possible shape. The second idea is risk aversion: Litigants do not like surprises when big money is on the line. In this economic theory about civil courts, there is a natural role of the economics expert in high-stakes cases.

What are reasonable assumptions about discount rates and earnings growth rates? These are topics of active discussion and research by forensic economists; see, for example, the books by Martin (2012), Brookshire, Slesnick, and Ward (2007), and Marshall and Ireland (2006). Also see the peer-reviewed research articles in the *Journal of Forensic Economics* and the *Journal of Legal Economics*. The national and regional meetings of professional organizations, including National Association of Forensic Economists (NAFE) and the American Academy of Economic and Financial Experts (AAEFE), include presentations on state-of-the-art research concerning the key inputs to present value and economic damages in personal injury cases. Leading forensic economists regularly attend these meetings and present their own research at such venues.

Just as a business has more in mind than economic damages when handling a business liability case, an economics expert has more in mind than the rough sketch of economic damages presented here. Much remains to be filled in, to complete a damage estimate. Fortunately, a qualified forensic economist pursues these details with zeal. At the end, they report an estimate informed by sound economic and statistical practice, and stand ready to explain their opinion at trial.[18] To get some additional idea of how an economist operates in this sort of work, the appendix to this chapter briefly describes the process common in personal injury cases.

Scientific Evidence

If you use an economics expert in your case, you should gain confidence about the estimate of economic damages that you ultimately present to opposing counsel and the court. Despite the fact that economics is a social science, evidence based on economic analysis is not generally comparable to evidence based on the "hard" sciences. Hard sciences achieve greater exactitude than soft sciences, and it is easier to establish things like error rates in the former. So, when an economist states their opinion to a "reasonable degree of economic certainty," it is commonly understood that this degree of certainty is likely coarser than for an engineer, say. For this reason, while evidentiary standards, rules, and case law create the possibility that a competent economics expert's opinion will be refused at court via a Daubert or Frye challenge,[19] the success of such challenges is rare.

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[18] For a business faced with a liability suit, their lawyers may engage an economist to analyze evidence and present an oral opinion on economic damages and any reports by opposing witnesses, but often such economists are not asked to provide written reports or to testify at trial.

[19] At trial, a Daubert challenge is a "motion in limine" type of legal proceeding in which an expert's suitability as witness is challenged by invoking evidentiary legal precedents (and possibly statues) like the *Daubert v. Merrell Dow Pharmaceuticals* case cited earlier. A Frye or "Frye +" challenge is similar but based on legal precedents like the *Frye v. United States* mentioned earlier.

Damn Lies, Statistics, and Liability Evidence

A famous saying of the late author Mark Twain is that there are "lies, damn lies, and statistics." When a business is faced with a liability case, some evidence may come in the form of statistics, or some conclusion about economic damages may hinge on the use of some statistical procedure. The courts, as well as other dispute-resolution institutions like insurance arbitration hearings, can benefit from the evidence-enhancing power of statistics, or instead fall prey to the beguiling misuse of statistics—as hinted at by the Twain quote earlier. Having long been exposed to the merits and pitfalls of statistics, the courts have developed procedures and evidentiary standards that attempt to keep the good while minimizing the bad.

One use of statistics is to shed light on fault for some action. For an employee who was fired from their job, did the employer fire them for business reasons or for some reasons that might be discriminatory against women, or disabled workers, or gays? If it is just a single employee under consideration, the information about their specific employment history might be enough to assess the likely cause of termination. But if we are talking about a large company and the set of all employees fired over a period of time, a pattern or tendency in termination may be apparent for the group of fired workers as a whole, a pattern that may not be obvious by looking at their employee files one by one. A formal statistical test of discrimination and nondiscrimination hypotheses may be available if the sample of workers is sufficiently large, and may produce some conclusion about a business's liability for discrimination against its workers.

Statistical tests for business liability, as in the afore-described case of a class action for wrongful termination, require a sufficiently large sample of data, an expert trained in statistical testing, and some mathematical assumptions about the relevant variables in the data sample. Experts in this area include scholars with a PhD in statistics or allied fields like econometrics—*the application of statistics to economics*—or biometrics—*the application of statistics to biology*.[20] The reasonableness and robustness

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[20] An econometrician is typically a PhD in economics with specialization in the econometrics field. For example, I received my PhD in economics from the University of California San Diego in 1996, with specialization in "nonparametric regression models"—an econometric research topic.

of the relevant mathematical assumptions is something that the expert must consider carefully, as must the eventual trier of fact—*the person or persons responsible for determining facts from evidence in a dispute*.

A view from the literature on statistics in the courtroom reflects Mark Twain's sentiment in the quote earlier, which is that statistics-based evidence of liability should be welcomed for its promise of discovery but scrutinized for its ability to mislead. My own interest in economic damages began as a student at the University of California, Berkeley, in a statistics class taught by the late Professor David Friedman who recanted tales of his statistical consulting work and who also served as a major voice for clear and reliable application of statistics to legal disputes and social science.[21]

Aside from testing for fault or liability, statistics are also useful for determining economic damages when a business liability is found. Descriptive statistics serve to summarize a data set in some useful way, and can simplify the task of considering a large amount of evidence. Also, descriptive statistics such as the sample average may be useful in predicting future outcomes, assuming that future outcomes are "drawn" from the same pool of possibilities as past outcomes. For a business that wrongfully causes the loss of some economic opportunity, if the lost opportunity would have been affected by one or more known variables, regression models—of the expected value of one variable, given other variables—may be useful in estimating or forecasting the extent of the opportunity and its market value. A simple linear regression model relates one variable y, called the dependent variable, to a second variable x, called the independent variable, plus an error called e, as follows:

$$y = \alpha + \beta x + e \qquad (4.3)$$

where α is a constant known as the regression intercept and β is a constant known as the regression slope. In the linear regression model, the expectation of the variable y, given the observed value of the variable x, is

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[21] See, for example, the two works listed at the end of this book authored (or co-authored) by Professor Friedman: *Reference Guide on Statistics* and *Statistical Models and Causal Inference: A Dialogue with the Social Sciences*.

$$E[y \mid x] = a + \beta x \qquad\qquad (4.4)$$

If values can be assigned to the regression intercept and slope, then the expectation formula (4.4) can be applied to get expectations, predictions, or forecasts of y, given a known value of x.

Example 4.3 Expected Sales

Continuing the bakery delivery example from Example 4.2, suppose that bakery sales y are related to year x, for $x = 1, 2, 3, 4, 5$ via the simple linear regression model (4.3) with intercept $a = 50{,}000$ and $\beta = 50{,}000$. Applying the expectation rule (4.4), expected sales in years 1, …, 4 are 100,000, 150,000, 200,000, 250,000, and 300,000. Applying the same discount rate as earlier, economic damages are now $78,766.96.

Fuzzy Evidence: The Case of Hedonic Damages

We have been discussing evidence of business liability and economic loss, with the idea that what is lost is some economic opportunity like a car, job, or business contract. But that is not the whole scope of potential economic loss. Earlier we talked about society's well-being, or social welfare, via the utility of its collective consumption of goods at all dates and states of nature. We symbolized this utility-of-consumption function as $U(C)$, and argued that a business causes economic loss to society by any action that lowers the social utility number $U(C)$. Utility itself embodies the pleasure and benefit we enjoy from consuming goods. If we could agree on what value utility $U(C)$ takes in all relevant situations, we may be able to determine the dollar value of economic loss or damages by making a liable business pay the harmed party money sufficient to restore their own utility of consumption to the level it was at before the harm.

Example 4.4 Malpractice

To illustrate, suppose that a doctor makes a mistake while tending to an injured motorcyclist's leg, causing the patient to lose a leg that otherwise should have healed fine. Economic loss may include the work opportunities that a two-legged versus one-legged person may have access to, but the injured person's disability implies more

economic loss than just wages. Enjoyment of sports, ability to find and keep a spouse, ability to parent, and ability to enjoy life generally may be lowered by the loss of a leg. If the doctor pays to replace only the disabled person's labor earnings loss, arguably too little has been paid.

Utility ideas, and a utility function of the sort $U(C)$, are frequently applied in economics, but without clear guidance on how to quantify the value associated with the pleasure or enjoyment of life. If the disabled motorcyclist lost $1 million in labor earnings, in present value terms, perhaps they lost an additional $2 million associated with an inability to otherwise have or enjoy the same quality of life as before. But maybe the lost additional value is more like $5 million or $10 million. Who knows?

In personal injury cases, a jury typically considers a range of possible damages, both traditionally economic damages—including lost wages—and other damages like the loss of consortium or relation with other people. As a jury deliberates over damages, they may come up with a number value for the general loss of enjoyment of life—sometimes called "hedonic damages," separate from regular economic loss, based on the evidence and also the jury's collective life experiences. Economists will agree that jury members are endowed with their own utility or utility "functions," and so may make as good an assessment of hedonic damages as is feasible.

