

 Wharton School Publishing

---

# FINANCING

THE

# FUTURE

---

MARKET-BASED INNOVATIONS  
FOR GROWTH



FRANKLIN ALLEN  
GLENN YAGO

WHARTON SCHOOL PUBLISHING—MILKEN INSTITUTE  
SERIES ON FINANCIAL INNOVATIONS

Vice President, Publisher: Tim Moore  
Associate Publisher and Director of Marketing: Amy Neidlinger  
Wharton Editor: Steve Kobrin  
Executive Editor: Jim Boyd  
Editorial Assistant: Pamela Bolan  
Operations Manager: Gina Kanouse  
Senior Marketing Manager: Julie Phifer  
Publicity Manager: Laura Czaja  
Assistant Marketing Manager: Megan Colvin  
Cover Designer: Chuti Prasertsith  
Managing Editor: Kristy Hart  
Senior Project Editor: Lori Lyons  
Copy Editor: Hansing Editorial Services  
Proofreader: Sheri Cain  
Senior Indexer: Cheryl Lenser  
Senior Composer: Gloria Schurick  
Manufacturing Buyer: Dan Uhrig

© 2010 Milken Institute  
Pearson Education, Inc.  
Publishing as Wharton School Publishing  
Upper Saddle River, New Jersey 07458

**This book is sold with the understanding that neither the authors nor the publisher is engaged in rendering legal, accounting, or other professional services or advice by publishing this book. Each individual situation is unique. Thus, if legal or financial advice or other expert assistance is required in a specific situation, the services of a competent professional should be sought to ensure that the situation has been evaluated carefully and appropriately. The author and the publisher disclaim any liability, loss, or risk resulting directly or indirectly, from the use or application of any of the contents of this book.**

Wharton School Publishing offers excellent discounts on this book when ordered in quantity for bulk purchases or special sales. For more information, please contact U.S. Corporate and Government Sales, 1-800-382-3419, [corpsales@pearsontechgroup.com](mailto:corpsales@pearsontechgroup.com). For sales outside the U.S., please contact International Sales at [international@pearson.com](mailto:international@pearson.com).

Company and product names mentioned herein are the trademarks or registered trademarks of their respective owners.

All rights reserved. No part of this book may be reproduced, in any form or by any means, without permission in writing from the publisher.

Printed in the United States of America

First Printing March 2010

ISBN-10: 0-13-701127-X

ISBN-13: 978-0-13-701127-8

Pearson Education LTD.  
Pearson Education Australia PTY, Limited.  
Pearson Education Singapore, Pte. Ltd.  
Pearson Education North Asia, Ltd.  
Pearson Education Canada, Ltd.  
Pearson Educación de Mexico, S.A. de C.V.  
Pearson Education—Japan  
Pearson Education Malaysia, Pte. Ltd.

*Library of Congress Cataloging-in-Publication Data*

Allen, Franklin, 1956-

Financing the future : market-based innovations for growth / Franklin Allen, Glenn Yago.  
p. cm.

ISBN 978-0-13-701127-8 (hbk. : alk. paper) 1. Finance. 2. Capital market. I. Yago, Glenn.

II. Title.

HG173.A4334 2010

332'.041—dc22

2009053172

# 1

---

## The Evolution of Finance

It was a perfect storm. Beginning in 2007, a cascade of extreme events rocked the global financial system, outstripping the risks imagined by central bankers, financial professionals, and policymakers. Within a year's time, international stock market declines had destroyed trillions of dollars in wealth. In the wake of the housing meltdown and the ensuing "Great Recession," pension systems remain fragile and household balance sheets are a wreck.

A confusing alphabet soup of acronyms (think CDOs squared, then cubed, and stuffed with SIVs, CMOs, CLOs, and CDSs) dominated the headlines. With their leverage levels on steroids, many financial institutions and firms had gorged on these overly complex products. The press was aghast to learn that some CEOs didn't have a grasp on the convoluted products on which their traders had placed staggering bets.

The financial crisis of 2007–2009 brought many chickens home to roost in global capital markets. Some \$9 trillion of assets in the United States alone had been securitized. By fall 2008, lower-grade securities had been reworked into roughly a half-trillion dollars' worth of long-term capital instruments (through collateralized debt obligations) and \$1.2 trillion of short-term money market instruments (through asset-backed commercial paper and structured investment vehicles). These were underwritten by almost \$800 billion of private mortgage insurance, issued by bond insurers that ultimately backed a total of more than \$2 trillion of debt. The whole conflict-ridden system was hedged in a murky \$45 trillion credit default swap market—a fine mess, indeed. When the underlying asset bubbles began to implode, liquidity froze and markets cratered.<sup>1</sup>

Fear and loathing of Wall Street is once again loose in the land, but precious little analysis has been offered to distinguish genuine innovation from the churning out of copycat devices designed to conceal the shakiness of the underlying assets, and far too prone to exacerbating systemic risk. The long and storied tradition of *real* financial innovation—the drive to build new tools that increase clarity in valuation and promote capital formation for productive enterprises—was co-opted during the bubble years, perverted into schemes meant to obfuscate and create opacity in asset pricing.

The purpose of this book is to move beyond the noise and reclaim the concept of financial innovation. Throughout history, advances in financing have expanded opportunities and democratized societies—and their potential is still ready to be grasped today. If the right tools are deployed responsibly, financial innovations have the capacity to help us shape a more sustainable and prosperous future.

Finance, at its core, is the catalyst for launching productive ventures and the most effective tool for managing economic risks. Today that process takes place with split-second global transactions and cutting-edge software, but the essential concepts of finance are timeless and rooted in antiquity.

To fully grasp the underpinnings of modern finance, it is useful to note the seminal—and ever more sophisticated—innovations that have marked its evolution, whether it was the first use of credit in Assyria, Babylon, and Egypt more than 3,000 years ago, or the introduction of the bill of exchange in the fourteenth century.<sup>2</sup> Many of these advances democratized economic participation, such as when consumer credit took hold in the 1700s. (By the early part of the twentieth century, tallymen were hawking clothes in return for small weekly payments.<sup>3</sup>) Home mortgages, the founding of stock markets and exchanges, and the wider availability of farm and small-business credit and investment followed in turn.

Financial innovation not only threw open the door to a vast expansion of land, home, and business ownership—broadening prosperity in ways that were unimaginable in earlier centuries—but it also eventually devised ways to value intellectual property. That ability to transform ideas into new industries dramatically quickened the pace of change. By the mid-1980s, Nobel laureate Merton Miller correctly

noted, “The word *revolution* is entirely appropriate for describing the changes in financial institutions and instruments that have occurred in the past 20 years.”<sup>4</sup>

Multiple studies have documented the positive and profound effects of consumer and business finance on economic growth. Any country that forgoes the building of deep, broad financial institutions and markets is also likely to forgo growth. Cross-country comparisons show that nations with higher levels of market development experience faster aggregate growth and smaller income gaps with the wealthiest nations. Recent empirical estimates suggest that if emerging nations doubled bank credit to the private sector as a percent of gross domestic product (GDP), they could increase annual GDP growth by almost 3%. Doubling the trading volume in their securities markets would increase GDP growth by 2%.<sup>5</sup>

At its best, finance can be used to balance the interests of producers, consumers, owners, managers, employees, investors, and creditors. At the risk of stating the obvious, these disparate actors on the economic stage often fail to get along, for a whole host of reasons. When they don’t, economic value is destroyed, business plans are laid to waste, new technologies and ideas wither on the vine, and scarcity—the ultimate bane that economics seeks to overcome—prevails.

The purpose of finance, carried out with technology and sometimes a dash of art, is to create a capital structure that aligns the cooperating and sometimes conflicting interests within an enterprise—whether private, public, government, or nonprofit—toward a common objective. Finance mediates among these interests, addressing the frictions and risks inherent in transactions.

It is through the design and construction of a capital structure that a public or private enterprise finances its assets and leverages them into a greater flow of productivity, innovation, and enterprise. Capital structure is the way a firm, household, enterprise, or project (even those involving partnerships of public and private actors) allocates its liabilities through debt, equity, and hybrid instruments. These operating and investment decisions affect the value of any good or service that is produced.

The cash flow through an enterprise is as vital to its survival as oxygen. It must be distributed based on various claims from creditors,

owners, employees, and so forth. Capital structure allocates shares of that cash flow pie and seeks to grow it. Finance seeks to optimize the sustainability of cash flow, creating positive feedback loops among all the relevant players. Financial frameworks can serve as both carrot and stick, creating incentive structures that maintain an enterprise and enable it to grow.

As Bradford Cornell and Alan Shapiro have demonstrated, financial innovations and business policies can increase the value of an individual firm through the complex web of contracts that binds investors, management, employees, customers, suppliers, and distributors. Strengthening relations with noninvestor stakeholders through management and employee incentives, increasing the confidence of suppliers and customers, and linking public and private interests can increase the value of an enterprise.<sup>6</sup>

Innovation can also be used to resolve information asymmetries—that is, the situation in which some market participants have information that others do not, thereby making markets inefficient and costly to all. Information asymmetries are a core challenge in finance, increasing the risk of unknowns and uncertainties in any transaction, especially those concerning interest rates. Finance assigns costs to the risks of undisclosed information that might eventually emerge. In bridging these gaps between parties, their claims on the cash flows from any enterprise can be assigned, priced, packaged into a financial product, and exchanged.

