
The Dynamics of a Financial Dislocation: The Panic of 1907 and the Subprime Crisis

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Financial crises recur frequently and respect no borders.¹ The International Monetary Fund has identified 119 country years of banking crises in 31 countries from 1990 to 2005.² In its early history, the United States saw 11 banking panics from 1820 to 1914. **Figure 1** projects these panics onto a graph of annual economic growth. Generally, the panics followed periods of robust growth and occurred in the context of a recession, but not every recession featured a panic. Founding the U.S. Federal Reserve System in 1913 has ameliorated but has not prevented financial crises thereafter: The United States has witnessed three major episodes of financial crisis in the last century—1930–1934, the savings and loan (S&L) crisis³ of 1985–1989, and the current period, 2007–2009 (so far), which I refer to as the “subprime crisis”—and numerous smaller episodes, such as the near collapse of the commercial paper market in 1970, the seizure of Continental Illinois National Bank and Trust Company in 1984, the collapse of Long-Term Capital Management in 1998, and Enron Corporation in 2001. They were all associated with a decline in asset values, constriction of credit, and turbulence in the financial system.

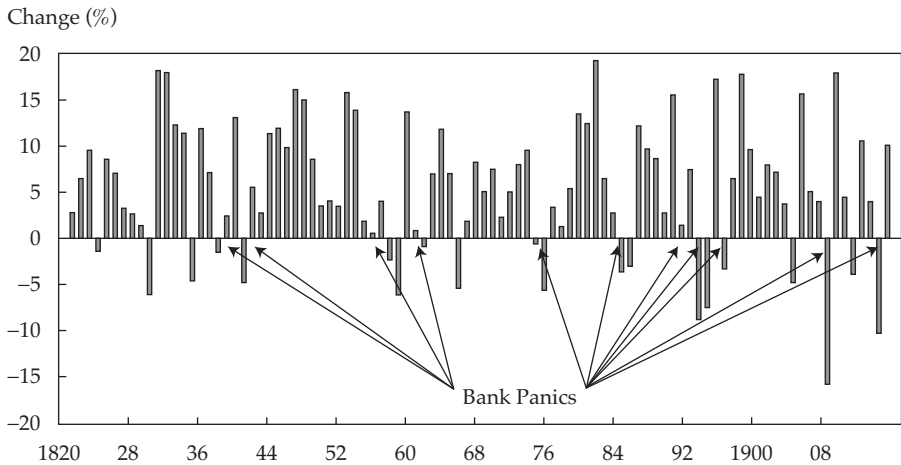
¹A *financial crisis* is an episode of severe threat to the stability, safety, and soundness of the financial system in the economy. A *crash*, or sharp decline in security prices, often precedes or coincides with a financial crisis, although many crashes have occurred without the corresponding financial crisis. A financial crisis typically includes a *panic*, in which depositors and lenders frantically seek to withdraw their money from institutions and markets, threatening a bank with *illiquidity* (an insufficiency of cash) or *insolvency* (an insufficiency of assets with which to meet liabilities). A panic may be only one episode of the longer period of instability. A financial crisis usually triggers or aggravates an *economic recession*, although many recessions have not featured financial crises. A financial crisis commences with some kind of economic shock and ends when financial market conditions return to normal.

²Dutttagupta and Cashin (2008).

³Although not commonly reflected in many lists of U.S. financial crises, the S&L crisis meets virtually all of the attributes of a crisis as described in Footnote 1.

Editor's Note: Robert F. Bruner is the co-author, with Sean D. Carr, of *The Panic of 1907: Lessons Learned from the Market's Perfect Storm*, from which some elements of this article have been adapted.

Figure 1. Banking Panics and Business Cycles as Reflected by Change in Industrial Production, 1820–1915



Sources: Bank panics identified in Calomiris (2000, p. 99). Data on industrial production from Davis (2004), the Davis Industrial Production Index, downloaded from the NBER website.

Much of what we understand about financial crises comes from macroscopic research—the study of broad capital market and economic conditions before, during, and after the crisis. These studies tell us, for instance, that crises first appear in financial centers and then spread broadly through interest rate shocks and slumping asset and commodity prices.⁴ Crises follow periods of high international capital mobility, but no significant differences exist in frequency or volume of financial crises between developed and emerging countries: “Banking crises are an equal opportunity menace,” in the words of Reinhart and Rogoff (2008b, p. 18). The aftermath of financial crises is protracted and typically severe: Housing and equity prices decline sharply; unemployment rises materially and lingers at a higher level for four years, on average; and government debt surges an average of 86 percent because of dwindling tax revenues, not because of bailouts.⁵

Macro insights are useful in setting public policy and in anticipating the behavior of policymakers. Yet, so much of what interests investors and company executives concerns the *dynamics* of the crisis: how a crisis unfolds, what influences its duration and virulence, and where human intervention helps or hurts. In other words, we hanker for more detail about the internal mechanics of crises.