Juries may be the best people to contemplate the loss of enjoyment of life in a business liability case, but that has not stopped some economists from trying their hand at it. Attempts in this direction have suffered, though, from a fuzzy or subjective application of evidence. A major hurdle for the economist estimating hedonic damages is that the relevant utility function is unobserved and not altogether identifiable. A possible remedy, in a personal injury case, is to ask the injured person how much money they would need in order to be just as happy as they were before their injury. In Example 4.4 earlier, the motorcyclist who lost his leg due to medical malpractice may give some answer, say $10 million or $100 million, but with a bit of forethought about the consequences of their answer, the answer might be in the billions or more. Since an economist cannot likely know the biker's true utility function or preferences, they cannot distinguish between an honest assessment of hedonic loss and a rationally aggrandized assessment.

The economist might also ask a bunch of healthy people how much they would need to be paid in order to become disabled in some way—such as losing a leg. The economist might then use the average response of these people as a measure of hedonic damages in a given case of liability against a doctor or business. As is easy to imagine, people may require an enormous amount of money to suffer a serious life-long disability, and some may refuse any amount offered. The possibility of extremely large, or infinite, values makes a sample average of such values a possibly unreliable estimate of the typical person's willingness to take on a serious disability in exchange for money.

Rather than asking people directly about their preferences toward money and health, an economist can attempt to ferret out such preferences from peoples' behavior in the marketplace. In the labor market, some people take on risky jobs like firefighter or high-rise construction worker, typically receiving some amount of hazard pay relative to people who take safe jobs like retail sales clerk. Taking on an increased risk of disability or death, in exchange for extra pay, is similar in principle to trading a guaranteed disability for pay, but is cast in probability terms.

Example 4.5 Window Washer

Suppose that a window washer of high-rise office buildings has a 0.1 percent chance of dying on the job, in a given year, and receives an extra $10,000 for taking on this risk, relative to pay available for washing windows on the ground floor only. How much money would the window washer be willing to accept for a 100 percent chance of dying? If taking on 0.001 (or 0.1%) probability of death pays $10,000, perhaps the window washer would accept the same payment per unit of death probability, from 0.001 to 0.002, and so on, to 1, with total payment of $1,000 \times \$10,000 = \$10$ million.

The logic in the Window Washer example is that market data tell us about the amount of money people are willing to pay to take on some measurable probability of death or disability, and this same market data can then be used to make inferences about a person's willingness to accept a 100 percent certainty of death.[22] A problem with the logic is that it

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[22] In addition to data on labor markets, similar estimates are available from the markets for seat belts, smoke detectors, and other devices that lower the risk of death by some known amount.

suggests a person is willing to take on additional chances or probability of death, each at the same price, until certainty (100 percent) is reached, whereas a person would likely insist on higher and higher prices for additional risks. If so, the window washer might rationally refuse $10 million in exchange for death and might also refuse any amount of money for it.

A subtle twist on the Window Washer example is to suppose that the issue of interest is society's dollar value placed on a typical window washer's life, rather than the value that a particular window washer would place on their own life. The market for fatality risk provides the price per unit of death probability, sometimes stated as the value of a statistical life (VSL):

$$\text{VSL} = \frac{\Delta W}{\Delta P} \tag{4.5}$$

where ΔP stands for the change in probability of death—with probability measured in decimal numbers rather than percentage numbers, and ΔW stands for the change in wages associated with an increased chance of death.

If society wants to consider social loss associated with the addition of 100 percent probability of death, where death risk spreads across the population, then VSL gives a sensible answer. This answer might usefully inform government policy makers who spend money to prevent accidents—like window washers falling off high rises—since then they can put money where the benefit gained at least meets the funding cost. This public policy focus makes VSL a potentially useful economic tool, though the range of estimated values for VSL is extremely broad and includes both negative and positive values.[23]

Returning to the business faced with a claim of liability for personal injury, in the Window Washer example we find that VSL = $10 million, and would like to compensate the biker for hedonic damages associated

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[23] There is an extensive literature on the value of life and its relation to risk-reducing public policy expenditures; see, for example, the article "The Value of Individual and Societal Risks to Life and Death" by Kip Viscusi, published in the *Handbook of the Economics of Risk and Uncertainty*, by North Holland, in 2014.

with his lost leg. How do we take the value of a whole life and figure out how much of that value corresponds to just one leg? Is it 25 percent? More? We can ask the injured biker to describe his sensed loss relative to the hypothetical loss of his own life, but we then run into the sorts of subjectivity problems mentioned earlier. We can survey a bunch of noninjured bikers, with the same sort of question, but then face the prospect of extreme variation of response—and nonrepresentativeness of the same—mentioned earlier.

Despite the grounding of the VSL statistic in the literature on public policy, the economist is currently left with only a fuzzy view of what hedonic damages might be in a personal injury case, based on evidence that might typically be available.[24] In other words, evidence of hedonic damages is fuzzy, not because the economist has missed some clever insight, but because hedonic damages ultimately involve preferences, enjoyment, and social utility of consumption $U(C)$, which economists well understand to be imprecisely known—and necessarily so. This means that a business hit with a claim of hedonic damages will find that claim founded on evidence that is pretty fuzzy, yet the claimed damages may run into the millions of dollars, hence deserving careful scrutiny.

Exercises

1. Suppose that a hotel provides a business services room to its customers, allowing them to use a computer with Internet access. A possible harm to the customer is that information about their identity and affairs is stolen off the hotel's computer. Suppose there is a 1 percent chance that some customer gets their information stolen off the hotel's computer, in a given year. Suppose also that the cost of identity theft to the customer is $1,000, and that the hotel spends $50 per year on software to block computer viruses and other malicious software on the computer used by its customers.

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[24] This is not to say that the view could not in principle be made clearer. Perhaps more survey-based estimates of willingness to accept disabilities will bear fruit, despite issues of sample reliability and possible confusion about the meaning of the relevant survey questions.

a. Applying the Hand rule, what are the values of probability p, loss L, and spending D to prevent harm?

b. According to the Hand rule, is the hotel spending enough money to avoid being held liable for harm if a customer's identity is stolen on the hotel's computer?

c. Do you consider the Hand rule a reasonable way to determine business liability in this situation? Explain.

2. Consider the situation described in Example 4.2 in the text, where a trucker loses a contract to deliver baked goods. Find the dollar effect on economic damages from the following changes to the situation.

a. Annual sales of the bakery are expected to grow each year by 3 percent, rather than remain constant.

b. The discount rate on future earnings is 10 percent rather than 8 percent.

c. Profits are measured before tax rather than after tax, with the effect that the trucker's costs are 3 percent of sales rather than 5 percent of sales.

3. Suppose that the amount y of settlement awarded to a wife in a divorce case against her husband depends on the annual labor earnings difference x between husband and wife. Suppose that the variables y and x are related to each other via the simple linear regression model (4.4) with intercept α equal to 0 and slope β equal to 3. What is the expected settlement amount to be paid to the wife if the husband earns $50,000 more than the wife does?

4. Suppose that a construction company builds a shopping mall in a small town, and that its construction activity accidentally causes a town resident to go blind. Suppose also that the construction company did not exercise due care to prevent injury, and so is liable for the injury. Hedonic damages, associated with the loss of the woman's sight, could be as large as VSL, depending on how important the woman's sight was as part of her life. Suppose that the woman would have accepted $30,000 in exchange for a 1 percent increase in the probability of death, before her injury. Using this information, compute VSL and comment on its relevance in determining economic damages in a personal injury lawsuit for lost sight.

Appendix: The Economist in a Personal Injury Case

This book is about two broad ideas: business liability and economic damages, but in actual claims of business liability the narrow details also require attention. This appendix covers one such detail—the common sort of work that an economist does in personal injury cases. An understanding of this detail by businesses can improve their grasp of how liability evidence makes its way through the courts.

Personal injury claims against insurance companies are typically settled without a lawsuit. The greater the medical costs and lost wages associated with the claim, the less certainty the claimant has about the final offer an insurance company is likely to make, in order to settle the claim.[25] By hiring a lawyer, the claimant can reduce uncertainty and also avoid the work of completing the negotiation himself. Applying economic principles, the rational claimant should hire a lawyer if the expected pecuniary loss from the injury is sufficiently great and uncertain.

An insurance claim is big, by some measure, if it becomes a lawsuit. Most personal injury cases involve damage elements that lawyers can assess with confidence, perhaps with the assistance of medical experts and accident reconstruction experts. However, some cases call for special economics expertise.

Consider a personal injury that leads to a loss of future wages, or requires a long-term healthcare plan. If the injury is at work and caused by the employer, workers' compensation statutes presumably apply. But in other cases with substantial long-term pecuniary loss, there is generally no silver bullet in terms of compensation and lawyers face significant uncertainty about economic damages. Even in the case of injury on the job, claims may be levied at parties other than the employer.[26]

Imagine that you are a lawyer who has a big personal injury case, and you must try to estimate economic damages, including those associated

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[25] For an interesting recent discussion, see the how-to book on filing personal injury claims: *How to Win Your Personal Injury Claim* (Nolo Press, 2012) by attorney Joseph Mathews.