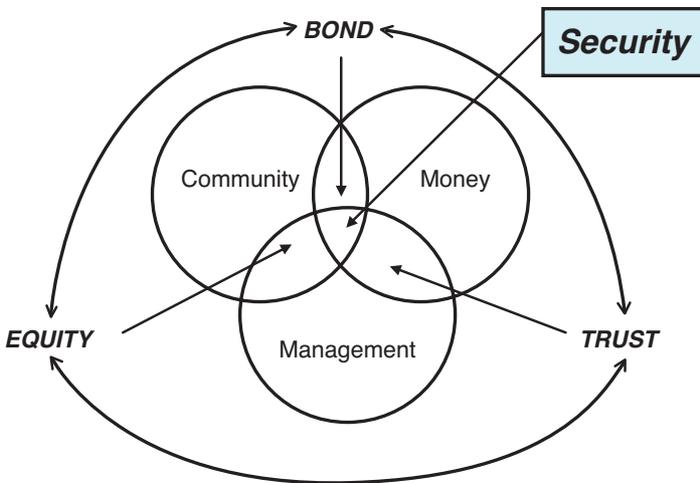
Finance is more than simply a method of allocating capital. When harnessed correctly, it has the capacity to drive social, economic, and environmental change, transforming ideas into new technologies, industries, and jobs.

Overcoming the remaining gaps in capital access and sound market structure represents the challenge and opportunity of our age. We can understand and resolve an array of urgent global problems—financial crises, environmental degradation, world hunger, post-conflict reconstruction, housing, and disease—if we carefully analyze them through the lens of finance.

## The Language of Finance

Finance emerged as a social construct from the way people gave voice to their day-to-day economic interests, defined them, and sought to measure and manage them in real markets. In many cases, the words they devised live on in common usage today, underlining the fact that, despite its sophisticated high-tech profile, the fundamental role of finance remains much the same as it ever was.

One way to understand finance at its most elemental level is to walk through an example of how a social unit becomes sustainable, a process Figure 1.1 illustrates. Imagine any basic unit of social organization: a family, a household, a community, a business, a nonprofit, or a project. Common to all is the necessity of enterprise—that is, undertaking activities that will define, build, and strengthen the unit as it seeks to transform and survive from one set of circumstances to another, whether it be a growing season, a market cycle, a time of life, or a natural disaster. Finance provides the means to bridge uncertain circumstances, such as the costs of discovery, retirement, illness, new technologies, family additions, or a future college education. Innovations that can lower the cost of these objectives are the subject of financial history.



**Figure 1.1** The social construction of capital

Common to all social units is the need to form a community of interests that can be managed and financed. All households have a

division of labor and tasks, management of resources, and a need to sustain itself with cash flow. The same is true for any social enterprise—a company, church, state, railroad, or war. Since Adam Smith’s *Theory of Moral Sentiments* appeared in 1759, those attempting to understand finance have dealt with the human interactions that underpin economic outcomes.

For a community, household, family, or enterprise to balance competing and conflicting claims, it must establish *trust* to sustain and continue transactions to build toward any common objective. As a moral sentiment and social link, trust embodies and secures a claim. We can trace the genesis of trust as a legal concept to late in the Roman Empire. It was through trusts that ownership and management of property first became possible beyond those lands granted, restricted, or seized by a monarch. In medieval England, when knights set off to do battle or join the Crusades, they entrusted their rights to land and property to the church or bishop, who managed them in their absence. From these arrangements sprouted sophisticated legal measures to preserve family estates and keep them out of the hands of the king. England’s trust laws became key instruments of finance, contributing moral, legal, and, ultimately, financial underpinnings that democratized markets.

The point of social interaction, in which monetary resources are allocated to pay for community needs (homes, machinery and equipment, and infrastructure), requires some **bond** that will hold together and steward the economic resources necessary for the community or enterprise’s survival. We can trace references to bonds as covenants that obligate as far back as the early fourteenth century. As codified under English law in the sixteenth century, a bond came to be understood as a deed that binds someone to pay a certain sum of money; the *Oxford English Dictionary (OED)* cites its early use in 1592 as “a contract whereby any man confesseth himselfe by his writing orderly made, sealed, and delivered to owe anything unto him with whom he contracteth.” “Go with me to a notary,” says Shakespeare’s *Merchant of Venice*, “seal me there your single bond.”

Already by the seventeenth century, bonds had become synonymous with debentures (notes backed by credit). Companies and governments issued them to finance everything from building infrastructure to waging war.

When capital resources are deployed to fund an enterprise's ongoing operations, ownership **equity** is created. In accounting terms, equity is what remains as the interest in assets after all liabilities or other claims are paid. The underlying premise of equity in this sense implies evenhanded dealing. Colloquially and quite literally, it became something you could count on—a piece of the action, some skin in the game. By the nineteenth century, the notion of equity encompassed a recognizable right or claim, such as a wife's equity to a suitable provision to maintain herself and her children, or the right to redeem an equity claim from a trust for a home or property. Finally, as stock markets became more ubiquitous, equity came to be understood as the stock (or residue) of a company's assets after creditors were paid. The building of equity in a home, business, or any aspect of productive society is the underlying factor driving real growth; this process embodies the value created by social collaboration in a household, company, or industry.

If all these values can be realized through social constructs and codified in binding legal arrangements, **security** is the ultimate result. When social relationships reinforce bonds, create trust, and build equity in the household, enterprise, or community, the result is greater overall security.

According to the *OED*, the first appearance of the term *security* suggesting property deposited or value derived as a legal obligation to secure fulfillment of a financial claim turns up in the sixteenth-century register of the Scottish Privy Council. Shakespeare's *Henry IV* expressed the vagaries of valuation: "He said sir, you should procure him better Assurance ... he would not take his Bond and yours, he lik'd not the security." By the seventeenth century, land registries mention securities held by creditors as guarantees for right of payment, as well as stocks, shares, or other form of investment guaranteed by security documents. When this system of exchange functions smoothly, the byproduct is the nonfinancial sense of security—that condition of being protected and safe or enjoying freedom from doubt and want.

This brief tour through the pages of the dictionary reflects not only the origins of the words we use in finance: It also illuminates the foundational concepts that inspired early markets and enabled them to work—concepts that are very much alive and at work today.

## What Is Financial Innovation?

Financial innovation is the creation of new financial instruments, technologies, institutions, and markets. As in other technologies, innovation in finance includes research and development functions as well as the demonstration, diffusion, and adoption of these new products or services.<sup>7</sup>

In finance, particularly, innovation involves adapting and improvising on existing products and concepts. Advances emerge initially as either products (such as derivatives, high-yield corporate bonds, and mortgage-backed securities) or processes (such as pricing mechanisms, trading platforms, and means and methods for distributing securities). By moving funds or enabling investors to pool funds, these tools increase liquidity to facilitate the sale and purchase of goods or the management of risks in markets and enterprises.

Exchange-traded derivatives, credit derivatives, equity swaps, weather derivatives, new insurance contracts, and new investment-management products such as exchange-traded funds can all be classified as innovations. But the field also encompasses developments that make the allocation of capital more efficient and operational methods that reduce transaction costs, whether in primary markets where equity and debt originate or in the secondary market where those products are traded.

The process of financial innovation, as Nobel laureate Robert Merton has explained, is similar to high-speed rail technology: The velocity the train can achieve depends on the state of the roadbed and the physical infrastructure along which the train travels.<sup>8</sup> Similarly, White House National Economic Committee Chairman Larry Summers observed, “Global capital markets pose the same kinds of problems that jet planes do. They are faster, more comfortable, and they get you where you are going better. But the crashes are much more spectacular.”<sup>9</sup> In finance, we have rapidly developed the ability to absorb and process information about risk management, to create products and services that seize on new technologies, to restructure companies and industries, and to build completely new markets. But the regulatory and market infrastructure to monitor the trading and pricing of risk has not always kept pace with the lightning-fast speed of information transmission, product trading, and pricing that

streams through today's market. From that point emerges many problems we will explore in the process of innovation.

Our discussion of financial innovations focuses on the following:

- New products and services (such as bank deposits, warrants, futures, options, high-yield securities, venture capital, and securitization)
- New processes and operations (such as net present value, Black–Scholes estimation, and asset pricing)
- New organizational forms (such as types of banks, exchanges, special-purpose vehicles, limited liability corporations, private equity, and leveraged buyout firms)

Innovations have given rise to new financial intermediaries (such as venture capitalists and private equity firms), new types of instruments (collateralized loan obligations and credit derivatives, for example), and new services or techniques (such as e-trading). At their best, these creations can overcome a variety of risks in a global economy.

The traditional function of finance is to transfer money from areas of surplus to areas with a demand and need for it. Financial innovation accomplishes this, becoming the central input for virtually all productive activity. Better finance encourages more saving and investment while improving productivity and investment decisions.

Finance is simply an intermediary that catalyzes other aspects of capital inputs to production. Its multiplying power derives from financial technologies that mobilize all the dimensions of capital: real capital (inputs of natural resources, land, buildings, machinery and equipment, cash, and the like), human capital (knowledge, intellect, skills, talents, and all qualities of human resources), and social capital (the social networks of people, institutions, and traditions).

Each section of this book addresses common questions about the means, methods, and processes of financial innovation:

- What triggers financial innovation, and why?
- What challenge is the innovation trying to address?
- Which form (product, service, organizational form) does a financial innovation take?
- What changes are created in the market as a result?

Invariably, some historical shift that generates an increased demand for capital sparks financial innovation. Some structural break occurs, requiring new vehicles that can move the markets forward.

Centuries ago, population growth and increased trade provided those triggers as the need arose for a system that would enable merchants to store commodities for future use. In the ancient societies of Mesopotamia, Egypt, and Rome, new advances emerged to finance the future production of precious goods such as olive oil, wine, and date sugar. In eighteenth-century Japan, warehouse owners sold receipts against stored rice, which eventually became a commercial currency that could be traded, standardized, and exchanged more broadly as future contracts. By the nineteenth century, this kind of trading in wheat, corn, and livestock was formalized as commodities markets were established in the United States and Europe. Tracing these developments reveals the historical dynamics at work in the evolution of finance.