⁴Reinhart and Rogoff (2008a).

⁵Reinhart and Rogoff (2009).

My aim in this article is to provide more granularity to our understanding of the dynamics of a crisis by means of *micro history*. Following is what I think the micro histories reveal: The dynamics of a financial crisis resemble a pernicious accelerating cycle, much like the vortex in a bathtub when the stopper is pulled. What makes the vortex possible is a systemic interdependence among financial institutions, growing instability, a shock, and intervention that is either absent or inadequate.

Banks and near-banks link to form a *system* by virtue of interbank loans and deposits, which means that trouble in one institution, city, or region can travel to other parts. And because financial systems are highly complex, it is difficult to know what might be going wrong.

Buoyant growth stimulates financial innovation in securities and institutions and creates rising demand for capital and liquidity. But growth in the economy makes the financial system more fragile—in part because of the demand for capital and in part because of the tendency of some institutions to take more risk than is prudent in the later stages of an economic boom. (In the late stages of an economic expansion, borrowers and creditors overreach in their use of debt, lowering the margin of safety in the financial system.) Leaders in government and in the financial sector then implement policies that advertently or inadvertently elevate the exposure to risk of crisis.

An economic shock hits the financial system. By definition, a shock must be surprising, material, costly, and unambiguous. Then, the system recoils. The news of the shock triggers a *regime shift*—a dramatic change in outlook among investors, depositors, consumers, and managers. The mood of the market swings from optimism to pessimism, creating a self-reinforcing downward spiral. Each piece of bad news motivates behavior that generates more bad news. Nevertheless, collective action by leaders can arrest the spiral; the speed and effectiveness with which they act will determine the length and severity of the crisis.

Complicating our understanding of the vortex-like dynamics of a crisis is the fact that these factors (system structure, instability, shock, and response) can *interact* in unexpected ways to affect the speed, breadth, and severity of the crisis. The histories of crises illustrate the existence and interplay of these factors.

This article reviews two crises: the Panic of 1907 and the recent subprime crisis. The Panic of 1907 is worth careful consideration in the 21st century because it was the last major crisis before the founding of the U.S. Federal Reserve System; indeed, it was the straw that broke the back of congressional opposition to the concept of a central bank in the United States. By seeing how markets, institutions, and individuals responded before the establishment of the regulatory superstructure and social safety nets in the United States, we can observe how the private market provides remedies to a financial crisis. The Panic of 1907 poses a useful comparison with the subprime crisis that began in late 2006 and continues to the date of this writing (mid-2009).

The Panic of 1907

The San Francisco earthquake of 18 April 1906 triggered a massive call on global gold reserves and a liquidity crunch in the United States. A recession commenced in June 1907. Security prices declined. In September, New York City narrowly averted a failure to refinance outstanding bonds. Then, on 16 October, a “bear squeeze” speculation failed and rendered two brokerage firms insolvent. The next day, depositors began a run on Knickerbocker Trust Company, which was known to be associated with the speculators. Runs spread to other trust companies and banks in New York City. And the panic rippled across the United States. Country banks had learned from past experience that during a panic, withdrawing deposits from reserve city banks could be difficult.⁶ Thus, at the first news of bank runs in New York City, country banks rushed to withdraw deposits, which caused some reserve city banks to fall below the minimum reserve requirement set in the national or state banking charters. Banks in many cities suspended the withdrawal of deposits.

Bank clearinghouses issued clearinghouse loan certificates that could substitute for cash. This near-money traded hands at a discount to true cash, reflecting fears about the solvency of the clearinghouses and their banks. At the height of the national panic, about \$250 million in these certificates circulated, equal to about 14 percent of all the currency in the hands of the public.⁷ Across the country, firms and banks resorted to a variety of substitutes for cash. Streetcar companies in Omaha and St. Louis paid their employees in nickels from the fare boxes or in five-cent fare tickets.⁸ Some companies issued certified checks, scrip, or IOUs. Bank checks were useful as cash only locally because in an environment where banks discriminated among payees, being a distant correspondent was a disadvantage.

By 2 November, at least partial suspension of bank withdrawals had spread across the country,⁹ a fast contagion given that the first suspension by Knickerbocker occurred on 22 October. The governors of Oregon, Nevada, and California declared legal holidays, which had the effect of closing the banks entirely. South Dakota, Indiana, Iowa, and Oklahoma sanctioned the payment by banks of only small amounts, such as \$10. Banks thus discriminated in making payments. There was the perception that banks in reserve cities, such as New York, Chicago, and

⁶Andrew (1908a, p. 298).

⁷The estimate of clearinghouse loan certificates issued is from Cannon (1910). The amount this represented as a percentage of all cash in the hands of the public is calculated by the author and draws the denominator, \$1.784 billion, from Friedman and Schwartz (1963, p. 706).

⁸Horwitz (1990, p. 643).

⁹Sprague (1908) notes that “the extent to which suspension was carried cannot be accurately determined” (p. 364).