[26] For example, the construction worker injured at a construction site may not only collect workers' compensation insurance from the contractor, but also seek compensation from the company that hired the contractor.

with future lost earnings or medical costs. Where do you begin? As a lawyer you have access to your own past cases and perhaps those of colleagues, plus your legal expertise and knowledge of case law and relevant statutes. You may also have access to some economics expert depositions via a local courthouse or lawyers' association. If with these resources you yourself can estimate economic damages with a reasonable degree of confidence and economic certainty, then you are done. But is such confidence well-placed?

To test your current grasp of economic damage estimation methodology, as it applies to personal injury cases, have a look at the reference guide on economic damages by Allen, Hall, and Lazear (2011), in the venerable *Reference Manual on Scientific Evidence* (third edition), freely available online. In that guide is a section (XII.A) on claims for lost personal income. It sets out a hypothetical personal injury scenario and then identifies two possible damages estimates, one produced by the plaintiff's legal team and one produced by the defense's team. Tables 4 and 5 in that work give a detailed breakdown of damage elements. If, after reviewing these tables, you find that you yourself can produce damages estimates with similarly detailed data, documentation, and discussion, then so much the better. If instead you look upon these tables—and attendant labels like "Probability of Surviving," "Probability of Working," and "Discount Rate Index"—with curiosity rather than professional knowledge then you also likely feel uncertain about your ability to produce such damages estimates without the help of an economics expert.

In the remainder of this appendix, will assume you are a lawyer who handles big personal injury cases or who is interested in taking on such cases. I will also assume that your expertise in law does not extend to economic matters, at least not so much that you are in full command of the methods of economic damage estimation. With these assumptions I will describe the working relationship between the lawyer and the economics expert working on a typical personal injury case, including key discussions, needed documentation, and work at deposition and trial. I will then describe in more detail the basic logic of the expert's estimation of damages and some variations in how that logic is routinely applied.

You and the Economics Expert

Suppose that you have a big personal injury case and have decided to use an economics expert—a forensic economist—to opine on economic damages in the case. How do you find one?

A colleague may recommend someone with whom they have had good experience. Alternatively, you might search for someone online in a commercial listing of expert witnesses; however, forensic economists have a national profession association—the NAFE—that lists its members and their contacts online.[27] You can also see on the NAFE website which of its members have made professional presentations at NAFE meetings, and published in NAFE-related peer-reviewed journals. The total NAFE membership is about 600 people, of which about 100 or so are economics professors with PhD degrees and active NAFE participation. With some luck you will find in this list some experts in your location. Typically the NAFE-associated economics expert will be happy to briefly discuss your personal injury case over the phone and tell you about their availability and basic requirements—including fees.

Fees

Forensic economists charge mainly for their time spent in researching a case, preparing written reports and oral presentations, and testifying at trial and deposition. The hourly rate varies but is typically on par with lawyers' rates, and is likely between $250 and $400 per hour. Payment is collected in advance or as services are delivered. This represents an up-front cost in your case, as the economist gets paid before the case settles or finishes in court. A typical personal injury case may require the economist to spend a day or more to produce a report, and hence charge $2,000 to $3,000 for it. Retainer fees, up front, of $500 or more are common. Fees for testimony may also be charged in advance of deposition

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[27] Some members of NAFE also appear on commercial listings of expert witnesses, such as Seak and Jurispro listings, but not all do. Another, related, association is AAEFE,which also provides a listing of its members online.

or trial. Other charges, such as fees to cover travel costs, are possible, but the forensic economist usually spells out all such charges in a written agreement provided to you.[28]

Documents

To estimate economic damages related to lost income, lost household services, and future medical costs, the forensic economist will need relevant data and documentation. To get an idea of the scope of economic damages, the economist will likely ask to review the original complaint filed by plaintiff's counsel, as well as subsequent responses and discovery documents, including reports by other experts. If the case involves a loss of future income the economist will usually want to see records of work activity. These can include tax records—including W2, 1040, and 1099 forms, pay stubs, employee evaluations completed by employers, workers' union records, pension and fringe benefit records, and records of special compensation like stock options.

To project future income the economist will first establish *base earnings*—the earnings that would be expected just subsequent to the injury, if the injury had not taken place. For this, the economist will want records on earnings activity for at least five years prior to the injury, if possible.

The natural progress of earnings is for them to rise over time, and the plaintiff lawyer may see an advantage in documenting only the most recent available year of earnings. If, however, evidence of earnings in earlier years is lacking then it becomes more difficult to establish a reliable number for base earnings. Do not be surprised, then, if your forensic economist makes a big deal out of getting multiple years of earnings records.

A typical person's future earnings hinge in part on their work history but also on their educational background, gender, family structure, and unique circumstances such as past injuries or special achievements. Much of this will hopefully be evident from interrogatories and

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[28] A significant expense for distant travel is possible, but many forensic economists do not charge for local travel.

depositions—copies of which you have supplied to the forensic econo-mist. However, your economist may ask for additional documentation or details about these matters. For cases involving long-term disability, if you are using medical or vocational experts the forensic economist may ask you for more details about their reports and opinions and may also wish to contact them directly.

Discussion

After reviewing documents, the forensic economist may have questions and want to discuss with you some damage elements, record availability, and legal guidelines (case law and statutes) that impinge on the damage analysis. Important issues may arise concerning the scope of damages to be estimated—including loss of earnings, pension, social security benefits, and household services. Is the court in which the case will be heard especially conservative in its views on economic damages? If so, is this disposition doc-umented in case law? The forensic economist will want to know about all relevant legal guidelines, and may want to discuss them with you in detail.

Report

Once documents have been produced and reviewed, and the economist has discussed with you any issues related to damages, he or she will be ready to estimate economic damages and deliver a report to you. Implicit in the report is an expert opinion on the nature and extent of economic damages in your case.

For a personal injury case, the forensic economist's report to plaintiffs' counsel is typically a written document some 5 to 15 pages in length. For defense counsel, reports are often oral rather than written, but may also include written suggestions for cross-examination of plaintiffs' witnesses. In the process of creating reports, the economist will likely accumulate records on the case, including e-mails to and from you, notes about phone calls, hand-written notes on the case, electronic spreadsheets, statistical information obtained from published sources, and a copy of the report

(print or electronic). To the extent that such records are discoverable, you may wish to maintain the option of having some of them destroyed prior to disclosing your witness. However, forensic economists who are members of the NAFE national organization tend to maintain exceptionally high professional and ethical standards as expert witnesses, and may refuse to destroy their records of the case. A clear agreement up front is therefore in order, about how records will be handled.

If, after getting your economist's report, you have questions or comments, you should not hesitate to make them known to the economist. The forensic economists who are NAFE and AAEFE members will make reports that are clear and also reproducible by other economists, but will also be happy to revise their reports in light of new information. If the reports are in written form, then the economist will provide you with a new document entitled "revised report" or something similar.

With or without revision, the economist's estimate of economic damages is unlikely to be exactly the same as the ball-park estimate that you may have conceived early on in the case. Also, reputable forensic economists will not "bend" their methods to get a damages estimate that lines up with what you have in mind. If you see a big difference between your initial expectations and the damages report, ask your economist to explain this difference to you. Explaining economic damages is, after all, an important part of their job.

Testimony

After the forensic economist completes their report (written or oral), if testimony from them is then planned at deposition or trial, the expert may want to discuss with you the upcoming event. They may also ask for a list of attorneys scheduled to be present and a list of known experts working for opposing counsel. Prior to testimony, you and the forensic economist should agree on exactly which opinion or opinions are being advanced, so that the scope of the testimony is clear. At deposition, if opposing counsel clearly understands the scope of opinions up front then everything runs more smoothly. At trial, this organized approach is also

crucial. You and your economist are a team in the sense that you jointly agree on the economic issues to be opined upon. This is true despite the fact that all reputable forensic economists are *neutral experts*—not affiliated with parties in the case.

Which aspects of the opinion(s) are most likely to be cross-examined heavily? You should discuss these with your economist. A practice session, in person, over the phone, or online using Skype or a similar method, may also be useful.

CHAPTER 5

Loss to Workers and Families

As a musician, life is not over just because you are getting older, and so I find retirement a very frightening and dark thought.

—Ian Anderson

Learning Objectives

1. Describe the role of worklife expectancy in determining economic damages when a worker is wrongfully injured, killed, or fired from work.
2. Describe the role of household services in determining economic damages when a worker is wrongfully injured or killed.
3. Describe the role of personal consumption in cases where an injured or dead person's family sues for economic damages.
4. Describe the role of a life care plan in determining economic damages when a person is permanently physically injured or disabled.

In earlier chapters, we explored the sorts of wrongful economic loss that businesses may cause and we estimated economic loss or damages via a variety of business liability examples. As noted in Chapter 4, there is a great deal more that can go into determining economic damages in real cases of business liability, and this chapter explores a few more points of interest in cases where losses are suffered by workers or the families of someone who was wrongfully injured or killed.