## **The First Financial Innovations: From Capital to Credit**

Before there could be access to capital, which would be used to create wealth, someone had to come up with the *idea* of capital as a factor of production. In ancient times, goods were traded through barter or, in rare cases, paid for with bars of gold, silver, bronze, copper, or other metals. In these cases, buyers and sellers had to confirm the weight and quality of the metal, a practice that existed in Mesopotamia and Egypt at the beginning of the first millennium B.C.

Access to capital in these ancient societies was limited to rulers, priests, craftsmen, and merchants. The first three groups were admired (and feared), but the merchants were considered a disreputable lot (after all, they didn't actually *create* anything—they just moved goods from point A to point B). The vast majority of people were peasants who tilled plots of land owned by the monarchs in Egypt and Mesopotamia. Wealth to them meant land, not metal bars. The thought of ever accumulating wealth was beyond their imagining. They caught glimpses of wealth in temples and palaces, and nowhere else.

However, a would-be merchant knew he could turn a profit by taking goods from areas where they were cheap to areas where they were expensive. He might have started out as a pottery maker, a fabricator of armor, a weaver of cloth, or a breeder of cattle, and then, by selling his products, emerge with those bars of metal and, later, the coins. For the most part, he had to rely upon his own capital. He might be able to obtain credit, but interest rates were sky-high because of the scarcity of capital and the risks associated with ventures. During the first half of the first millennium B.C., interest rates in Mesopotamia, Egypt, and southern Europe were rarely less than 30%. Transaction costs were oppressive, so simply moving up to the status of merchant was a major accomplishment.

The arrival of coinage, which was introduced in Lydia in Asia Minor sometime around 650 B.C., began to simplify and standardize transactions. The issuer guaranteed the weight and purity of the coins—but even so, they were eyed with a fair degree of suspicion, since shady types engaged in counterfeiting and shaving coins. The Athenians had an elaborate system of coinage, though they did not use the paper money, credit, securities, or joint-stock companies seen in Mesopotamia.

In Athens and other Greek cities, money changers eventually came on the scene to make small loans and act as middlemen. These “trapezites” would borrow then loan these borrowed funds to others who were willing to pay higher rates. Trapezites were not exactly bankers, but rather loan brokers. Merchants borrowed money from these individuals to purchase goods in distant lands, using their reputations and the cargos as security. They could also sell a contract to deliver the cargo at a specified price, receiving payment in advance. When the merchant returned with his cargo, he would sell it in the marketplace. If the price was higher than that of the futures contract, he would pocket the difference. If not, he would have to make up the loss.

The next great change came courtesy of Alexander the Great, who took control of Macedonia in northern Greece at the age of 20. In 334 B.C., he crossed into Asia with 40,000 troops and swept through Persia, seizing the vast wealth he found there. As a result of the Persian victories alone, he captured 180,000 talents of gold and

silver (the modern-day equivalent of approximately \$500 million). He immediately poured a good deal of this money into construction projects, especially temple reconstruction and road building. Irrigation canals were dredged, and sailing fleets were built. But perhaps most important, a great store of capital that previously had been unproductive entered the monetary stream, promoting further trade and industry (call it the ancient world's version of a stimulus package). This had the initial effect of lowering interest rates, which further sparked economic activity. Business loans at 6% became fairly common, although loans to cities were somewhat higher (presumably because the lender wielded more muscle over private citizens than municipalities). This was the economic underpinning inherited by Rome, the first great universal empire, one in which the merchant and the banker were honored and achieved power.<sup>10</sup>

The moral of this story? When transaction costs are lowered and capital can be obtained more easily, economic activity quickens and prosperity widens. Without these elements, economies languish and the standard of living declines.<sup>11</sup>

## **Financial Innovations in the Age of Discovery**

The Spanish, Portuguese, and French voyages of exploration were sponsored by ambitious rulers and financed through taxes, plunder, mining, and loans. The expeditions were purely commercial in nature, with hoped-for profits fueling expectations.

England, Europe's relatively poor cousin during this period, was ruled by monarchs whose taxation powers were limited by the Magna Carta and common law. The nobles, some of whom were wealthy, were not interested in such crass matters as commerce. England did have a large and growing merchant class, with a centuries-old interest in commerce and a willingness to invest in ventures. But if England's monarchs were to enter the colonial race on a large scale, they would have to find some other means of obtaining capital.

One method was outright theft. Queen Elizabeth unleashed the "sea dogs," who robbed Spanish vessels laden with wealth from South and Central America. The other strategy was an alliance of monarch

and merchant in joint stock companies that received charters in the New World.

The Crown chartered several trading companies in the sixteenth century. They were open to all who had money to purchase shares in one venture or another. At first, they sponsored single voyages or enterprises and were dissolved on completion of the mission. But as the century wore on, they became permanent. The first of these, the Muscovy Company, held a monopoly on trade with Russia for hundreds of years. Decades later, the Levant Company was founded to trade with Turkey, and the Barbary Company was created to trade with North Africa.<sup>12</sup>

The East India Company, destined to be the most important of all the joint stock companies, obtained its charter in 1600. It was granted a 15-year monopoly for English trade between the Cape of Good Hope and the Straits of Magellan. By 1610, the company had 19 facilities and was sending shipments of spices and fabrics from the Orient to England. The merchants pocketed handsome profits, and the Crown taxed that wealth, ending its sole dependence on Parliament for funding. Later, joint stock companies would enter the history books by settling several of the English colonies in North America and elsewhere.

The joint stock idea continued throughout the seventeenth, eighteenth, and nineteenth centuries. Its popularity was due in large part to the voluntary nature of the enterprises, the hopes of great profit, and the sharing of risks.

## **The Rise of Financial Capitalism**

New financial innovations emerged with the explosion of global trade in the seventeenth century. When the Treaty of Westphalia (1648) ended the bloody and protracted Thirty Years' War, the Holy Roman Empire broke apart into 300 sovereign political entities, creating a structural need to finance these nation-states and territories, along with the enterprises that fueled their economies.

Amid the turmoil of the Thirty Years' War, the Dutch managed to establish and defend a thriving merchant fleet, financing their commercial supremacy through long-distance trade through the Baltic, Russia, and the East and West Indies. These wealthy merchants minimized the need for cash by issuing liquid trade receipts backed by a

unified system of payments. Amsterdam reigned as Europe's center of commercial credit, extending credit on the basis of bills of exchange payable in Holland. This was the dawn of modern public finance, with the introduction of debt instruments backed by taxes dedicated to a specific purpose, such as erecting levees to hold back the sea or building great sailing ships for trade. As in England, the demand for capital gave rise to joint stock companies—and to the world's first organized securities markets.<sup>13</sup>

The Dutch, British, and French created alternative structures of finance—merchant banks, money markets, and information networks for private credit and public finance. Each nation developed new capacities for transportation, communications, and storage, and financial innovations were necessary to fund long-distance trade, industry, and military expansion.

The British, however, eventually reshaped the rules of the game. By the beginning of the eighteenth century, they were relying not just on financial institutions alone, but on a combination of institutions and financial markets. The British were embroiled in a succession of wars during the eighteenth and early nineteenth centuries, and the need to fund these campaigns led to a financial revolution. Peter Dickson has argued that the ability of the British to fund their government debt so effectively was an important factor that enabled them to regularly defeat the French for more than a century, despite the fact that their population was roughly one-third that of France.<sup>14</sup> This sturdy British architecture proved flexible to shocks and changes, while elsewhere in Europe, the reliance upon financiers and credit institutions stunted the development of financial markets. Without capital markets at work, excessive volatility distorted the prices of assets. Capital was priced to protect entrenched interests instead of financing new and more efficient producers. Payment systems and monetary regimes in much of Europe were subject to the vagaries of politics, but the British capital markets promoted efficiency and productivity.

Rail, steel, and coal emerged as the backbones of a new industrial economy by the 1800s. The resulting economic and geographic integration of markets created vast new demands for capital. Significant external financing was especially needed for rail systems, which required mighty infusions of investment and labor. New

forms of equity and debt securities appeared at this time, from the use of common and preferred stock to various income-related debt instruments and equipment trust certificates.

In more recent times, the dramatic expansion of public equities and the initial public offering market after World War II led to the ability to finance large-scale manufacturing and new mass-consumer markets, from aviation and automobiles to entertainment. The automobile–rubber–oil industrial cluster that drove U.S. economic growth in the twentieth century demanded huge capital investment.

The 1970s brought soaring inflation to the United States, and against this backdrop, interest rate derivatives appeared. These instruments (based on the right to exchange a given amount of money at a set interest rate) now enable 80% of the world's top companies to control cash flow.<sup>15</sup> By the beginning of the 1980s, businesses were struggling with unimagined challenges in dealing with interest rate and current exchange rate risks. Industrial manufacturers found that exchange rate shifts could wipe out price advantages because of the absence of hedging mechanisms. This situation could and did drive corporate bankruptcies and sovereign debt insolvency in the developing world. The “new” asset of interest rate derivatives provided the ability to pay or receive an amount of money at a given interest rate. That interest rate derivative market is now the largest in the world, estimated at more than \$60 trillion.

High-yield corporate bonds were also devised around this time as an attempt to create longer-term, fixed-rate financing for growth companies and even emerging industries that could not get financing elsewhere. These new bonds were especially useful to companies that had been shocked by the interest rate spikes of bank lending in the 1970s or stymied by banks' reluctance to lend to the high-potential businesses of the future based on their prospective cash flows instead of their existing book assets. Iconic names such as News Corporation, Barnes & Noble, Turner Broadcasting, Time Warner, McCaw Cellular (later AT&T Wireless), and Cablevision turned to the high-yield market to finance growth.