Minneapolis-St. Paul, were slow in remitting deposits back to correspondents in the South and West of the United States. The financial system rocked with the turmoil: 42 trust companies failed as did 6 of 6,412 national banks.¹⁰

News that some banks had suspended withdrawals triggered a national wave of hoarding currency and gold. As a consequence, rentals of safe deposit boxes “skyrocketed.”¹¹ About \$350 million in deposits were withdrawn from the U.S. financial system.¹² Of this amount, the bulk of it was simply socked away—estimates of cash hoarded range from \$200 million to \$296 million.¹³ Arguably, absent the suspension of withdrawals, the amount hoarded would have been considerably greater.

The recession that began in June 1907 worsened considerably. Commodity prices fell by 21 percent, canceling virtually the entire increase from 1904 to 1907.¹⁴ Industrial production fell more than in any U.S. panic up to 1907.¹⁵ In November, United States Steel Corporation’s (U.S. Steel’s) output was down by 25 percent versus a year earlier; in December, it was down 65 percent. The dollar volume of bankruptcies declared in November spiked by 47 percent over a year earlier; the panic would be associated with the second-worst volume of bankruptcies in U.S. history up to that time.¹⁶ Gross earnings by railroads fell by 6 percent in December.¹⁷ Production fell 11 percent from May 1907 to June 1908; wholesale prices fell 5 percent. Imports shrank 26 percent.¹⁸ Unemployment rose from 2.8 percent to 8 percent¹⁹, a dramatic increase in a short space of time. The *Commercial and Financial Chronicle* wrote, “It is probably no exaggeration to say that the industrial paralysis and the prostration was the very worst ever experienced in the country’s history.”²⁰ Milton Friedman and Anna Schwartz concluded that the recession was “among the five or six most severe” (Friedman and Schwartz 1963, p. 156). Other descriptions of the economic contraction in 1907–1908 include “extremely severe,”²¹ “extraordinarily violent,”²² and an “intense depression.”²³

¹⁰Calomiris and Gorton (1991, p. 150).

¹¹Andrew (1908a, p. 294).

¹²Sprague (1908, p. 367).

¹³The amount of \$200 million is cited in Sprague (1908, p. 367), and \$296 million is cited in Noyes (1909, p. 188).

¹⁴Noyes (1909, p. 207).

¹⁵Calomiris and Gorton (1991, p. 156).

¹⁶Calomiris and Gorton (1991, p. 156).

¹⁷These developments are discussed in detail in Sprague (1908, pp. 368–371).

¹⁸Noyes (1909, p. 208).

¹⁹Cahill (1998, p. 296).

²⁰Quoted in Cahill (1998, p. 296).

²¹Friedman and Schwartz (1963, p. 156).

²²See Noyes (1909, p. 211).

²³*Commercial and Financial Chronicle*, quoted in Cahill (1998, p. 796).

Symptoms of the panic, such as bank suspensions of payment, receded in January 1908.²⁴ The recession itself ended in June 1908, followed by buoyant economic growth in the United States for the next 18 months. The stock market and industrial production recovered to precrisis levels by late 1909. The economic cycle peaked in January 1910 and then slumped until January 1912. The financial system was stable until the commencement of World War I, when equity trading was interrupted by the closing of the New York Stock Exchange from August through November 1914.

The effects of the panic were not confined to the United States. Some scholars have associated the crash and panic in the United States with financial crises in Egypt (January to May 1907), Hamburg (October), Chile (October), Holland and Genoa (September), and Copenhagen (winter).²⁵ And the panic had geopolitical repercussions as well. It has been identified as one of the factors provoking the Mexican Revolution of 1910.

Most importantly, the Panic of 1907 was the catalyst for a profound re-examination of the Jefferson–Jackson policy against central banking in the United States. Historian Robert Wiebe wrote:

The panic of 1907 acted as a catalyst in the [political] ferment. Most obviously, it convinced almost everyone, including the bankers, that financial reform was imperative. . . . The panic released countless little pockets of pressure, turning concerned but comfortable citizens into active reformers and opening many more to the calls for change. (Wiebe 1967, p. 201)

In 1913, Congress passed legislation establishing the Federal Reserve System.

In confronting the panic, the official systems of response failed. The New York Clearing House Association simply refused to clear checks associated with the speculators' institutions. President Theodore Roosevelt, antagonistic toward Wall Street, was drawn late and reluctantly to offer rather bland statements of confidence in the financial system. The U.S. Treasury moved deposits of gold to New York City banks, but the amounts proved inadequate to the scale of the crisis. By mid-November, the Treasury itself held only \$5 million in gold, effectively sidelining that institution from further influence over the course of events.²⁶

²⁴Calomiris and Gorton (1991, p. 161) date the end of suspension at 4 January 1908. Friedman and Schwartz (1963, p. 163) note that the U.S. Treasury resumed demanding payments in cash in December but that some banks continued to restrict payments through January.