Worklife Expectancy

Business liability includes situations where a business wrongfully causes a loss of economic opportunity to someone. Among these opportunities

is the opportunity to work and earn a wage. In personal injury cases, a claim for lost wages is often made, and if the injury leads to permanent disability then the claim may include lost future wages from work that can no longer be done. An important issue in considering such claims is worklife expectancy—*the number of future years during which a person can be expected to work*. The idea of worklife expectancy is different from life expectancy—*the number of future years during which a person can be expected to live*—and also healthy life expectancy—*the number of future years during which a person can be expected to live and remain healthy*.

Since the inception of the U.S. Social Security program in the 1930s, one relevant notion of worklife expectancy is the age at which a person expects to receive full benefits from Social Security. The Social Security retirement age is particularly relevant for people who cannot reasonably be expected to earn significant income beyond that age. As such, it is more applicable to workers who are relatively low skilled, whose skills are particular to a physically demanding or hazardous industry, or who are union members with special retirement plans.[1] It is less applicable to workers who are relatively high skilled, whose work is not physically demanding or hazardous, or who are not union members. Also, Social Security retirement age is less relevant for workers who love their jobs and prefer the activity of working to that of leisure, as is often the case for judges.[2]

Even for workers who can reasonably be expected to work until Social Security retirement age and then retire, there remains the possibility that they will have some lapses in employment or that they will die before retirement age. If so, then the expected number of years worked will be less than the number of years until retirement age. Generally, a person's expected worklife can be modeled as the sum or probabilities P(alive & work) of being alive and working, added up over all ages or years t. To see why, we can write the number of years that a person will continue working as the sum $\sum_t 1(\text{alive}_t \ \& \ \text{work}_t)$ with $1(\text{alive}_t \ \& \ \text{work}_t)$ being the

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[1] Another possible reference point for retirement age is the age at which a person qualifies for Medicare, which is normally 65 years.

[2] For relevant discussion, see the article "Worklife and Economic Damages" (The Brief, a periodical published by the American Bar Association, 2014) by the author (Scott Gilbert).

"indicator" variable that equals 1 if the person is alive and working in the future year t, and equals 0 otherwise. The expectation of this sum is the sum of expectations for the summed items, and each of these has expectation $E[1(\text{alive}_t \ \& \ \text{work}_t)] = P(\text{alive}_t \ \& \ \text{work}_t)$, which is a probability. These probabilities are each "joint" probabilities of two events—"alive" and "working"—and can be usefully expressed in terms of the "conditional probability" $P(\text{work}_t \mid \text{alive}_t)$ of working if alive and the marginal probability $P(\text{alive}_t)$ of being alive:

$$E[\text{worklife}] = \sum_t P(\text{work}_t \ / \ \text{alive}_t)P(\text{alive}_t) \tag{5.1}$$

For a person of a given age, the probability of being alive (or dead) at various future ages t is estimated by the U.S. Department of Health and Human Services, via its U.S. Life Tables, the most recent of which was for 2011 and which covers ages t up to 100. The conditional probability of working, given that a person is alive, used to be estimated by the U.S. Department of Labor based on labor market information, and they combined this with Life Table data and formula (5.1) to provide estimates of worklife expectancy. Publication of these government-based estimates of worklife lapsed by the mid-1980s, but was revived by forensic economists by the turn of the century, with some refinements.[3] The worklife expectancy charts or tables in this literature report estimates of worklife expectancy for the general population and also for subpopulations including men, women, people with at most a high school education, people with a four-year college degree, those currently working, those currently not working, and more.

It is useful to compare worklife expectancy to life expectancy. We can write the latter in terms similar to formula (5.1), but simpler, as follows:

$$E[\text{life}] = \sum_t P(\text{alive}_t) \tag{5.2}$$

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[3] See, for example, the article "The Markov Process Model of Labor Force Activity: Extended Tables of Central Tendency, Shape, Percentile Points, and Bootstrap Standard Errors." *Journal of Forensic Economics*, 22(2), 2011, by Gary Skoog, James Ciecka, and Kurt Krueger.

Life expectancy is a bigger number than worklife expectancy because each summed term in formula (5.1) involves the multiplication of probability $P(\text{alive}_t)$ times another probability $P(\text{work}_t \mid \text{alive}_t)$, which is itself a number less than 1 in value, making each summed term in formula (5.1) smaller than the corresponding term in formula (5.2). But of course one must be alive to work, so the fact that life expectancy is greater than worklife expectancy is also logically necessary, but a comparison of formulas (5.1) and (5.2) can do more than state the obvious. Noting that the conditional probabilities $P(\text{work}_t \mid \text{alive}_t)$ are sensibly quite small at advanced ages t, the difference between life expectancy and worklife expectancy is both logically necessary and also likely to be numerically large.

One can also compare worklife expectancy to healthy life expectancy, the latter modeled as

$$E[\text{life} \mid \text{healthy}] = \sum_t P(\text{healthy}_t \mid \text{alive}_t) P(\text{alive}_t) \qquad (5.3)$$

Since it is normally assumed that one needs to be healthy in order to work, the conditional probabilities $P(\text{healthy}_t \mid \text{alive}_t)$ in formula (5.3) are each at least as big as the ones, $P(\text{work}_t \mid \text{alive}_t)$, in formula (5.1), but still less than the value 1. Consequently, life expectancy exceeds healthy life expectancy which, in turn, exceeds worklife expectancy, as one would expect.

The relevance of formula (5.1) for worklife expectancy assumes that the central issue is the amount of work a person can reasonably be expected to do. However, in cases of labor earnings loss courts sometimes emphasize instead the idea of earnings capacity—*the ability to do work and receive wages*. For example, if a business's pollution poisons a housewife and renders her unable to do work, the court may find the business liable even if the woman never worked nor ever would. The idea is that if the woman could have worked, but chose instead to stay at home and raise a family, then she retained the capacity to do work, this being an economic opportunity deprived of her by the business's actions. The loss of economic opportunity is then a business liability for which economic

damages may be estimated. For this one needs an estimate of expected worklife capacity:

$$E[\text{worklife capacity}] = \sum_t P(\text{work-capable}_t | \text{alive}_t) P(\text{alive}_t) \quad (5.4)$$

which is analogous to formula (5.1) but now in terms of worklife capacity and the probability of being work-capable.[4]

While labor market data provide ready estimates of the conditional probability of working, given that one is alive, it does not provide estimates of the probability $P(\text{work-capable}_t | \text{alive}_t)$ of being work-capable conditional on being alive. For this reason, the worklife formula (5.4) cannot currently be estimated in a way that is directly analogous to how formula (5.1) is estimated. A simple solution is to assume that each healthy person is capable of working and receiving wages, in which case the probability $P(\text{work-capable}_t | \text{alive}_t)$ coincides with the probability $P(\text{healthy}_t | \text{alive}_t)$, and applying formulas (5.3) and (5.4) one finds that worklife capacity expectancy is the same as healthy life expectancy. Data on healthy life expectancy are available from various sources,[5] and a key remaining issue for estimating worklife capacity expectancy in these terms is what sort of "healthy" life state or condition corresponds best to a person having the capacity and opportunity to work.

Suppose that a satisfactory estimate of worklife capacity, or worklife expectation, is in hand. In a lawsuit alleging a loss of work capacity it remains to estimate the expected amount of wages or earnings in those years during which the person is capable of working. In the case of a woman (or man) who is a homemaker and has never worked, a history of wages is not available for making estimates of future wages, and instead a

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[4] In formula (5.2), "worklife_capacity" means worklife capacity and worklife_capable means worklife-capable.

[5] See, for example, Healthy Life Expectancy: Mortality and Morbidity Analysis, 2010 Tables (Expectancy Data, 2014).

statistical estimate of earnings capacity may be used—averaging the earn-
ings of persons of similar background.[6]

In cases of wrongful death the spouse of the deceased may sue and ask
for economic damages that include both their partner's expected future
labor earnings and also pension and other benefits that would be expected
to continue after retirement and through life expectancy. In such cases,
some economic losses continue through life expectancy, while others
continue through worklife expectancy or worklife capacity expectancy.
Evidence on the particulars of post-retirement benefits is often available
from a pension actuary or an other benefit plan representative.

For a business faced with a wrongful death suit, economic damages
may be made substantially larger by the loss of post-retirement benefits,
relative to what they would be if the only loss were labor earnings, but
only to the extent that such benefits were reduced by the (wrongful) death.

Household Services

Despite modern conveniences, at home people tend to spend a signifi-
cant amount of time performing household services for themselves and
their families. Such services include regular house and yard work plus
shopping, managing bills and bank accounts, and caring for pets. Also
included as household services are time spent planning or arranging for
home maintenance and time spent traveling to stores. If a business causes
a person physical injury that prevents them from providing household
services for themselves and the family, the loss of such services may add
to the overall economic loss and damages for which the business is liable.
Also, if a business causes a person's death then that person's family can
seek damages based in part on the loss of household services that would
have been provided if the person were still alive.