Mortgage-backed securities also emerged in the 1970s as the demand for housing spiked, far outstripping the ability of government agencies to provide sufficient liquidity for home lending. Yes,

overcomplexity and leverage were layered onto the backs of these instruments during the bubble years, but mortgage-backed securities worked smoothly for decades. Securitization contributed in a monumental way to the development of the mortgage market by tapping into a broader base for funding and providing vital liquidity.

Market innovators have never stopped searching for new strategies that can address price instability and risk. Later chapters of this book detail the most visionary financing concepts currently being deployed to reboot the housing market, protect the environment, promote faster medical cures, and tackle a host of other social problems.

## **Landmarks in Financial Innovation**

Multiple factors must be in place for new financial structures to work, including transparency, standardization, a system of exchange, and price discovery. These are necessary ingredients for overcoming information asymmetries and helping all parties to price and manage risk. Just as physical infrastructure is required for transportation and communications, an adequate information infrastructure must be in place for financial innovations to take hold and succeed.<sup>16</sup>

### ***Uniform Commodity and Security Standards***

Transaction costs are reduced and markets are made more reliable when uniform commodity and security standards are defined. The ability to measure, monitor, and manage data about any security underlies the ability to price or trade it. Standardization is key to ensuring that accurate valuation can occur. The underlying asset must be specified, whether it is a bushel of corn or an interest rate. Benchmarking, auditing, and information management allow transparent transactions to take place. Standardization delineates the type of settlement (cash or physical), the number of units of the underlying asset per contract, the currency or unit of exchange, the grade (type of commodity or grade of security), and the timing of the trade (delivery, trading date, and maturation). The process of standardization is carried out by establishing broadly accepted principles for determining accounting values, while still allowing some degree of methodological flexibility. Competing interests must be overcome to harmonize measurements so that accurate valuations can be made.

## ***Legal Instruments Providing Evidence of Ownership***

Property rights constitute one of the fundamental building blocks that make financial innovations and markets possible. Ownership grows as cash flows from operations, trading, and commerce. The registration and protection of property rights—whether involving a parcel of land or intellectual property—is necessary for the mobilization of all forms of capital for productive use. The ability to establish proprietary interests in economic activity underlies what Hernando de Soto has appropriately called “the mystery of capital.”<sup>17</sup> Claims that can leverage other means of finance toward creative goals of economic activity must be established and protected. Tangible ownership stakes provide the physical means and incentives for individuals to take transformative action.

## ***Exchanges***

Exchanges grew out of the need to provide channels for the flow of savings to investment. The prospects of long-term capital gains for investors emerged systematically as firms that had growing demands for capital reinvested earnings to attract investors seeking higher returns. The earliest exchanges grew out of the need to finance trades and fairs through bills of exchange, drafts, notes, and instruments. From exchanges for bills and notes, the movement toward more complex securities came swiftly as the structural needs for external financing grew to accommodate new markets, technologies, and challenges. Exchange-traded financial innovations are standardized and can be margined and financed.

## ***Futures, Options, and Forward Markets***

Futures are standardized contracts committing parties to buy or sell goods at a specific quality and price for delivery at a specific point in the future. Traders on a mercantile exchange can use them to swap pork belly futures, or airlines can use them to hedge oil prices. They have been at work for centuries—in fact, they surface as Aristotle relates the story of Thales of Miletus in the sixth century B.C.<sup>18</sup> Thales overcame his legendary poverty by developing forecasting and estimation skills relative to weather and geography: He predicted a

bumper crop of olives and raised money to deposit for olive presses, which he then claimed and traded at profit.

Futures exchanges act as clearinghouses between buyers and sellers, guaranteeing their contracts. They monitor the credit of buyers and sellers, process new information about supply and demand, and generally provide stability in an unstable environment by ensuring future prices and availability.

Futures are standardized and exchange-traded, while forwards and options are customized for a counterparty and therefore not frequently traded on exchanges. (The “forward market” is a general term used to refer to the informal market in which these contracts are entered and exited.) Informal spot markets form when economic actors make only limited contractual obligations to the future by negotiating a cash price for a good, service, or commodity on the spot at current market prices. Later, the ability to commit to forward prices occurs.

In all cases of the evolution of these markets, standardization of the underlying good or asset is required to measure price variability, arrive at competitive prices, ensure that viable cash markets exist, and determine patterns of forward contracting. Patterns of contract design emerge that are consistent with legal and tax restrictions, enabling trade.

### ***Over-the-Counter (OTC) Markets***

The need for customized solutions to control financial risk gave rise to OTC markets. If a standardized exchange-based option is inadequate, a corporation can write a more tailored contract that is designed and priced to provide greater stability. For example, a corporation needing to plan production might need to hedge a stream of foreign currency revenue for a longer period than what is available via an exchange-traded instrument. In a bilateral over-the-counter contract (such as a corporate bond), two parties agree on how a particular trade or transaction is to be settled in the future. While exchange-traded instruments are standardized contracts, OTC options are tailored to particular risks. Price discovery on exchange-traded options is important for determining prices of OTC options. Banks, investment banks, insurance companies, large corporations, and other

parties participate in OTC markets. Forwards and swaps are prime examples of OTC contracts; without futures, insurance and risk management for these more customized instruments can be extreme.

## **Did Financial Innovation Cause the Crisis?**

As we discuss further in Chapter 4, “Innovations in Housing Finance,” the housing sector has seen a considerable amount of financial innovation in recent years—and a number of commentators have argued that this played an important role in causing the crisis.<sup>19</sup> Although new mortgage products and the predatory practices of many lenders in persuading people to take on mortgages they could not afford exacerbated the impact of the meltdown, we believe they were not its fundamental cause. There are clearly many factors that drove the crisis and a wide divergence of opinion about their relative importance. For example, a number of people argue that moral hazard caused by the government safety net and the prospect of bailouts for banks and entities like Fannie Mae and Freddie Mac led to excessive risk-taking by financial institutions. While we believe this was an important factor—and an area in which financial innovation needs to focus in the future in order to better align incentives—we argue that the primary problem was a loose monetary policy that led to a massive run-up in home prices.

Carmen Reinhart and Kenneth Rogoff have also pointed to the outsized bubble in house prices as the primary culprit.<sup>20</sup> They tracked real housing prices in the United States from 1891 until 2008, showing that prices remained remarkably stable until the early 2000s, when they spiked dramatically before starting to fall precipitously in 2006. In the decade between 1996 and 2006, real housing prices in the United States grew about 92%—three times more than the total increase (27%) they had posted from 1891 until 1996. When this bubble burst, it first hit subprime mortgages before spilling over to the rest of the financial system.

The United States was hardly the only place that produced a housing bubble. Spain and Ireland, to name just two examples, were also hard hit—and, interestingly, in neither of these countries was financial innovation a major factor. Securitized mortgages in Spain were required to have loan-to-value ratios of 80% or less (meaning borrowers had to contribute at least 20% down payments).<sup>21</sup> In Ireland, the

main financial innovation introduced during the bubble years was simply the lengthening of mortgage terms.<sup>22</sup> Yet both of these countries have felt even more severe consequences than the United States. In Spain, the impacts have been serious, even though the major commercial banks (such as Santander and BBVA) came through the crisis much better than most of their international counterparts.

John Taylor has made a direct connection between lax monetary policy and the bubble in home prices in the United States, Spain, and Ireland.<sup>23</sup> He considered what would have happened in the United States if the Federal Reserve had maintained the same approach that had prevailed since the 1980s, during the period known as the Great Moderation. His simulations suggest that under that scenario, the housing price boom would have been much smaller. Although Spanish interest rates never approached lows like the 1% rate set by the Federal Reserve from 2003–2004, monetary policy was nevertheless very loose, taking into account the high rate of inflation in Spain at the time and other economic factors. In fact, Spain had the loosest monetary policy and the largest housing boom in the Eurozone. The story in Ireland was similar.

The growing issuance of subprime mortgages in the United States, particularly as home prices moved toward their peak, meant that the bursting of the bubble caused immediate damage. Because many subprime borrowers had little to no cushion, their default rates went up soon after home prices began to fall, sparking problems in the money market. Given what happened in other countries with less financial innovation, a major crisis would have occurred even without subprime mortgages. Reinhart and Rogoff cite real estate bubbles as the causes behind banking crises in Spain in 1977, Norway in 1987, Finland and Sweden in 1991, Japan in 1992, and many Asian countries in 1997. In all these cases, a collapse in housing prices caused banking crises.<sup>24</sup>

Many of the recent financial innovations in the mortgage market were aimed at expanding homeownership to people with low incomes and few assets—and this policy is in fact desirable in many ways. However, these new products relied heavily on the assumption that home prices would continue to rise. As long as this was the case, an individual's mortgage could be refinanced or the house could simply be sold to pay off the mortgage if problems occurred. Although it seems obvious

in retrospect that there was a bubble in housing prices, it was not so clear at the time. Some observers, such as economist Nouriel Roubini, did sound warnings. *The Economist* even ran an analysis in mid-2005 cautioning that “it looks like the biggest bubble in history.”<sup>25</sup> But nevertheless, the Federal Reserve, the other bank regulators, and many market participants missed (or chose to ignore) the signs. The rewards to anybody who realized the existence of the bubble and invested appropriately were staggering. For example, hedge fund manager John Paulson made \$3.7 billion in 2007 by taking positions to exploit the fall in house prices.<sup>26</sup>

There is no sugarcoating the fact that some of the complex mortgage products developed during this period were explicitly designed to mislead people. But making things complicated to fool people is a practice that is hardly restricted to financial innovation. In the markets for many products, from car rentals to mobile phones, vendors take advantage of the unwitting. Xavier Gabaix and David Laibson have shown how this can happen even in competitive markets.<sup>27</sup>

This book is about the many benefits that financial innovation can create. This is not to say that financial innovation is universally beneficial. Some “innovations,” particularly those that are complex for complexity’s sake, with the aim of fooling consumers, are not desirable. However, these aberrations should not obscure the past accomplishments and future potential of financial innovation. They should instead motivate the financial community to find new ways to safely test new products, manage risk, and increase transparency.