²⁵Both Noyes (1909, pp. 202–206) and Kindleberger (1978) mention that the Panic of 1907 occurred in a context of financial instability in foreign cities. The notion of contagion, or spread, of financial crises has been documented in the financial crises of the late 20th century. But the global contagion in 1907 is not as fully documented. Flows of gold into and out of the United States in 1907 are well discussed in contemporary and recent writings on the Panic. It remains to be shown how these flows (or other mechanisms) actually transmitted the financial crisis globally in 1907.

²⁶Tallman and Moen (1990, p. 8).

What is novel about the Panic of 1907 is that the organizer of collective action had no official role or mandate at all. John Pierpont Morgan, then 70 years old and semi-retired, intervened to organize rescues of trust companies, banks, the New York Stock Exchange, New York City, and the brokerage firm of Moore and Schley. His mantle of authority was not a regulatory position but, rather, an extensive and strong network of influence throughout the New York financial community as well as an ability to direct the resources of his own partnership, J.P. Morgan & Company. A few vignettes are instructive in illustrating the instruments of his intervention.

On 19 October 1907, Morgan's partners urgently asked him to return to New York City from Richmond, Virginia, where he had been attending the Triennial Episcopal Convention. Taking a personal express train back to New York City, he arrived on 20 October and immediately convened a meeting of leading bankers in the library of his home at 36th Street and Madison Avenue. This group mobilized teams of auditors to visit the panic-stricken institutions and assess their solvency. On the basis of this firsthand information, Morgan and his circle determined that the Knickerbocker Trust should not be saved but that the next endangered institution, Trust Company of America, was still solvent; at that pivotal moment, Morgan said, "This is the place to stop the trouble then."²⁷ He organized a rescue pool of funds for Trust Company of America. And every institution that he and his circle determined to save thereafter survived the panic.

Yet, the panic would not recede. Morgan's circle of financiers grew apprehensive that their dwindling uncommitted capital would be sufficient to mount yet more rescues and feared that their failure to do so would trigger a complete collapse of the banking system. Morgan determined that the instability of the trust companies—a new and less-regulated type of financial institution—were at the heart of the panic and that restoring confidence would be assisted by a commitment of mutual assistance among the trust companies, much like the function served by the New York Clearing House that provided mutual support for banks. On the night of 2 November, Morgan convened a meeting of the presidents of the trust companies—some 120 people—at the library of his home. Lacking clarity about the solvency of the various institutions, the presidents were understandably reluctant to have anything to do with each other. The meeting droned on into the early morning. Then one person sought to leave the room and discovered that Morgan had locked the door. Shortly thereafter, Morgan drew out a pen and a draft agreement for mutual assistance and walked from person to person instructing where to sign. As the trust company presidents emerged into the early light of day on 3 November, the trust companies had formed a collective.

²⁷Strong (1924).

By 3 November, collapsing equity prices had weakened a number of brokerage firms, which depended on the value of securities held as collateral for loans by the brokers to customers. One firm (Moore and Schley) teetered on insolvency owing to a concentration of holdings in the Tennessee Coal, Iron and Railroad Company (TCI), a limping steel company. Fearing that a failure of Moore and Schley would precipitate a new wave of panic, Morgan hastily organized a meeting of the directors of U.S. Steel, of which he was a member. (He had organized the company in 1901.) Explaining the gravity of the situation, he persuaded the very reluctant directors to agree to acquire TCI in a stock-for-bonds exchange. If the deal went through, Moore and Schley's collateral position would be greatly enhanced and the firm would survive the panic. But the directors of U.S. Steel imposed a condition requiring the approval of the U.S. government. President Roosevelt had been busting trusts and other large enterprises. The directors did not want the acquisition of TCI to put U.S. Steel in jeopardy. So, Morgan dispatched the chairman and CEO of U.S. Steel to Washington, DC, to importune President Roosevelt for his approval. With time running out and the prospect of financial collapse at hand, Roosevelt granted the acquisition exemption from prosecution. Moore and Schley was saved.

Dynamics of the Panic of 1907

Embedded in this simple but violent financial crisis is a narrative about crisis dynamics: how they unfold, what influences their duration and virulence, and where human intervention helps or hurts. The narrative begins with the fact that the financial institutions constitute a system; the existence of a system implies a rich range of possible dynamics. The system grows unstable. A shock occurs. Intervention affects the duration and severity of the crisis. Let us consider these four elements.

Financial Institutions Constitute a System. A financial system has two vitally important foundations for financial crises. First, the existence of a system means that trouble can travel. The difficulties of one financial intermediary can become the difficulties of others. Second, the complexity of a financial system means that it is impossible for all participants in the financial system to be well informed; this is called an “information asymmetry” and may motivate perverse behavior that can trigger or worsen a financial crisis.