Records of employment and wages are typically available via pay
stubs, other employer records, tax records from IRS and state tax offices,
Social Security earnings records, and bank statements. However, records

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[6] For more discussion of the valuation of earnings capacity, see the article "The
Valuation of Earnings Capacity: Definition, Measurement, and Evidence." *Jour-
nal of Forensic Economics*, 12(1), 1999, by Stephen Horner and Frank Slesnick.

of housework—or household services generally—are less common: people do not usually record such work systematically. If the harmed person is alive, one way to gather information about their household services performed is to hire an economist or an other expert to administer a detailed questionnaire covering their day-to-day activities, similar to how the U.S. government currently goes about gathering information for its American Time Use Survey (ATUS). If the person has a spouse, they can be questioned similarly.[7] In addition, the ATUS data provide useful statistics on the average amount of time spent by people on various household services. Given some estimated number of hours spent on various household services, the dollar value of those services can be estimated by applying hourly wage rates for the various service categories, with wage data available from the Bureau of Labor Statistics.[8]

For a business facing liability for personal injury or wrongful death, the loss of household services may be a relatively small component of economic damages, relative to labor wages. On the other hand, for a person injured near retirement age, the household services component of damages may outweigh labor wages. As with wages, an important issue with household services is the stretch of future time over which the activity is expected to take place. Clearly, for household services the time span is not greater than the person's life expectancy but likely exceeds a person's worklife expectancy, and perhaps coincides with healthy life expectancy.

From an economic damages perspective, an interesting question is whether an injured person (or their family) can be properly compensated for the loss of past household services. For example, if a car wreck rendered a person unable to mow their lawn last year then they may have lost a year's worth of lawn mowings before a personal injury trial takes place. If a court awards economic damages for the lawn mowings, it cannot go back in time and get the lawn mowed in a past season, and hence cannot replace the services themselves. It can get bills paid for any hired lawn

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[7] As the injured person and their spouse stand to benefit from economic damages, their responses to questionnaires must be interpreted accordingly.

[8] See, for example, The Dollar Value of a Day: Time Diary Analysis, 2013 Dollar Valuation (Expectancy Data, 2014).

mowing service that took over lawn mowing. It can get fines paid if the lawn went unmowed and location officials administered fines. If a spouse or other family member mowed the lawn then the injured person did not suffer economic loss but this circumstance may fall under the heading of collateral source—as discussed earlier—in which case family contributions may be either excluded from consideration or counted as equivalent to the situation where an outside lawn mowing service did the work.

Personal Consumption

For a wrongful death claim, brought by the deceased's family, economic damages can include lost wages and household services. The family is suing for that part of the deceased's wages and household services that would have gone to the family if not for the wrongful death. Each person normally requires a certain amount of money to be spent on their own maintenance or individual-specific needs, such as their own doctor visits, personal grooming, clothing, and so on. Likewise, among the household services that a person performs, some are likely to be used up by that person only, such as preparing themselves a sack lunch to take to work. For this reason, in wrongful death cases it is appropriate to subtract from earnings and household services some amount of personal consumption—*the amount of goods consumed by an individual that are not jointly consumed by others.*

Like data on household services, individual-specific information on a person's personal consumption is unlikely to be as well-documented as is a person's labor market activity. In addition, in a wrongful death case one does not have the opportunity to question the (deceased) person about their consumption patterns, though one may be able to question family members. As with household services there are statistical averages available, based on survey data, for rates of personal consumption expenditures.[9]

As an intermediate step in determining economic damages in wrongful death cases, courts typically insist on the subtraction of a portion of

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[9] See, for example, the articles: "Patton-Nelson Personal Consumption Tables 2005−06." *Journal of Forensic Economics*, 3(20), 2007, by Michael Ruble, Robert Patton, and David Nelson and "Personal Consumption by Husbands and Wives." *Journal of Forensic Economics*, 1(20), 2007, by Kurt Krueger.

claimed earnings loss, typically of the order of 15 to 30 percent. So personal consumption is a big deal, in terms of damages that may ultimately be attached to business liability.

Life Care Plan

In addition to earnings loss, a person who gets physically injured may face a permanent state of injury or disability in the future.

> ### Example 5.1 Baker Biker
>
> A baker who commutes to work via motorcycle and gets hit by a furniture delivery truck on the way to work may lose a leg. If the furniture company or its delivery driver negligently caused the baker to lose a leg then economic damages may include the baker's medical bills during the accident and recovery periods, and the baker's lost wages while recovering. A baker with one leg may be able to use a prosthetic leg and still do work as a baker, but that presents two problems. First, the baker's productivity at work may be less, due to slowness associated with a prosthetic leg and permanent disability. Second, a prosthetic leg can be very expensive, and is often custom-made.

For a long-term physical disability, such as a lost leg, the effects of the disability on work productivity may be possible to measure or estimate, and if so then the effect on future wages may also be possible to estimate, and so fall into the economic damages framework we have discussed so far. But what about the medical and health care costs associated with the disability? Determining the reasonable set of ongoing medical services and goods needed to accommodate a lost leg or an other disability likely requires the expertise of a doctor or nurse. Assuming that the medical goods and services can be identified, they can be scheduled into a life care plan—a scheduled set of medical and health-related services and goods, designed to restore the injured person to a state of health and function as good as the person had before the injury, or as near as possible to that state.

To illustrate, for the baker-biker example a life care plan may include the initial purchase of a regular-function prosthetic leg, plus the purchase of a special-function prosthetic leg—for more strenuous or exercise

oriented activities. In addition to the "legs" themselves, a separate attach-ment piece—for connecting the "leg" to the human leg stump, may be needed. The equipment undergoes wear and tear with use, and so may require annual maintenance as well as replacement of the equipment every three to five years. Also, the injured person will likely require reha-bilitation in the prosthetic leg's use, and this training may need to be con-tinued if the design of future prosthetic legs changes. If the baker biker lost his leg in his 20s, a life care plan may cover 50 more future years of medical and health-related goods and services.

For a business that negligently causes personal physical injury, economic damages associated with a life care plan may run into the millions of dollars. The economic loss associated with a life care plan can be put into the analytical framework discussed earlier in this book, as long as the cost of the medical or health equipment and services can be priced—creating a schedule or stream of current and future costs.[10] Once the life care plan is converted into a stream of costs, it can be brought to the present value using the economic models presented in Chapter 3. The present value, in dollar terms, is part of economic damages.

In applying economic models to life care plans, two issues arise. One is the choice of discount rate, when bringing future costs to the present value. Commonly, a risk-free or low-risk discount rate—such as the yield on a government bond—is used for this purpose, just as when bringing lost labor earnings to the present value. Another issue is that the price of medical and health-related goods and services changes over time, some-times dramatically. A doctor or nurse typically specifies a life care plan with its goods or services components at their current market cost, but that same doctor or nurse may not be qualified to opine on how the com-ponents' prices are likely to change in the future. Instead, an economist may be asked to fill this role—using relevant market data, published fore-casts of medical prices, and possibly some economic model of the health care industry.

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[10] For health care costs taking place in the past—before trial—the total cost is typ-ically determined by adding up all relevant receipts for care. Such costs are often included under the heading of "special damages," a term that has varied meanings but in tort law refers to relatively concrete, tangible, or readily monetized losses.

For an economist trying to forecast medical cost inflation, when estimating economic loss associated with a life care plan, conditions in the private market for health care and medical goods and services are relevant. Also relevant are public or government effects on prices and costs. The U.S. federal government exerts an important influence on the health care and medical prices, via the Medicare program, and the government itself provides useful forecasts of future costs associated with this program. Also, government-mandated changes in the health insurance market, including the Affordable Care Act (ObamaCare), have also impacted health and medical costs.[11] For some goods, like prosthetic limbs, the technology may be advanced and its pricing may require additional data and modeling assumptions. Generally, prices of health- and medical-related goods and services have risen over time, at a rate that has matched or exceeded the general rise of consumer prices, and a conservative approach to forecasting health or medical inflation is to use inflation in the broad-based consumer price index.[12]

Exercises

1. Suppose that a cruise ship company is sued for the wrongful death of a passenger who falls overboard during a cruise. Assume that the person was 60 years old.
   a. The probability that the person would have lived, in each year beyond 60, if not for the accident, is as follows: P(alive at age 61) = 0.98 = P(alive at age 62) = … = P(alive at age 70), P(alive at age 71) = 0.70 = P(alive at age 72) = … = P(alive at age 79), and P(alive at age 80) = 0. What is the person's life expectancy?
   b. The conditional probability that the person would have worked, had they lived, in each year beyond 60, is as follows: P(work at

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[11] See, for example, "The Affordable Care Act and Trends in Health Care Spending," an article posted online by the White House in 2013.

[12] For more on the economics of life care plans, see, for example, "Method for Calculating Reasonable Aggregate Range Estimates in Life Care Plan Analysis and Other Forensic Economic Applications." *Journal of Forensic Economics*, 17(1), 2004, by David Schap.

age 61| alive) = 0.75 = P(work at age 62|alive) = ... = P(work at age 65 alive), P(worked at age 66|alive) = 0 = P(worked at age 67|alive)... and so on at later ages. Assuming also the life probabilities in part (a) of this question, what is the person's worklife expectancy?