The major lessons from the crisis can be boiled down to this: Complexity does not equal innovation, and *leverage* is not a synonym for *credit*. Everything new under the sun is not automatically an innovation. As noted in our discussion of the vocabulary of finance, equity emerges from the variety of interactions that build real value in an enterprise, be it a household, business, government, or community. Credit, as its root, implies the reliance on the truth or reality of something—its ability to be valued in a manner that becomes an accounting entry, representing the balance of cash in one’s favor. True innovation in capital markets and finance has made access to credit and the ability to build equity more flexible and less costly.

But in recent years, as new products became increasingly Byzantine and financial institutions became dangerously leveraged, credit was often used for speculation, not necessarily to enhance value or productivity. A host of Rube Goldberg financial products were introduced simply for the sake of product differentiation and marketing; many were embedded with high leverage or disguised with intentionally opaque structures. The recent financial crisis illustrated vividly that excessive complexity is the enemy of transparency, ultimately hampering the market efficiency that financial systems need to operate.

With the advent of banking, insurance, securities, futures, and other derivative markets, the strengths and imperfections of finance have remained. As in any area, innovation in finance is dynamic, disruptive, and nonlinear. Financial growth, despite its newly broad reach and seemingly boundless potential, is still inadequate and unequally shared. Until the evolution of finance and the markets serving it are fully complete, the risk of crisis remains present—and that risk has even intensified over time as an intricate web of global connections has formed.

But risk management is a fundamental component of financial innovation, and new breakthroughs will be the key to controlling the potential for outsized global shocks. The overall objective is to reduce the cost of capital while mitigating systemic risk—the cascading failures of businesses, financial institutions, and intermediaries that sometimes arise when economic actors trade without possessing adequate information.<sup>28</sup>

It is crucial to look beyond the hype and hysteria that surfaced during the most recent financial crisis. We believe that financial innovations are the cure for instability, not the cause.

## **Using Finance to Manage Risk and Democratize Access to Capital**

All types of enterprises involve risks, many of which are difficult to quantify. The role of finance is to understand those risks and provide the institutional framework to resolve them and build linkages to the capital markets.

As Robert Shiller has noted, numerous financial innovations arose from attempts to insure risk. Coincident with the growth of

global trade in the seventeenth century came an increased understanding of probability theory—and, with it, the creation of actuarial tables for various risks. Initially, Shiller explains, only narrow risks were insured, such as death, the sinking of ships, or destruction by fire. Gradually, insurance extended to disability, floods, and accidents. Today he sees financial innovation broadening the use of risk management, extending it to new classes of risks that limit global growth, such as income inequality.<sup>29</sup>

Increasingly, managing complex risks within a firm requires the integration of finance into all aspects of accounting, corporate strategy, and industrial organization. Capital structure comes to reflect and enable those strategies. The ability to measure and monitor risk has taken a leap forward with information technology, and major innovations have arisen to manage newly conceptualized factors. The underlying technologies of telecommunications and data processing have had a transformational effect on this field.

Financial innovation and information technology intersect most profoundly around the issues of overcoming information asymmetries and improving the ability to price risk. Lenders that faced difficulties in determining who was creditworthy or monitoring performance after a loan or investment was made paved the way to new advances in fundamental credit analysis and scoring geared toward overcoming problems of adverse selection and moral hazard. New credit and investment products that can build on valuation methodologies derived from larger relational database management have the capacity to overcome problems of asset pricing models. Breakthroughs in financial IT have improved methods of assessing market risk and the fragility or strength of portfolio mixes.

Fundamental analysis is based on an honest evaluation of the financial conditions, management, and competitive advantages of a business or project; this process necessarily includes scrutiny of production, distribution, earnings, interest rates, and management. The ability to conduct such analysis underlies all valuations of firms and projects, encompassing projections of their performance and calculation of the credit risk involved in extending them financing.

The financial instruments introduced over time are built on this essential ability to ascribe, measure, and monitor value. Improving the

means and methods of valuation is central to overcoming the information barriers of price discovery—a major goal of financial innovation. The components subject to valuation can be translated into equity, debt, and combination (hybrid) structures, running the spectrum of external and internal financing methods available. The linkage of savings into investment is the key process at the heart of finance, and these tools make the translation between the two possible.

The proposition inherent in financial innovation is that the expansion of finance can improve productivity in a way that will solve economic, social, and environmental problems, thereby leading to job creation and better standards of living. Financial innovations can align interests to achieve poverty reduction (through microfinance and impact investing), entrepreneurial growth (through small business financing), the mitigation of environmental problems (through markets for emissions permits and transferable fishing quotas), and medical cures (through new financing strategies to support the R&D process). The objective of finance, as with economics in general, is to overcome problems of scarcity by increasing prosperity.

The recent meltdown did not halt the evolution of financial innovation. On the contrary, the need for fresh solutions has never been greater. Innovations can lay the groundwork for reconstructing a more robust set of institutions and instruments, ultimately building a new global economy based upon sustainability and wider participation.

By examining both history and contemporary case studies, this book explores how innovations can deliver the benefits of finance to increasingly broader segments of the population, expanding access to capital and opportunity.

## Endnotes

<sup>1</sup>Joseph R. Mason, “The Summer of ‘07 and the Shortcomings of Financial Innovation,” *Journal of Applied Finance* 18, no. 1 (2008): 8–15; Markus K. Brunnermeier, “Deciphering the Liquidity and Credit Crunch 2007–8,” *Journal of Economic Perspectives* 23, no. 1 (Winter 2009): 77–100.

<sup>2</sup>William N. Goetzman and K. Geert Rouwenhorst, *The Origins of Value: The Financial Innovations That Created Modern Capital Markets* (New York: Oxford University Press, 2005).

<sup>3</sup>These merchants were called tallymen because they kept a record, or tally, of what people had bought on a wooden stick. One side of the stick was marked with notches to represent the amount of debt, and the other side was a record of payments.

<sup>4</sup>Merton H. Miller, “Financial Innovation: The Last Twenty Years and the Next,” *Journal of Financial and Quantitative Analysis* 21, no. 4 (December 1986): 437.

<sup>5</sup>Ross Levine, “Finance and Growth: Theory and Evidence” (working paper no. 10766, National Bureau of Economic Research, September 2004).

<sup>6</sup>Bradford Cornell and Alan C. Shapiro, “Financing Corporate Growth,” *The Revolution in Corporate Finance*, 4th ed. (London: Blackwell, 2003).

<sup>7</sup>Robert Merton, “Financial Innovation and Economic Performance,” *Journal of Applied Corporate Finance* 4, no. 4 (1992): 12–22.

<sup>8</sup>*Ibid.*

<sup>9</sup>Joshua Cooper Ramo, “The Three Marketeers,” *Time* (15 February 1999).

<sup>10</sup>Paul Millett, *Lending and Borrowing in Ancient Athens* (New York: Cambridge University Press, 2002). For further background on origins, see Peter Bernstein, *Against the Gods: The Remarkable Story of Risk* (New York: Wiley, 1998); and Michael Hudson and Marc Van de Mierop (eds.), *Debt and Economic Renewal in the Ancient Near East* (Potomac, MD: CDL Press, 2002).

<sup>11</sup>Francesco Boldizzone, *Means and Ends: The Idea of Capital in the West, 1500–1970* (London: Palgrave Macmillan, 2008).

<sup>12</sup>Karl Polanyi, Conrad Arensberg, and Harry Pearson, eds., *Trade and Market in the Early Empires* (New York: The Free Press, 1957).

<sup>13</sup>Larry Neal, *The Rise of Financial Capitalism: International Capital in the Age of Reason* (New York: Cambridge University Press, 2002); and Walter Russell Meade, *God and Gold: Britain, America, and the Making of the Modern World* (New York: Knopf, 2008).

<sup>14</sup>Peter G. M. Dickson, *The Financial Revolution in England, A Study in the Development of Public Credit, 1688–1756* (New York: St. Martin’s Press, 1967).

<sup>15</sup>Richard L. Sandor and Howard Sosin, “Inventive Activity in Futures Markets: A Case Study of the Development of the First Interest Rate Futures Market,” *Futures Markets: Modeling, Managing, and Monitoring Futures Trading* (Oxford: Basil Blackwell, 1983).

<sup>16</sup>Thanks to our colleague Richard Sandor for his work in identifying the stages of financial innovation.

<sup>17</sup>Hernando de Soto, *The Mystery of Capital: Why Capitalism Triumphs in the West and Fails Everywhere Else* (New York: Basic Books, 2000).

<sup>18</sup>Aristotle, 1259 a 6-23; Plutarch *Vit. Sol.* II.4.

<sup>19</sup>Simon Johnson and James Kwak, “Finance: Before the Next Meltdown,” *Democracy*, issue 13 (Summer 2009); [www.democracyjournal.org/article2.php?ID=6701&limit=0&limit2=1000&page=1](http://www.democracyjournal.org/article2.php?ID=6701&limit=0&limit2=1000&page=1).