The collection of financial intermediaries in an economy is called a “financial system,” reflecting the fact that its parts are linked and interact. The various intermediaries (banks, trust companies, brokerage firms) are lenders and creditors to one another by virtue of the cash transfers that they facilitate. Financial institutions are linked into a system by means of the steady stream of transactions triggered by them and their depositors. The financial system was global, or at least pan-European, as early as the Renaissance in the sense that institutions in different countries were linked through transactions and deposits. Kindleberger (1978) noted that over time, the waves of financial crises have had a strong international dimension to them because of such linkages.

The other relevant aspect of financial systems has to do with opacity of information. Some participants in a market have an information advantage over others. This information asymmetry may lead to the problem of adverse selection, in which the better-informed people might exploit the poorly informed. George Akerlof described this situation as the “lemons” problem, in which the market for used cars features imperfect pricing. Michael Spence extended the insights drawing on the labor market. And Joseph Stiglitz focused on credit markets. Akerlof, Spence, and Stiglitz received the Nobel Prize in economics in 2001 for their groundbreaking work.

In 1983, two economists, Douglas Diamond and Philip Dybvig, suggested that bank panics are simply randomly occurring events.²⁸ Bank runs occur when depositors fear that some kind of shock will force the bank into costly and time-consuming liquidation. To be last in line to withdraw deposited funds exposes the individual to the risk of loss. Therefore, Diamond and Dybvig hypothesize that a run is caused simply by the fear of random deposit withdrawals and the risk of being last in line.²⁹

An alternative theory is that bank runs are explained by asymmetric information: The problem of adverse selection can motivate panic selling or withdrawal of deposits. Calomiris and Gorton (1991), Gorton (1985), and others have suspected that runs could begin when some depositors observe negative information about the value of bank assets and withdraw their deposits. In a world of unequally distributed information, some depositors will find it costly to ascertain the solvency of their banks. Thus, runs might be a rational means of monitoring the performance of banks, a crude means of forcing the banks to reveal to depositors the adequacy of their assets and reserves. Calomiris and Gorton reasoned that if the information asymmetry theory is true, panics are triggered by real asset shocks that cause a decline in collateral values underpinning bank loans. They found that bank panics originated in areas of real shocks and that the cause in these regions was a decline in asset values. In particular, panics tended to follow sharp declines in the stock market and tended to occur in the early and later parts of the year. They also reasoned that the resolution of a bank panic would be created by elimination of an important aspect of the information asymmetry: Gaining clarity as to which banks were solvent and which were insolvent would stop the runs on solvent banks.

²⁸Diamond and Dybvig (1983).

²⁹One researcher, Glenn Donaldson, found some evidence in support of this “random withdrawal” theory: Interest rates during a panic were much higher than in nonpanic times. See Donaldson (1992, pp. 278, 298).

Empirical research gives some support to the asymmetric information theory over the random withdrawal theory, but the findings are not uniformly supportive.³⁰ Studies have considered how well information asymmetry explains panics by looking at whether (1) deposit losses predict panics, (2) the yield spreads between low- and high-risk bonds peak at the panic, and (3) real declines in the stock market are greater in panic years than nonpanic years; generally, these findings are affirmed.³¹ Mishkin (1991) considered evidence from a range of financial crises in the 19th century and concluded:

The timing and pattern of the data in the episodes studied here seem to fit an asymmetric information interpretation of financial crises. Rather than starting with bank panics, most of the financial crises begin with a rise in interest rates, a stock market decline and the widening of the interest rate spread. Furthermore, a financial panic frequently is immediately preceded by a major failure of a financial firm, which increases uncertainty in the marketplace. The increase in uncertainty and the rise in interest rates would magnify the adverse selection-lemons problem in the credit markets while the decline in the stock market increases agency as well as adverse selection problems, both of which are reflected in the rise in the spread between interest rates for low and high-quality borrowers. The increase in adverse selection and agency problems would then lead to a decline in investment activity and aggregate economic activity. (p. 27)

The System Grows Unstable. The Panic of 1907 ended a 12-year stretch of rapid economic growth for the United States. Since the panic of 1893, the U.S. economy had grown at an annual average real rate of 7.3 percent, a blistering pace. This growth resulted from such factors as the industrialization of the U.S. economy, technological change (e.g., railroads, telegraphy, electrification), and a high volume of immigration that ensured a workforce sufficient to meet the demands of rapid growth. Financing for this growth flowed from the money centers of Europe to support both debt and equity issuances by corporations. “New era” thinking seemed warranted: Prices were reaching a permanently higher plateau; new and less sophisticated investors were entering the stock market; capital for new ventures was relatively plentiful.

Rapid growth stimulated innovation in business models. Trusts, such as the Standard Oil Trust, were formed to eliminate “ruinous competition.” During the great merger wave of 1894–1904, more than 1,800 companies disappeared as they were consolidated into 93 companies with an important, if not dominant, share of market in their respective industries. The epitome of this wave was the formation

³⁰Carlson (undated, p. 4) tests the asymmetric information theory as the explainer of panics and bank suspensions—as opposed to Diamond and Dybvig’s random withdrawal theory. He finds the results to favor the asymmetric information theory when tested using state-level data but indeterminate when using local-level data.