2. The ATUS is administered by the U.S. government and keeps track of time people spend on various activities during the day. To get some idea of how such statistics may apply to your own life, record on a sheet of paper each task or activity you performed from 4 a.m. yesterday until 4 a.m. today.

a. How much time did you spend on household services?

b. If you were to replace your own efforts on these services by hiring outside help, about how much would that cost per hour?

c. Using your estimates in parts (a) and (b), what is the approximate value of household services that you provide daily?

d. Recent statistical estimates suggest that the daily value of household services for American adults varies between $25 and $65 per day and depends on the person's family situation. How does your estimate in part (c) compare to this range?

e. If you were to deduct some amount of personal consumption from your household services value in part (c), how much would that deduction amount to, and what would be the remaining or residual value?

Afterword

If you've made it through most of the material in this book, you've encountered a fair amount of economic discussion and analysis, some description of legal procedures, and numerous examples, all targeted at understanding economic damages in business liability cases. My guess is you haven't read a similar book before, not because you aren't well-read, but because none exists. Scholars of law and economics like to write books on substantive law and its connection to economics,[1] but much of what lies in the present book concerns procedural law and the determination of economic damages in a given case. On the other hand, forensic economists like to write books on the calculation of economic damages,[2] but the focus is much more technical, with limited discussion of general economic and statistical principles.

My hope is that this book has added fruitfully to the mindset of business owners and managers who deal with business liability. If you're a lawyer or an economist curious about how economic and statistical principles play out in court settlements, I hope you've seen some familiar principles interwoven with unfamiliar ones, with a thought-provoking end result. If you have comments or questions on material in this book, I look forward to hearing from you.[3]

Despite a pretty expansive and ambitious scope, a book of this length could not possibly cover exhaustively the myriad issues that arise in the connection between business liability and economic damages. An initial plan for this book included two more chapters, one on "Economic Loss to Businesses" and one on "Economic Loss to Society." These were essentially compressed and distributed into the chapters in the present book's form, but it's worth mentioning some additional issues in these areas.

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[1] See for example the *Law & Economics* text cited earlier, by Cooter and Ulen.

[2] See for example the book *Determining Economic Damages* cited earlier, by Martin.

[3] The e-mail contact for author (Scott Gilbert) is gilberts@siu.edu

When a business causes a wrongful economic loss to another business, the problem of determining economic damages can become challenging simply due to the sheer scale of the businesses themselves. A case of business interruption, lost profit, or copyright infringement can involve thousands of documents, massive amounts of accounting data, and considerable thought about what economic opportunities might (or might not) have been lost due to the alleged wrongful act. There is a natural tendency for businesses to omit or obscure information in such cases, when disclosure is contrary to their interest, and an economist charged with determining economic damages due to business liability must also determine fact from fiction. Too, existing business and tax records say something about profit, earnings, risk, and so on, but not necessarily in the terms most appropriate for determining economic damages, and this often calls for careful interpretation of evidence.

When a business causes harm to society generally, the government often becomes the plaintiff in court, seeking economic damages. We mentioned oil spills earlier, but another important general context is antitrust law, with the government going after big companies like Microsoft for being monopolistic—taking too much control of an industry—to the detriment of the customer. The subject of antitrust business liability is fascinating and has attracted much attention from both legal and economics scholars.[4] When is a business too big, in a given industry? If it is too big, what is the economic loss to society? To answer the first question in detail, one must step beyond the confines of this book—which are mostly walled by the assumption of open and competitive markets, with many buyers and sellers. To answer the second question, a key fact is that big businesses typically try to maximize profit in some form, and in so doing raise prices and lower quantities supplied, relative to what they might be in a perfectly competitive market. But how much are prices jacked up, and how much are quantities cut back, in a situation of monopoly or cartel or oligopoly? Those remaining questions require some economic model of customer demand and production possibilities. At the

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[4] For an example of how antitrust law and economics are commonly discussed, see the periodical *Antitrust* produced by the American Bar Association, and also relevant articles in the academic journal *The Journal of Law and Economics*.

least, an economist who estimates economic damages caused by antitrust or monopolistic activity must understand in deep terms how the company and industry in question work. Systematic coverage of these issues would fill a book different than this one, particularly if multi-period or dynamic losses are considered.[5]

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[5] For the reader interested in economic damages in monopoly, cartel, and other antitrust cases, a good starting point is Chapter 7 of the book *Quantitative Techniques for Competition and Antitrust Analysis* (Princeton University Press, year 2010), by Peter Davis and Elaina Garces. Other relevant works are listed at the end of this book.

Glossary

antitrust case A lawsuit in which a business or businesses are accused of economic harm due to excessive or unfair influence on market outcomes.

arbitration Dispute resolution facilitated by a neutral binding third party.

back pay In employment law, back pay concerns the amount of labor earnings that a person could reasonably earn in the past.

bench trial A trial with a judge but no jury.

breach of contract One party's wrongful harm to another caused by failure to uphold a business contract between them, for which courts provide a remedy.

business liability Debts or other obligations owed by a business to an individual, a group, or an organization.

cause in fact In a court case, a cause in fact is the exclusive and conclusive cause of harm.

ceteris paribus All else equal.

civil law, substantive Laws concerning actions that are noncriminal yet against society's interests.

civil law, procedure The legal procedure by which a judge relies on statutes or other "black letter" instructions to decide court cases.

claims adjuster In an insurance company, claims adjusters gather evidence about loss claims and negotiate settlements with those making the claims.

claims adjuster, independent An outside, or for-hire, claims adjuster hired by an insurance company to gather evidence of liability and loss.

claims adjuster, public An outside, or for-hire, claims adjuster hired by an insurance claimant company to gather evidence of liability and loss.

class action case A lawsuit in which multiple people claim injury or harm of the same sort, and are jointly included in the legal action against the alleged wrongdoer.

common law The legal procedure by which a judge relies on past court decisions—precedent—to decide court cases.

complement In economics, if one good (call it A) is a complement for another (call it B), then A is used together with B, and so the demand for A falls when B becomes more scarce or costly.

collateral source In law, with regard to a wrongful economic loss a collateral source is some opportunity to recover from loss, available to the loss sufferer from their own resources or community, which the court refuses to consider as an offset to the amount owed by the party causing loss.

cost of capital The interest or return on investment that a business must pay in order to attract funds to pay for its business activities.

counsel In law, a lawyer acts as counsel when representing the interests of their client in negotiations or legal proceedings.

damages Court-awarded monetary transfers that compensate for economic or pecuniary loss.

deposition An interrogation of a witness by opposing counsel, while under oath, before trial.

descriptive statistic For a data set consisting of number values, a descriptive statistic serves to summarize or describe the information in the number values.

discovery Evidence gathering.

duty of care In tort law, duty of care is a responsibility held by a party toward others, to reasonably prevent harm. A failure to perform a duty of care may imply negligence.

earnings capacity In law, earnings capacity is the ability to do work and receive wages.

earnings stream A sequence of earnings, or payments, over time.

econometrics The application of statistics to economics. See **economics**.

economics The social science dealing with the production, distribution, and consumption of goods and services.

economic damages In tort and contract law, economic damages are wrongful economic costs imposed by one party (the defendant) on the other party (the plaintiff).

economic expansion A period of time in which the national economy is producing output at a rate that is significantly above its optimal level, given its resources and institutions.

economic loss The destruction of economic opportunity. See **economic opportunity**.

economic opportunity A means of deriving utility from goods consumption now or in the future. See **utility**.

economic recession A period of time in which the national economy is producing output at a rate that is significantly below its optimal level, given its resources and institutions.

economic risk Uncertainty about future economic outcomes.

egalitarianism A political philosophy in which people should be treated as equals, or receive the same opportunities.

evidentiary standard At trial, an evidentiary standard is a standard or criterion for the admissibility of evidence.

externality, negative Costs to people not involved in an activity.

externality, positive Benefits to people not involved in an activity.

first fundamental welfare theorem An economic theory in which markets provide a socially optimal way of allocating society's resources and distributing its goods to people, except in special circumstances.

forensic economist An economist who serves as a consultant or expert in disputes involving economic loss, he or she is qualified to see, produce, or interpret evidence in a way that may clarify its meaning to the parties in a dispute.

front pay In employment law, front pay concerns the amount of labor earnings that a person could reasonably earn in the future.

good faith Honesty or sincerity of intention.

goods Anything satisfying human needs and wants, providing utility, including life-enhancing experiences and vehicles thereof.

hypothesis test In statistics, a hypothesis test uses a data sample to weigh evidence on two or more competing hypotheses about what is happening in the population from which the sample was drawn.

implicit rate of return For a future earnings stream, with a known price for the stream and given values of expected future earnings, the implicit rate of return equates price with the (time-discounted) present value of expected earnings.

insurance A contract in which one party meets the obligations of another, under specific conditions.

insurance, first party Insurance owned by one party that covers losses incurred by that party.

insurance, third party Insurance owned by one party that covers losses incurred by another party.

intentional tort In law, an intentional tort is a civil wrong or harm that is intentionally caused by the offending party—or tortfeasor.

liability, business (legal) Situations, identified by the law, where a business is found to bear obligation to an individual, a group, or an organization.

liability, legal Situations, identified by the law, where an individual, a group, or an organization is found to bear obligation to another.

liability, strict In law, strict liability is the responsibility for causing harm, regardless of intent or disposition.

liability, joint and several In law, joint and several liability is a responsibility for causing harm, shared by two or more parties.

life care plan For a person who has suffered a permanent injury or disability, a life care plan is a scheduled set of medical and health-related services and goods, designed to restore the injured person to a state of health and function as good as the person had before the injury, or as near as possible to that state.

life expectancy The number of future years during which a person can be expected to live.

life expectancy, healthy The number of future years during which a person can be expected to live and remain healthy.

lump sum An amount of money paid all at once.

mean For a random variable, the mean value is a measure of central tendency, describing the middle of the probability distribution.

mediation Dispute resolution facilitated by a neutral nonbinding third party.

moral hazard An excessive shift of risk from one party to another, due to risk avoidance.

motion in limine A request made by one party of a legal dispute for the court to suppress evidence presented by another party.

negligence, tort A tort, or harm to society, arising from lack of due care.

nuisance, tort In civil law, nuisance is a tort in which one party wrongfully controls another's property.

opportunity cost The difference in value between a given opportunity and the next best available opportunity.

option, financial The right to buy or sell a financial asset, at a given price—called the strike price—within a specific time period.

option, real Options available to businesses, to pursue future earnings opportunities.