- <sup>20</sup>Carmen S. Reinhart and Kenneth S. Rogoff, *This Time Is Different: Eight Centuries of Financial Folly* (Princeton and Oxford: Princeton University Press: 2009).
- <sup>21</sup>Gregario Mayayo, President of the Spanish Mortgage Association, “The Spanish Mortgage Market and the American Subprime Crisis,” Asociación Hipotecaria Española, December 2007.
- <sup>22</sup>David Miles and Vladimir Pillonca, “Financial Innovation and European Housing and Mortgage Markets,” *Oxford Review of Economic Policy* 24 (2008): 145–175.
- <sup>23</sup>John Taylor, “The Financial Crisis and Policy Responses: An Empirical Analysis of What Went Wrong” (working paper, Stanford University, November 2008).
- <sup>24</sup>Reinhart and Rogoff, Table 10.8, p. 160.
- <sup>25</sup>Stephen Mihm, “Dr. Doom,” *New York Times Magazine* (15 August 2008). See also “In Come the Waves,” *The Economist* (16 June 2005).
- <sup>26</sup>James Mackintosh, “Record Profits for Fund Shorting Subprime,” *Financial Times* (15 January 2008); and Henny Sender, “Hedge Fund Chief Pessimistic About UK Property,” *Financial Times* (18 June 2008).
- <sup>27</sup>Xavier Gabaix and David Laibson, “Shrouded Attributes and Information Suppression in Competitive Markets,” *Quarterly Journal of Economics* 121, no. 206 (May 2004): 505–540.
- <sup>28</sup>Michael Magill and Martine Quinzi, *Theory of Incomplete Markets* (Cambridge: MIT Press, 1996).
- <sup>29</sup>Robert Shiller, *The New Financial Order: Risk in the 21st Century* (Princeton: Princeton University Press, 2003).

# INDEX

## A

access to capital, 23-24, 221-222  
Acid Rain Program, 133-135  
Acumen Fund, 166  
Adams, John Quincy, 59  
ADB (Asian Development Bank), 170  
adjustable-rate mortgages (ARMs), 97  
Advance Market Commitment, 207  
advance purchase agreements for vaccines, 206-209  
affordable housing solutions, 108-109  
Africa, infrastructure development, 171  
agency problems, 39-41  
AIDS vaccine development, 206  
AIG, CDS (credit default swaps) and, 78  
Alexander the Great, 11  
American Research and Development (ARD), 68  
American Stock Exchange, 67  
Ameriprise Financial, history of, 66

Anderson, Harlan, 68  
arbitrage, 45  
ARD (American Research and Development), 68  
Aristotle, 17  
ARMs (adjustable-rate mortgages), 97  
Asian Development Bank (ADB), 170  
Asian Financial Crisis of 1997–1998, 170  
asset bubbles, 216  
asset prices, sustainability of, 103  
asymmetric information, 39-41

## B

back-end plans, as antitakeover technique, 76  
Bank of America, history of, 65  
Banker's Trust, 62  
Barbary Company, 13  
Bayer Healthcare AG, 205  
Bayh–Dole Act of 1980, 197  
Becker, Gary, 152  
biodiversity banking, 141-142  
biodiversity value, 123

**biomedical development finance**  
 capital structure, 188-193  
 current business model, 185-187  
 donor bonds, 209-210  
 financial innovations, types of, 187  
 funding sources, 193-204  
     *CEFF, 197*  
     *collaborative development, 196*  
     *credit enhancement strategies, 201-204*  
     *CRO-linked financing, 197*  
     *designated funds, 197*  
     *incubators, 197*  
     *projected royalty streams, 195*  
     *public equity and venture capital, overcoming limitations of, 199-201*  
     *traditional funding, 193-195*  
     *university partnerships/private equity/public-sector investing, 197-199*  
 nonprofit pharmaceutical companies, 210  
 public-private partnerships, 204-209  
 social change via, 223  
**Black, Fischer, 44**  
**Black-Scholes model, 44-46**  
     formula for, 225  
     in history of corporate finance, 70  
**bond-warrant units in history of corporate finance, 71-72**  
**bonds**  
     covered bonds, 106  
     defined, 6

    donor bonds for vaccine and treatment development, 209-210  
     for food security, 173-174  
     high-yield bonds in history of corporate finance, 70-71  
     zero-coupon bonds in history of corporate finance, 73  
**Boyle, Phelim, 46**  
**Brandeis, Louis, 220**  
**Brown, Gordon, 207**  
**Bugg-Levine, Antony, 167**  
**building and loan societies in history of housing finance, 88**  
**Burton, Ellison, 133**  
**Bush, George H. W., 130**  
**Bush, George W., 153**  
**business cycles, origin of theory, 63**  
**business failures, financial innovation in, 63**  
**business finance. See corporate finance**  
**C**  
**call options, 45**  
**cap, in cap-and-trade, 132**  
**cap-and-trade**  
     in environmental finance, 123  
     in pollution markets, 132  
     *Acid Rain Program, 133-135*  
     *for carbon emissions, 135-137*  
**capital**  
     access to, 23-24, 221-222  
     democratization of access to, in history of corporate finance, 65-66  
     history of, 10-12

- Capital Asset Pricing Model (CAPM)**, 43-44  
 in history of corporate finance, 69
- capital market, housing crisis solutions in**, 106-107
- capital structure**  
 of biomedical development funding, 188-193  
 in corporate finance, 55-57  
 in financial innovation, 221  
 in history of corporate finance, 69-74  
 of railroad industry, 60
- capital structure models**, 27-29  
 Black–Scholes model, 44-46  
*formula for*, 225  
*in history of corporate finance*, 70
- CAPM (Capital Asset Pricing Model)**, 43-44
- Modigliani–Miller capital structure propositions**, 27-36
- Monte Carlo methods**, 46
- uncertainty in**, 28
- capitalism, history of**, 13-16
- CAPM (Capital Asset Pricing Model)**, 43-44  
 in history of corporate finance, 69
- carbon emissions cap-and-trade system**, 135-137
- cash flow model for SRFs**, 126
- catch-share programs**, 138-140
- CBOE (Chicago Board Options Exchange)**, 38
- CDM (clean development mechanism)**, 137
- CDOs (collateralized debt obligations)**, role in housing crisis, 98
- CDS (credit default swaps)**  
 in history of corporate finance, 77-79  
 role in housing crisis, 100
- CEFF (committed-equity financing facilities)**, 197
- cellphones, access to**, 158-159
- charter amendments, as antitakeover technique**, 75
- Chase National**, 62
- Chicago Board Options Exchange (CBOE)**, 38
- Chicago Climate Exchange**, 136
- China**  
 as development finance example, 175-178  
 infrastructure development, 170
- Clean Air Act**, 133
- clean development mechanism (CDM)**, 137
- Clean Water Act**, 124, 141
- climate change, cap-and-trade system to avoid**, 135-137. *See also* environmental finance
- clinical trials, phases of**, 192
- CLTs (community land trusts)**, 108
- CLTV (combined loan-to-value ratio)**, 104
- CMOs (collateralized mortgage obligations)**, 93
- Coase, Ronald**, 122
- coinage, history of**, 11
- collaborative development for biomedical development funding**, 196

- collateralized debt obligations (CDOs), role in housing crisis, 98
- collateralized mortgage obligations (CMOs), 93
- combined loan-to-value ratio (CLTV), 104
- commercial paper, origin of, 60
- committed-equity financing facilities (CEFF), 197
- commodities, standardization, 16
- commodity-linked securities in history of corporate finance, 73
- community land trusts (CLTs), 108
- competition among prescription drugs, 190
- complexity of financial products, 217-219
- Comptom, Karl, 68
- conservation. *See* environmental finance
- conservation project funding
  - debt-for-nature swaps, 129-132
  - SRFs (state revolving funds), 124-129
- contract research organization (CRO)-linked financing, 197
- convertible bonds in railroad industry, 60
- convertible debt, 40
- Cornell, Bradford, 4, 56
- corporate finance, 51, 55
  - capital structure and, 55-57
  - history of
    - Alexander Hamilton, role of*, 57-59
    - capital structure innovations*, 69-74
    - CDS (credit default swaps)*, 77-79
    - creative destruction (finance and technology)*, 63-64
    - credit scoring*, 77
    - democratization of capital*, 65-66
    - investment banking*, 61-62
    - LBOs (leveraged buyouts)*, 75-77
    - nineteenth century innovations*, 59-61
    - private equity*, 74-75
    - venture capital*, 66-69
  - social change via, 222
- corporate governance,
  - antitakeover techniques, 75-77
- covered bonds, 106
- creative destruction in history of corporate finance, 63-64
- credit
  - defined, 21
  - history of, 10-12
  - leverage and, 219-220
- credit default swaps (CDS)
  - in history of corporate finance, 77-79
  - role in housing crisis, 100
- credit enhancement strategies in biomedical development finance, 201-204
- credit scoring in history of corporate finance, 77
- crisis. *See* financial crisis of 2007-2009
- CRO-linked financing, 197
- Curb Exchange, 67

**D**

D&O (directors and officers)  
 insurance, 204

Danish mortgage model, 107

Dannone, Grameen Bank  
 and, 162

de Soto, Hernando, 17

debt  
 convertible debt, 40  
 relationship with returns, 33-34  
 relationship with risk, 34-35

debt-equity ratio  
 in corporate finance, 55-57  
 Modigliani–Miller capital  
 structure propositions, 29-36

debt-for-nature swaps, 129-132

debt-reduction methods, 64

DeLong, Bradford, 62

Demirguc-Kunt, Asli, 159

democratization of capital in  
 history of corporate finance,  
 65-66

designated funds for biomedical  
 development funding, 197

development finance, 149, 152.  
*See also* poverty  
 China and India examples,  
 175-178  
 economic growth and, 157-160  
 for food security, 172-175  
 history of, 153-157  
 for infrastructure development,  
 169-172  
 infrastructure needed for, 152,  
 157-160  
 microfinance  
*history of*, 160-161  
*Muhammad Yunus*, 162-163

for SMEs  
*financial innovations*,  
 166-169  
*limitations of*, 162-166  
 social change via, 223  
 terminology changes, 154