³¹See Gorton (1988); Donaldson (1992); Mishkin (1991); and Carlson (undated).

of U.S. Steel in 1901, the first company capitalized at \$1 billion. Among financial institutions, the wave of innovation in financial models appeared in the formation of trust companies, unregulated (until early 1907) bank-like institutions that attracted depositors with higher interest rates.

The Progressive Movement rose to address the social and political ills associated with rapid growth, immigration, and industrialization. Beneath the political surface swirled other movements, such as populism, socialism, communism, and anarchism. Theodore Roosevelt came to the White House following the assassination of President William McKinley by an anarchist in 1901. Roosevelt himself earned the sobriquet “trust-buster” by vigorously enforcing the Sherman Antitrust Act to break up large companies. To build political support, he inveighed against Wall Street with heated rhetoric: “malefactors of great wealth” and “predatory man of wealth.” Such sentiments, combined with active aggressive regulatory enforcement, spawned anxiety among investors by early 1907.

In short, the environment preceding the Panic of 1907 was one of growing instability and uncertainty about the sustainability of growth, a growing appetite for risk, and growing complexity.

A particular feature of the late stage of growth eras is a greater tolerance for risk. This tolerance is evident in the more aggressive use of debt financing, the reach for higher returns, an increase in “bet the ranch” behavior, momentum-style investing, more herd-like movements in the markets along with the attendant higher volatility, relaxation of lending standards and risk management practices by financial institutions, and proclamations of a “new era” in business opportunities for which old guidelines have become inadequate. This constellation of factors has the effect of eroding the safety buffers in the economic system. For example, the level of capital with which to withstand economic shocks grows inadequate. The financial system grows more vulnerable to the eventual reckoning. The business cycle is associated with a cycle of credit expansion and contraction that significantly amplifies changes in markets and economic growth. The boom part of the credit cycle erodes the shock absorbers that would otherwise cushion the financial system in the inevitable slump. Some banks, eager to make profits, unwisely expand their lending to less and less creditworthy clients as the boom proceeds.

Then some external shock occurs, and the bank directors awaken to the inadequacy of their capitalization relative to the credit risks they have taken. Consequently, banks reduce or cut off new loans available to their clients, which triggers a liquidity crisis that drives both a stock market crash and depositor panic. Hyman Minsky argued that this behavior on the part of the financial system would create phases of “overtrading,” “revulsion,” and “discredit.”³² The prime cause of economic slumps, according to Minsky, is the credit cycle, the expansion and contraction of loans for

³²These words are used by Kindleberger (1978, p. 19) to describe the model of Hyman Minsky.

businesses and consumers: Easy credit amplifies the boom, and tight credit amplifies the contraction. In this view, Minsky followed John Maynard Keynes. Minsky argued for government intervention to reduce the amplitude of the cycle—more aggressive lending by the government during contractions and tighter regulation of bank lending standards during the booms. Economic slumps, in this view, are associated with financial crises by means of the loss of discipline: Through the boom, banks overreach and extend loans to riskier clients. The buoyancy of economic booms causes riskier creditors to approach banks for loans, which creates what economists call a problem of adverse selection. Some banks succumb to the temptation to make loans to these creditors, perhaps in the belief that luck or a bank clearinghouse will see them through; this is a problem of moral hazard.³³

Adverse selection and moral hazard ultimately earn their just reward. A decline in asset values causes a decline in collateral for loans; therefore, banks tighten their lending practices.³⁴ As the slump worsens, the banks with the riskiest clients turn illiquid and then insolvent. System fragility stems not only from the behavior of some banks; it also grows from the structure of the industry. A system with many small and undiversified banks—such as existed in the United States in the National Banking Era—is more prone to panics.³⁵ In addition, the absence of systemic shock absorbers, such as bank clearinghouses and cooperative agreements, increase exposure to crises.³⁶

A Shock to the System. Research on financial crises acknowledges the role of some triggering event. Financial crises require a spark. The shock that triggers a financial crisis will probably have these attributes:

- *Real, not apparent.* Calomiris and Gorton (1991), Sprague (1910), and Friedman and Schwartz (1963) argue that “real disturbances” cause erosion of trust in the banking system and are the precursors to panics. A “real” event is one that affects economic fundamentals: an unexpectedly large agricultural harvest, the introduction of new technology or some other disruptive innovation, a massive industrywide labor strike, the opening of new markets, deregulation or re-regulation, an earthquake.

³³The problems of adverse selection and moral hazard are discussed in Mishkin (1990, p. 2).

³⁴See Mishkin (1991, p. 4).