Pareto optimal A Pareto optimal outcome is a socially best outcome in which no one person can be made better off without making someone else worse off.

pecuniary loss A loss of money, assets, or the opportunity to earn money. Financial losses that can be precisely measured. See also **economic loss** and **economic damages**.

personal consumption The amount of goods consumed by an individual that are not jointly consumed by others.

plaintiff In civil law, a plaintiff is the party bringing suit via a complaint to the court.

precedent In law, a precedent is one court's ruling on a legal case that is relied upon by other courts facing similar cases.

probability For an event, its probability is the chance that the event will occur.

probative value The ability of proffered evidence to prove something important in a trial.

procedural law Laws that specify how litigants may present their cases before the court, separate from substantive law—laws that specify how courts may reach a decision on a case, based on the evidence.

property Anything, tangible or intangible, that is owned by a person or entity. Also, the right to possess, keep, hold, use, enjoy, and dispose of what is owned.

proximate cause In a court case, a proximate cause is an event sufficiently related to the harm or injury in question to be held as its cause.

public good A good which a market cannot provide adequately, either because nonbuyers cannot be excluded from its use, or, similarly, because a single unit of the good can be enjoyed by more than one person at a time.

random variable A variable whose value is random and not perfectly predictable.

regression model A statistical model of the expected value of one variable, given some other variables.

return For a financial investment, the investment's return is the amount of money it produces, often expressed as a ratio of money received to money invested (*gross return*) or as the ratio of profit to money invested (*net return*).

return, excess The financial return earned by a risky asset minus the interest rate or yield on a riskless bond.

risk-averse preference An attitude that views risky economic opportunities as less desirable than riskless opportunities having the same expected rewards.

risk-neutral preference An attitude that views risky economic opportunities as perfect substitutes for opportunities having the same expected rewards.

settlement hearing In a tort trial, a settlement hearing is a private meeting between the plaintiff, defendant, their lawyers, and the judge, with the aim of reaching a settlement before trial.

Sharpe ratio A measure of the attractiveness of a financial investment or portfolio of such investments, the Sharpe ratio is the investment's excess return divided by the standard deviation of return.

social contract An idea or framework that serves to define and limit the rights and responsibilities of society's members.

social welfare function Society's collective or aggregate utility associated with consumption by its members. See also **utility**.

special damages In tort law, special damages refer to relatively concrete, tangible, or readily monetized losses.

speculation In law, speculation is opinion lacking foundation in fact or evidence.

standard deviation A measure of spread or dispersion among the possible values of a random variable, equal to the square root of variance. See also **variance**.

statistical model A mathematical model of some pattern, tendency, or relationship in a data set. Statistical models are applied to a data sample and are often used to better understand a larger population.

substantive laws Laws that specify how courts may reach a decision on a case, based on the evidence.

substitute In economics, if one good (call it A) is a substitute for another (call it B), then A can be used in place of B, and so the demand for A rises when B becomes more scarce or costly.

substitute, perfect In economics, one good is a perfect substitute for another if the first can be used in place of the other, with no loss of utility.

state of nature A possible situation or outcome.

statute A written law passed by a legislative body.

structured settlement An amount of money paid over time.

taking In law, a taking is the act of laying hold upon something.

tort One party's wrongful harm to another, notwithstanding any business contract between them, for which courts provide a remedy.

tortfeasor In civil law, a tortfeasor is one who commits a wrongful (tort) act.

transfer In economics, a transfer—or transfer payment—is a redistribution of goods, income, or resources within society.

trespass, tort In civil law, trespass is a tort in which one party wrongfully occupies another's property.

trier of fact The person or persons responsible for determining facts from evidence in a dispute.

utility In economics, utility is usefulness, the ability to satisfy needs or wants.

variable A quantity that can take on different values in different situations.

value of a statistical life For a person facing an opportunity to take on increased chance of death in exchange for some money, the value of a statistical life is the dollar price per unit of death probability.

variance A measure of spread or dispersion among the possible values of a random variable, equal to the mean squared deviation of the variable from its mean. See also **standard deviation**.

worklife expectancy The number of future years during which a person can be expected to work. See also **life expectancy**.

Bibliography

Allen, M.A., R.E. Hall, and V.A. Lazear. 2011. "Reference Guide on Estimation of Economic Damages." In *Reference Manual on Scientific Evidence*. 3rd ed. Washington, DC: National Economic Press.

Allen, M.A., R.E. Hall, and V.A. Lazear. 2011. *Reference Guide on Estimation of Economic Damages*. 3rd ed. Washington, DC: The National Academic Press.

The American Law Institute. 2013. *A Concise Restatement of Torts.* 3rd ed. Philadelphia, PA: The American Law Institute.

Anderson, P.L. 2012. *The Economics of Business Valuation: Towards a Value Functional Approach.* Stanford, CA: Stanford University Press.

Anderson, P., T. Bolema, and I. Geckil. 2007. "Damage in Antitust Cases." Anderson Economics Group Working Paper 2007-2.

Anderson, D., D. Sweeney, and T. Williams. 2011. *Essentials of Statistics for Business and Economics*. 7th ed. Independence, KY: Cengage Learning.

Anzivino, R.C. Summer 2008. "The Economic Loss Doctrine: Distinguishing Economic Loss from Non-Economic Loss." *Marquette Law Review* 91, no. 4, p. 1081, Article 6.

American Physical Therapy Association. 2015. *Law & liability*. 2nd ed. Alexandria, VA: American Physical Therapy Association.

Bailey, R.E. 2005. *The Economics of Financial Markets.* New York, NY: Cambridge University Press.

Baker, K., and G. Filbeck, eds. 2013. *Portfolio Theory and Management.* New York, NY: Oxford University Press.

Ball, D., and D. Keenan. 2009. *Reptile: The 2009 Manual of the Plantiff's Revolution.* New York, NY: Balloon Press.

Barr & Forman LLP, T.N. Barr, B. Collins, and D.C. Dolive. 2013. *Business Liability Insurance Answer Book.* New York, NY: Practicing Law Institute.

Bhattacharya, S., and G.M. Constantinides, eds. 2005. *The Theory of Valuation*. 2nd ed. Hackensack, NJ: World Scientific Publishing Company.

Blackwell, D.W., M.D. Griffiths, and D.B. Winters. 2007. *Modern Financial Markets: Prices, Yields, and Risk Analysis.* New York, NY: John Wiley & Sons, Inc.

Blomquist, R.F., ed. 2010. *The Quotable Judge Posner: Selections from Twenty-Five Years of Judicial Opinions.* New York, NY: SUNY Series in American Constitutionalism.

Breit, W., and K.G. Elzinga. 1996. *The Antitrust Casebook: Milestones in Economic Regulation*. 3rd ed. Oak Brook, IL: The Dryden Press.

Brookshire, M., F. Slesnick, and J. Ward. 2007. *The Plaintiff and Defense Attorney's Guide to Understanding Economic Damages.* Tucson, AZ: Lawyers and Judges Publishing Company, Inc.

Buccirossi, P., ed. 2008. *Handbook of Antitrust Economics.* Cambridge, MA: Massachusetts Institute of Technology.

Cooter, R., and T. Ulen. 2012. *Law and Economics.* Boston, MA: Addison-Wesley.

Council to the Members of the American Law Institute. 2012. *Torts: Liability for Economic Harm*, Tentative Draft No. 1, *Part of the Restatement of the Law Third Series.* Philadelphia, PA: American Law Institute.

Cvitanic, J., and F. Zapatero. 2004. *Introduction to the Economics and Mathematics of Financial Markets.* Cambridge, MA: The MIT Press.

Damadoran, A. 2006. *Damodaran on Valuation: Security Analysis for Investment and Corporate Finance.* 2nd ed. Johnston, IA: Wiley Finance.