Dickson, Peter, 14

Digital Equipment, 68

directors and officers (D&O)  
 insurance, 204

diversification, CAPM (Capital  
 Asset Pricing Model), 43-44

donor bonds for vaccine and  
 treatment development,  
 209-210

Doriot, George, 68

double-bottom-line investing. *See*  
 impact investing

Draper, Gaither, and Anderson  
 (venture capital firm), 68

Drinking Water State Revolving  
 Fund (DWSRF), 128

drug pipelines, selling to  
 pharmaceutical companies, 195

DWSRF (Drinking Water State  
 Revolving Fund), 128

dynamic trading, 45

**E**

earnings per share (EPS),  
 calculating, 30

East India Company, 13

economic development. *See*  
 development finance

economic growth, development  
 finance and, 157-160

education in developing  
 world, 152

EIB (European Investment Bank), 198  
 emerging markets, 154. *See also* development finance  
 Endangered Species Act, 142  
 environmental finance, 117, 120  
   for conservation projects  
     *debt-for-nature swaps*, 129-132  
     *SRFs (state revolving funds)*, 124-129  
 externalities, 120-122  
 innovations in, 123-124  
 in pollution markets, 132  
     *Acid Rain Program*, 133-135  
     *carbon emissions cap-and-trade*, 135-137  
 property rights and, 122  
 in public goods markets  
     *biodiversity banking*, 141-142  
     *catch-share programs in fisheries*, 138-140  
     *wetlands mitigation banking*, 141-142  
 social change via, 223  
 EPS (earnings per share), calculating, 30  
 equity  
   debt-equity ratio  
     *in corporate finance*, 55-57  
     *Modigliani–Miller capital structure propositions*, 29-36  
   defined, 7, 21  
 European Investment Bank (EIB), 198  
 European Union Emissions Trading System (EU ETS), 136

exchanges, 17  
 externalities in environmental finance, 120-122

## F

failures. *See* business failures  
 Fannie Mae, 92, 99  
 Farlow, Andrew, 208  
 FDIC (Federal Deposit Insurance Corporation), origin of, 91  
 Federal Housing Administration (FHA), origin of, 91  
 Federal National Mortgage Association (FNMA), origin of, 91  
 Fenn, George, 74  
 FHA (Federal Housing Administration), origin of, 91  
 finance  
   history of, 5-7  
   purpose of, 3-4, 9  
   as social construct, 5-7  
 financial crisis of 2007–2009, 1  
   causes of, 19-22, 215-217  
   corporate finance in, 51  
 financial engineering, 45  
 financial innovation. *See also* biomedical development finance; corporate finance; development finance; environmental finance; housing finance  
   advantages of, 2-3  
   in agency problems, 39-41  
   in asymmetric information, 39-41  
   in business failures, 63  
   capital access with, 23-24

capital structure. *See* capital structure models  
 explained, 8-10  
 financial crisis of 2007–2009 and, 215-217  
 history of, 2-3  
   *in age of discovery, 12-13*  
   *in ancient world, 10-12*  
   *capitalism, 13-16*  
 in incomplete markets, 37-39  
 information infrastructure for, 16-19  
 risk management in, 22-23  
 rules of  
   *access to capital, 221-222*  
   *capital structure, 221*  
   *complexity of products, 217-219*  
   *leverage and credit, 219-220*  
   *positive social change, 222-224*  
   *transparency, role of, 220*  
 for SMEs, 166-169  
 in taxes and regulations, 41-42  
 technology and, 63-64  
 in transaction costs, 39-41  
 financial services, accessing via cellphone, 158-159  
 First Bank of the United States, 59  
 First National Bank, 62  
 fisheries, catch-share programs, 138-140  
 Flint, Charles Ranlett, 62  
 flip-over plans, as antitakeover technique, 76  
 FNMA (Federal National Mortgage Association), origin of, 91

food security, financial innovations for, 172-175  
 foreclosures, Genesee County Land Bank example, 110-111  
 foreign aid. *See* development finance  
 forwards, 18  
 Freddie Mac, 92, 99  
 fundamental analysis, 23  
 funding sources for biomedical development, 193-204  
   CEFF, 197  
   collaborative development, 196  
   credit enhancement strategies, 201-204  
   CRO-lined financing, 197  
   designated funds, 197  
   incubators, 197  
   projected royalty streams, 195  
   public equity and venture capital, overcoming limitations of, 199-201  
   traditional funding, 193-195  
   university partnerships/private equity/public-sector investing, 197-199  
 futures, 17-18  
   risk sharing, 38

## G

Gabaix, Xavier, 21  
 Gates, John W., 62  
 GAVI (Global Alliance for Vaccines and Immunization), 210  
 Genesee County Land Bank, 110-111  
 Giannini, A. P., 65-66, 89  
 GIIN (Global Impact Investing Network), 167

Ginnie Mae, 92-93  
 GlaxoSmithKline Biologicals (GSK), 206  
 Global Alliance for TB Drug Development, 205  
 Global Alliance for Vaccines and Immunization (GAVI), 210  
 Global Impact Investing Network (GIIN), 167  
 global warming. *See* climate change; environmental finance  
 Goldstein, John, 167  
 Grameen Bank, 160  
   Dannone and, 162  
 green finance. *See* environmental finance  
 greenhouse gases cap-and-trade system, 135-137  
 growth. *See* economic growth  
 GSK (GlaxoSmithKline Biologicals), 206  
 Guaranty Trust, 62

## H

Hale, Victoria, 210  
 Hamilton, Alexander, 57-59  
 Hardin, Garrett, 121  
 healthcare finance. *See* biomedical development finance  
 HEFI (home equity fractional interest security), 109  
 Hickman, W. Braddock, 70  
 high-yield corporate bonds  
   history of, 15  
   in history of corporate finance, 70-71

## history

of corporate finance  
   *Alexander Hamilton, role of*, 57-59  
   *capital structure innovations*, 69-74  
   *CDS (credit default swaps)*, 77-79  
   *creative destruction (finance and technology)*, 63-64  
   *credit scoring*, 77  
   *democratization of capital*, 65-66  
   *investment banking*, 61-62  
   *LBOs (leveraged buyouts)*, 75-77  
   *nineteenth century innovations*, 59-61  
   *private equity*, 74-75  
   *venture capital*, 66-69  
 of development finance, 153-157  
 of finance, 5-7  
 of financial innovation, 2-3  
   *in age of discovery*, 12-13  
   *in ancient world*, 10-12  
   *capitalism*, 13-16  
 of housing finance, 86-95  
   *increased demand for*, 89-92  
   *savings and loan crisis*, 92-93  
   *securitization*, 93-95  
 of microfinance, 160-161  
 HIV/AIDS vaccine development, 206  
 home equity fractional interest security (HEFI), 109  
 Home Owner's Loan Corporation, 91

homeownership statistics, 96  
 Homestead Act, 88  
 Hoover, Herbert, 90  
 hostile takeovers. *See* LBOs  
 (leveraged buyouts)  
 housing bubble  
   avoiding in future, 103-105  
   as cause of 2007–2009 financial  
   crisis, 19-22  
   explanation of, 95-103  
   solutions to, 105-109, 112  
 housing finance, 85  
   history of, 86-95  
     *increased demand for*, 89-92  
     *savings and loan crisis*,  
     92-93  
     *securitization*, 93-95  
   housing bubble  
     *avoiding in future*, 103-105  
     *as cause of 2007–2009*  
     *financial crisis*, 19-22  
     *explanation of*, 95-103  
     *solutions to*, 105-109, 112  
   private capital in, 110-112  
   social change via, 222  
 humanitarian needs, financial  
 innovations for, 172-175

## I

IAVI (International Aids Vaccine  
 Initiative), 206  
 IFFIm (International Financing  
 Facility for Immunisation),  
 174, 210  
 IFQs (individual fishing  
 quotas), 139  
 impact investing, 166-167

imperfections. *See* market  
 imperfections  
 incentives in housing finance,  
 misalignment of, 104  
 income bonds in railroad  
 industry, 60  
 incomplete markets, 37-39  
 incubators for biomedical  
 development funding, 197  
 India  
   as development finance example,  
   175-178  
   infrastructure development, 170  
 individual fishing quotas  
 (IFQs), 139  
 individual transferable quotas  
 (ITQs), 139  
 industrial companies, investment  
 banking and, 61-62  
 infrastructure development,  
 financing for, 169-172  
 infrastructure for financial  
 innovation, 16-19  
 initial public offerings (IPOs), 68  
   for biomedical development  
   funding, 194  
 insurance with options, 45  
 interest rate derivatives, history  
 of, 15  
 internal cash flow, 52  
 International Aids Vaccine  
 Initiative (IAVI), 206  
 International Financing Facility  
 for Immunisation (IFFIm),  
 174, 210  
 investment banking in history of  
 corporate finance, 61-62

investment-grade bonds,  
 high-yield bonds versus, 71  
 IPOs (initial public offerings), 68  
   for biomedical development  
   funding, 191, 194  
 ITQs (individual transferable  
 quotas), 139

## J–K

Jackson, Andrew, 60  
 Jansen, Robert, 159  
 Jarrow, Robert A., 38  
 Jefferson, Thomas, 58  
 Jensen, Michael, 39  
 joint stock companies, history of,  
 12-13  
 JSE Securities Exchange, 168  
 junk bonds. *See* high-yield bonds

Kane, Edward, 42  
 Kennedy, John F., 153  
 Kildee, Dan, 110  
 Krugman, Paul, 100  
 Kyoto Protocol, 137

## L

Laibson, David, 21  
 land acquisition with SRFs,  
 128-129  
 land banks, 109  
   Genesee County Land Bank,  
   110-111  
 LAPPs (limited access  
 privilege programs). *See*  
 catch-share programs  
 LBOs (leveraged buyouts) in  
 history of corporate finance,  
 75-77

Levant Company, 13  
 leverage, credit and, 219-220  
 leveraged buyouts (LBOs) in  
 history of corporate finance,  
 75-77  
 Levine, Ross, 159  
 Liang, Nellie, 74  
 limited access privilege  
 programs (LAPPs). *See*  
 catch-share programs  
 Lincoln, Abraham, 88  
 Lintner, John, 43  
 loan-to-value (LTV) ratio, 104  
 lotteries in history of corporate  
 finance, 58  
 Lovejoy, Thomas, 130  
 LTV (loan-to-value) ratio, 104