³⁵Gorton and Huang (2002) argue that banks are not individually unstable. Rather, the source of instability is in the structure of the industry. A banking industry populated with many small and undiversified banks will be more prone to panic than will an industry with a few large and well-diversified banks. Gorton and Huang (2002, pp. 3, 6) point out that states that permit branch banking have experienced many fewer bank failures than those states with unit-banking laws (laws that prohibit branching). Also, Calomiris and Gorton (1991, p. 118) argue that branch banking systems tend to be less prone to the effects of panics.

³⁶See Donaldson (1993, p. 5), Calomiris and Gorton (1991, p. 119), and Calomiris (2000, p. 110).

- *Large*. The trigger of a major financial crisis must be meaningful enough to shake the system. It must cause a regime shift in outlook among most investors.
- *Unambiguous and difficult to repeat*. A shock is a signal to investors. For it to cause a major shift in expectations among investors, the event must stand apart from the noise in the marketplace. Moreover, the signal must be authentic and must be impossible for a casual participant to send.
- *Surprising*. For an event to qualify as a “shock,” it must be unanticipated by definition. Indeed, it is the surprise that causes the sudden shift in expectations that triggers the crisis. Predicting shocks is an impossibility. Sornette (2003) attempted to identify telltale inflection points in security prices that might predict market crashes, but he concluded, “Predictions of trend-reversals, changes of regime, or ‘ruptures’ is extraordinarily difficult and unreliable in essentially all real-life domains of applications, such as economics, finance, weather, and climate” (p. 321).

The San Francisco earthquake of April 1906 meets these criteria. Research by Odell and Weidenmier (2002) identifies the earthquake as the trigger for the Panic of 1907.

Reaction and Intervention. The shock, in the context of an unstable system, produces a remarkable mood swing—from overconfidence to fear and pessimism. In *The Psychology of the Stock Market*, originally published in 1912, G.C. Selden wrote:

Both the panic and the boom are eminently psychological phenomena. This is not saying that the fundamental conditions do not warrant sharp declines in prices and at other times equally sharp advances. But the panic, properly so-called, represents a decline greater than is warranted by conditions usually because of an excited state of the public mind accompanied by exhaustion of resources; while the term “boom” is used to mean an excessive and largely speculative advance. . . . It is really astonishing what a hold the fear of a possible panic has on the minds of many investors. The memory of the events of 1907 undoubtedly operated greatly to lessen the volume of speculative trade from that time to the present. (2005, p. 69)

This passage echoes the perspective of a range of writers whose very titles argue the case: *Irrational Exuberance* (Shiller 2000), *Memoirs of Extraordinary Popular Delusions and the Madness of Crowds* (Mackay 1841), *The Crowd: A Study of the Popular Mind* (Le Bon 1895), *Manias, Panics, and Crashes* (Kindleberger 1978). In his classic text for investors, *Reminiscences of a Stock Operator* (originally published in 1923), which is believed to be based on the career of the speculator Jesse

Livermore, Lefevre (1994) wrote, “A speculator’s deadly enemies are ignorance, greed, fear, and hope” (p. 286). In his analytic exploration *Why Markets Crash*, Sornette (2003) wrote:

A recurring theme . . . is that bubbles and crashes result from speculation. The objects of speculation differ from boom to boom . . . including metallic coins, tulips, selected companies, import commodities, country banks, foreign mines, building sites, agricultural and public lands, railroad shares, copper, silver, gold, real estate, derivatives, hedge-funds and new industries. The *euphoria* derived from the *infatuation* with new industries, especially the market bubble preceding the great crash of October 1929. . . . As the euphoria of a boom gives way to the *pessimism* of a bust, one ought to wonder what really happens to the buying plans and business projects of overextended consumers and businesspeople. (p. 268) [italics added]

Sornette argued that the root of aberrant market trends is one of the best-documented findings: People tend to be overconfident. His analysis of crashes suggests that herding and imitative behavior by investors lead to self-reinforcing market trends that are ultimately sharply reversed.

Optimism or pessimism is defined *relative* to those prices consistent with underlying fundamentals.³⁷ The extent to which market prices depart from those dictated by economic fundamentals remains a topic of keen debate at the frontier of economics. The concept of an emotional market “panic” challenges fundamental economic assumptions about the rationality of economic decision makers. Rationality assumes that prices today reasonably reflect an expectation of prices tomorrow and that markets are efficient in impounding news into asset prices. On balance, large markets in standard assets appear to be rational on average and over time. But crashes and panics are the exceptions to such “average” assumptions. To suspend the assumption of rationality admits the possibility of a great deal of bizarre behavior.³⁸

In the rapidly changing mood of the market, leadership becomes vital. Friedman and Schwartz (1964) emphasized the importance of leadership in managing financial system liquidity during a crisis:

The detailed story of every banking crisis in our history shows how much depends on the presence of one or more outstanding individuals willing to assume responsibility and leadership. It was a defect of the financial system that it was susceptible to crises resolvable only with such leadership. . . . In the absence of vigorous

³⁷See Harris (2003, p. 556).