Davis, P., and E. Garces. 2010. *Quantitative Techniques for Competition and Antitrust Analysis.* Princeton, NJ: Princeton University Press.

DeGroot, M., and M. Schervish. 2012. *Probability and Statistics*. 4th ed. Boston, MA: Addison Wesley.

Demange, G., and G. Laroque. 2005. *Finance and the Economics of Uncertainty.* New York, NY: Blackwell Publishing.

DeSerpa, A. 2005. *Economics and the Common Law: Cases and Analysis*. Mason, OH: Thompson South-Western.

Duffie, D. 2001. *Dynamic Asset Pricing Theory.* 3rd ed. Princeton, NJ: Princeton University Press.

Elhauge, E. 2011. *United States Antitrust Law and Economics.* 2nd ed. New York: Foundation Press.

Epstein, L., W.H. Landes, and R.A. Posner. 2013. *The Behavior of Federal Judges: A Theoretical and Empirical Study of Rational Choice*. Cambridge, MA: Harvard University Press.

Fernandez, P. 2013. *Valuation and Common Sense*. 3rd ed. Nevarra, Spain: IESE Business School, University of Nevarra.

Freedman, D. 2010. *Statistical Models and Causal Inference: A Dialogue with the Social Sciences.* New York, NY: Cambridge University Press.

Freedman, D., R. Pisani, and R. Purves. 2007. *Statistics*. 4th ed. New York, NY: W.W. Norton.

Freudenburg, W., and R. Gramling. 2012. *Blowout in the Gulf: The BP Oil Spill Disaster and the Future of Energy in America.* Cambridge, MA: The MIT Press.

Garner, Bryan A. 2011. *Black's Law Dictionary.* 9th ed. Eagan, MN: West Publishing.

Gaughan, P.A. 2009. *Measuring Business Interruption Losses and Other Commercial Damages.* Hoboken, NJ: John Wiley and Sons, Inc.

Gellhorn, E., W.E. Kovacic, and S. Calkins. 1994. *Antitrust Law and Economics*. 5th ed. Eagan, MN: West Publishing.

Goetzmann, W.N., and R.G. Ibbotson. 2006. *The Equity Premium Puzzle.* New York, NY: Oxford University Press.

Goldberg, J.C.P., and B.C. Zipursky. 2010. *The Oxford Introductions to U.S. Law: Torts.* New York, NY: Oxford University Press.

Graham, J.R., and C.R. Harvey. 2013. *The Equity Risk Premium in 2013.* Unpublished Working Paper, Duke University, also available as an NBER Working Paper.

Harrington, S.E., and G.R. Niehaus. 2004. *Risk Management and Insurance.* New York, NY: McGraw-Hill.

Hobbes, T. 1651. *Leviathan.* Reprinted by Clarendon Press. Available online at www.archive.org

Huang, C.F., and R.H. Litzenberger.1988. *Foundations for Financial Economics.* Upper Saddle River, NJ: Prentice Hall.

Huber, P.W. 1988. *Liability: The Legal Revolution and Its Consequences.* New York, NY: Basic Books.

Hunter, D. 2012. *The Oxford Introductions to U.S. Law: Intellectual Property.* New York, NY: Oxford University Press.

Jones, C. 2008. *Financial Economics.* London, England: Routledge.

Kaye, D.H., and D.A. Freedman. 2011. "Reference Guide on Statistics." In *Reference Manual on Scientific Evidence.* 3rd ed. Washington, DC: National Economic Press.

Krueger, K.V. 2014. *Healthy Life Expectancy: Mortality and Morbidity Analysis.* Kansas City, MO: Expectancy Data.

Krueger, K.V., and J.O. Ward. 2014. *The Dollar Value of a Day: Time Diary Analysis, 2013 Dollar Valuation.* Kansas City, MO: Expectancy Data.

Lengwiler, Y. 2009. *Microfoundations of Financial Economics: An Introduction to General Equilibrium Asset Pricing.* Princeton, NJ: Princeton University Press.

Levy, H. 2012. *The Capital Asset Pricing Model in the 21st Century: Analytical, Empirical, and Behavioral Perspectives.* New York, NY: Cambridge University Press.

Locke, J. 1689. *Second Treatise of Government.* Amen-Corner. Available online at www.oll.libertyfund.org

Machina, M., and K. Viscusi, eds. 2014. *Handbook of the Economics of Risk and Uncertainty.* Amsterdam, Netherlands: North Holland.

Marshall, K. 2008. *The Economics of Antitrust Injury and Firm-Specific Damages.* Tucson, AZ: Lawyers and Judges Publishing Company, Inc.

Marshall, K., and T. Ireland. 2006. *Measuring Loss in Catastrophic Injury Cases.* Tucson, AZ: Lawyers and Judges Publishing Company, Inc.

Martin, G.D. 2012. *Determining Economic Damages.* Costa Mesa, CA: James Publishing, Inc.

Meiners, R.E., and B. Yandle, eds. 1991. *The Economic Consequences of Liability Rules: In Defense of Common Law Liability.* New York, NY: Quorum Books.

Merrill, T.W., and H.E. Smith. 2010. *The Oxford Introductions to U.S. Law: Contracts.* New York, NY: Oxford University Press.

Monk, C. 2013. *Financial Asset Pricing Theory.* New York, NY: Oxford University Press.

Nyce, C.M. 2006. *Foundations of Risk Management and Insurance.* 2nd ed. Malvern, PA: American Institute for CPCU.

Olson, W., ed. 1988. *New Directions in Liability Law.* New York, NY: Academy of Political Science in conjunction with the Manhattan Institute for Policy Research.

Pitofsky, R., ed. 2008. *How the Chicago School Overshot the Mark: The Effect of Conservative Economics on Antitrust.* New York, NY: Oxford University Press.

Posner, R.A. 1976. *Antitrust Law: An Economic Perspective.* Chicago, IL: The University of Chicago Press.

Posner. R.A. 1983. *The Economics of Justice.* Cambridge, MA: Harvard University Press.

Pratt, S.P. 2003. *Cost of Capital: Estimation and Applications.* 2nd ed. New York, NY: John Wiley & Sons, Inc.

Pratt, S.P. 2009. *Business Valuation Discounts and Premiums.* 2nd ed. New York, NY: John Wiley & Son, Inc.

Rawls, J. 1971. *Thought Experiment.* Cambridge, MA: Belknap Press.

Risius, J.M. 2007. *Business Liability: A Primer for the Legal Professional.* New York, NY: American Bar Association.

Rousseau, J.-J. 1762. *The Social Contract.* Translated by G.D.H. Cole. Available online at www.constitution.org

Rubenstein, M. 1976. "Income Steams and the Pricing of Options." *The Bell Journal of Economics* 7, no. 2, pp. 407–25.

Samuelson, P., and W. Nordhaus. 2009. *Economics.* 19th ed. Columbus, OH: McGraw Hill Education.

Sen, A. 2009. *The Idea of Justice.* Cambridge, MA: Belknap Press.

Skiadas, C. 2009. *Asset Pricing Theory.* Princeton, NJ: Princeton University Press.

Thomas Sullivan, E., and J.L. Harrison. 2003. *Understanding Antitrust and Its Economic Implications.* 4th ed. Philadelphia, PA: Matthew Bender & Company Inc.

Viscusi, W.K., J.E. Harrington, Jr., and J.M. Vernon. 2005. *Economics of Regulation and Antitrust.* 4th ed. Cambridge, MA: The MIT Press.

Wagner, G., ed. 2005. *Tort Law and Liability Insurance.* New York: Springer. Contributions by Tom Baker and others.

Ward, J., F. Slesnick, and M. Brookshire. 2007. *The Plaintiff and Defense Attorney's Guide to Understanding Economic Damages.* Tucson, AZ: Lawyers and Judges Publishing Company, Inc.

Whinston, M.D. 2006. *Lectures on Antitrust Economics.* Cambridge, MA: The MIT Press.

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Scott D. Gilbert

Businesses exist to provide goods and services to customers and in so doing they take risks. Among these risks is the chance of losing money in lawsuits filed by customers, employees, and others negatively impacted by the business. Insurance provides some protection against these liabilities, but lawsuits still take their toll.

This book covers the subject of economic damages and its role in insurance claims and lawsuits against businesses. After reading and understanding this book, the reader will be able to identify economic damages as a component of business liability, describe the business risk posed by economic damages, explain the key determinants of economic damages, and estimate economic damages and business loss in a variety of cases.

Scott Gilbert, PhD, is an economist who is currently an associate professor of economics at Southern Illinois University Carbondale, and has been director of graduate and undergraduate economic studies there. He teaches courses in economic and business statistics, econometrics, macroeconomics, microeconomics, financial economics, and monetary economics. He is a research economist and statistician whose research has been published in excellent academic journals, including the *Journal of the American Statistical Association*, the *Journal of Multivariate Analysis*, the *Journal of Futures Markets*, and *Economics Letters*. He received his PhD in economics from the University of California, San Diego, and his bachelor's degree in economics from the University of California, Berkeley. He also provides consulting and expert witness services in insurance and court cases involving economic damages.

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