## M

M&A (mergers & acquisitions)  
 among biotech companies, 195  
 malaria vaccine development, 207  
 Mandela, Nelson, 149  
 market failure in environmental  
 finance, 120-122  
 market imperfections  
   agency problems, 39-41  
   asymmetric information, 39-41  
   incomplete markets, 37-39  
   role in determining capital  
   structure models, 35-36  
   taxes and regulations, 41-42  
   transaction costs, 39-41  
 Markowitz, Harry, 43  
 Marshall Plan, 153  
 MBS (mortgage-backed  
 securities)  
   covered bonds versus, 106  
   history of, 15

McCaw Cellular, 73  
 MCI, 72  
 MDGs (Millennium Development Goals), 155  
 Meckling, William, 39  
 medical financing. *See* biomedical development finance  
 mergers & acquisitions (M&A)  
   among biotech companies, 195  
 Merrill, Charles, 66-67  
 Merton, Robert, 8, 41, 44  
 MFIs (microfinance institutions), 161  
 microcredit, limitations of, 156  
 microfinance  
   history of, 160-161  
   Muhammad Yunus, 162-163  
 microfinance institutions (MFIs), 161  
 Milken, Michael, 70-71, 79  
 Milken Institute, xi  
 Millennium Development Goals (MDGs), 155  
 Miller, Merton, 2, 27, 69  
 Mint Act of 1792, 59  
 mission-related investing. *See* impact investing  
 mobile technology, access to, 158-159  
 Modigliani, Franco, 27, 69  
 Modigliani-Miller capital structure propositions, 27-36, 69  
 monetary policy as cause of  
   2007-2009 financial crisis, 20  
 Monte Carlo methods, 46, 69  
 Morgan, J.P., 61-62  
 mortgage-backed securities (MBS)  
   covered bonds versus, 106  
   history of, 15

mortgages. *See also* housing finance  
   origin of, 88  
   securitization of, 104  
   shared equity, 108-109  
   subprime mortgages, 97-98  
   types of, 96  
 Muscovy Company, 13  
 mutual savings banks in history of  
   housing finance, 88  
 Myers, Stewart, 40

## N-O

National Institutes of Health (NIH), 189  
 natural resources. *See* environmental finance  
 New Zealand catch-share program example, 140  
 nonprofit pharmaceutical companies, 210  
 O'Brien, John, 109  
 O'Hara, Maureen, 38  
 Obama, Barack, 153  
 Olson, Kenneth, 68  
 OneWorld Health, 210  
 options, 18  
   Black-Scholes model, 44, 46, 225  
   explained, 45  
   Monte Carlo methods, 46  
   risk sharing, 38  
 originate-to-distribute model, 93, 96  
 originate-to-hold model, 93  
 OTC (over-the-counter) markets, 18  
 ownership, evidence of, 17

**P**

Padoa-Schioppa, Tommaso, 207  
 Paulson, John, 21, 100  
 payment-in-kind (PIK) in history  
   of corporate finance, 72-73  
 pharmaceutical companies,  
   selling drug pipelines to, 195  
 pharmaceutical R&D financing.  
*See* biomedical development  
 finance  
 PIK (payment-in-kind) in history  
   of corporate finance, 72-73  
 PIPEs (private investments in  
   public equity), 194  
 pollution markets, 132  
   Acid Rain Program, 133-135  
   carbon emissions cap-and-trade,  
   135-137  
 poverty statistics, 149-151. *See*  
*also* development finance  
 preferred stock plans  
   as antitakeover technique, 76  
   in railroad industry, 60  
 prescription drugs. *See also*  
   biomedical development finance  
   clinical trial phases, 192  
   competition sources, 190  
 private capital in housing finance,  
 110-112  
 private equity  
   for biomedical development  
   funding, 197-199  
   in history of corporate finance,  
   74-75  
 private investments in public  
   equity (PIPEs), 194  
 ProCredit, 168

projected royalty streams for  
   biomedical development  
   funding, 195  
 property rights, 17  
   environmental finance and, 122  
 Prowse, Stephen, 74  
 public credit system, origin of,  
 58-59  
 public equity, overcoming  
   limitations of, 199-201  
 public goods markets  
   biodiversity banking, 141-142  
   catch-share programs in  
   fisheries, 138-140  
   wetlands mitigation banking,  
   141-142  
 public-private partnerships for  
   vaccine and treatment  
   development, 204-209  
 public-sector investing for  
   biomedical development  
   funding, 197-199  
 put options, 45

**Q-R**

Quota Management System, 140  
 R&D financing. *See* biomedical  
 development finance  
 railroad industry  
   capital structure of, 60  
   reorganization of, 61  
 rating agencies, 105  
 ratings, role in housing crisis, 98  
 real estate bubble. *See* housing  
 bubble  
 real estate finance. *See* housing  
 finance

**Regional Greenhouse Gas Initiative (RGGI)**, 136  
 regulations  
     financial innovations in response to, 41-42  
     need for, 105  
**Reinhart, Carmen**, 19  
 relationship banking, 61  
 remittances as part of  
     development finance, 168  
 reserve model for SRFs, 126  
 return on equity (ROE),  
     calculating, 30  
 returns  
     Modigliani–Miller capital structure propositions, 29-36  
     relationship with debt, 33-34  
**RGGI (Regional Greenhouse Gas Initiative)**, 136  
 risk, relationship with debt, 34-35  
 risk management  
     in biomedical development finance, 200-201  
     CAPM (Capital Asset Pricing Model), 43-44  
     in financial innovation, 22-23  
     in history of corporate finance, 73  
 risk sharing  
     with futures, 38  
     in incomplete markets, 37  
     with options, 38  
 risk-sharing finance facility (RSFF), 198  
**ROE (return on equity)**,  
     calculating, 30  
**Rogoff, Kenneth**, 19  
**Roosevelt, Franklin**, 91

**Root Capital**, 167  
**Ross, Stephen**, 41  
**Roubini, Nouriel**, 21, 100  
 royalty streams for biomedical development funding, 195  
**RSFF (risk-sharing finance facility)**, 198

## S

**S&L (savings and loan) crisis**, 92-93  
**Sandor, Richard**, 135  
**Sanjour, William**, 133  
 savings and loan crisis, 92-93  
**Scholes, Myron**, 44  
**Schumpeter, Joseph**, 63  
**SEAF (Small Enterprise Assistance Funds)**, 169  
**Second Bank of the United States**, 59  
 securities, standardization, 16  
 securitization  
     covered bonds versus, 106  
     in history of housing finance, 93-95  
     of mortgages, 104  
 security, defined, 7  
**Shapiro, Alan**, 4, 56  
 shared equity in housing, 108-109  
 shared-equity mortgages, 109  
**Sharpe, William**, 43  
**Shiller, Robert**, 22  
**Small Enterprise Assistance Funds (SEAF)**, 169  
**SMEs (small and medium-size enterprises)**, 156  
     financial innovations for, 166-169  
     limitations in financing, 162-166

social businesses, 162-163  
 social change via financial innovation, 222-224  
 social construct, finance as, 5-7  
 spreads in CDS (credit default swaps), 78  
 SRFs (state revolving funds), 124-129  
 standardization, 16  
 state revolving funds (SRFs), 124-129  
 statistics  
   biomedical research spending, 186  
   foreign aid, 155  
   microfinance, 160-161  
   poverty, 149-151  
   R&D productivity, 189  
 Stern, Nicholas, 135  
 stocks, popular ownership of, 66-67  
 subprime mortgages, 97-98  
 sulfur dioxide cap-and-trade system, 133-135  
 Summers, Larry, 8  
 Sunshine Mining, 73  
 Symphony Capital, 198

## T

Tappan, John Elliott, 66  
 Tax Equity and Fiscal Responsibility Act of 1982 (TEFRA), 42  
 taxes  
   financial innovations in response to, 41-42  
   role in determining capital structure models, 35-36

Taylor, John, 20  
 TB (tuberculosis) research, 205-206  
 TB Alliance, 205  
 technology, financial innovation and, 63-64  
 TEFRA (Tax Equity and Fiscal Responsibility Act of 1982), 42  
 TFCA (Tropical Forest Conservation Act), 131  
 Thales of Miletus, 17  
 Third World. *See* emerging markets  
 thrifts. *See* savings and loan crisis  
 Toffler, Alvin, 62  
 trade, in cap-and-trade, 132  
 “trade-off” theory of capital structure, 36  
 tragedy of the commons, 121  
 transaction costs, 39-41  
 Transamerica. *See* Bank of America  
 transparency  
   in biomedical development finance, 200-201  
   role in financial innovation, 220  
 triple-bottom-line investing. *See* impact investing  
 Tropical Forest Conservation Act (TFCA), 131  
 trust as legal concept, 6  
 tuberculosis (TB) research, 205-206  
 Tufano, Peter, 60  
 Turner Broadcasting, 73

**U-V**

- uncertainty in capital structure models, 28
- underdeveloped countries. *See* emerging markets
- university partnerships for biomedical development funding, 197-199
- vaccine development funding, 204-209
- Van Horne, James, 38
- venture capital (VC)
  - for biomedical development, 193
  - history of, 66-69
  - overcoming limitations of, 199-201
  - private equity and, 75
- Viacom International, 73

**W-Z**

- warrants, 64, 71
- water quality funding, 124-129
- watershed ecosystem services, 123
- wetlands mitigation banking, 141-142
- World Bank Green Bonds, 172
- Worm, Boris, 138
- Yunus, Muhammad, 160-163
- zero-coupon bonds, 42, 73