³⁸The theory of rational choice (or “rationality” for short) presumes that individuals are self-interested, prefer more wealth to less, and that their preferences are transitive (if you like A better than B and B better than C, you will like A better than C). Rationality is an attractive foundation in the social sciences for two reasons. First, it simplifies the world greatly. And second, it opens up a number of important and intuitively appealing economic insights. Nevertheless, other researchers in behavioral finance point to disorderly patterns in markets that are not consistent with rationality: herding and excessive volatility, market anomalies, the winner’s curse, and loss aversion. See, for example, Shiller (1995, 1989); Capen, Clapp, and Campbell (1971); and Kahneman and Tversky (1984).

intellectual leadership by the [Federal Reserve] Board or of a consensus on the correct policy in the community at large or of Reserve Bank governors willing and able to assume responsibility for an independent course, the tendencies of drift and indecision had full scope. Moreover, as time went on, their force cumulated. Each failure to act made another such failure more likely. (p. 418)

The events of 1907 illustrate how collective action might address a bank panic. Most vividly, we see Morgan and his circle of influential New York bankers asserting “the trouble stops here” with their support for Trust Company of America. Morgan also forced the presidents of the New York trust companies to form their own association to support each other. Ultimately, the legacy of the crash and panic was to nationalize collective action by means of founding the Federal Reserve System. Several scholars have highlighted the important role of collective action as a brake on the severity of financial crises.³⁹

Leadership is the decisive resource in collective action. What is the nature of such leadership? Conferred power and authority may be useful, but they are insufficient. Treasury Secretary George Cortelyou had both, but he was distant from the work of organizing the collective effort. Morgan had earned his authority by virtue of his years in the business and his leadership of earlier collective efforts, such as in responding to the financial crisis of 1893. He displayed other qualities of leadership as well: the ability to recognize problems and opportunities; to shape a vision and strategy for responding and to engage others in the vision and strategy; to persuade others; and to organize action. Morgan wielded the instruments of intervention and leadership: superior information, influence, the ability to marshal financial resources, and even coercion.

The Panic of 2007–2009: The Subprime Crisis

What I call the subprime crisis—a name focusing on the origins of the panic of 2007–2009, although it eventually spread far beyond subprime loans and mortgages—had its roots in the collapse of a debt-fueled boom in residential real estate.⁴⁰ As house prices began to fall in late 2006, speculators and risky borrowers started defaulting in rising numbers as the opportunity to sell houses at a profit began to fade. The impact of those defaults became apparent in November 2006, triggering failures and losses in the first half of 2007. A liquidity crunch in subprime mortgages began: Investment demand for them dwindled, as did their market values. Mortgage loan originators lost money and/or went bankrupt.

³⁹See, particularly, Wicker (2000) and Tallman and Moen (1995, p. 1).

⁴⁰A very detailed documentation of events of the subprime crisis may be found at “Credit Crisis Timeline,” University of Iowa Center for International Finance and Development, at www.uiowa.edu/ifdebook/timeline/timeline1.shtml. An important supplement is “The Financial Crisis: A Timeline of Events and Policy Actions,” published by the Federal Reserve Bank of St. Louis, at <http://stlouisfed.org/timeline/default.cfm>.

Rating agencies sharply downgraded the credit rating of mortgage-backed securities. Hedge funds that had specialized in those securities reported large losses and began to close. Although the immediate fallout of the liquidity crunch was swift and severe, the destruction of value did not stop there.

In mid-2007, fears rose about the stability of banks. These fears were realized when, in late 2007, banks reported large loan write-offs, closed special investment vehicles that specialized in subprime loans, and cashiered their CEOs. Late 2007 also witnessed the first prominent bank run, Northern Rock in the United Kingdom. Subsequently, the National Bureau of Economic Research declared that a recession had begun in the United States in December 2007. Credit market conditions continued to deteriorate.

To stem the decline, Congress passed a stimulus act in January 2008 that would give taxpayers a \$150 billion income tax rebate. These funds arrived in consumers' hands starting in early 2008, where they helped to reduce consumer indebtedness. In late February, a group of banks rescued AMBAC, a mortgage insurer without whose survival it was feared the entire mortgage market would collapse. In March, a run by institutional investors caused Bear Stearns, a leading investment bank, to fail to refinance its trading operations. Over the weekend of 14–15 March, JPMorgan Chase agreed to acquire Bear Stearns with support against loan losses from the U.S. Federal Reserve. The following month, three large institutions (Citigroup, Wachovia Corporation, and Washington Mutual) started efforts to raise capital from private investors—another clear indication of distress among the world's most prominent and, presumably, most solid financial institutions.

Through mid-2008, rising mortgage defaults and deteriorating mortgage values put more pressure on financial institutions. Rating agencies downgraded the credit rating of the mortgage insurers MBIA and AMBAC. The U.S. Treasury and Securities and Exchange Commission (SEC) took action to relieve pressures on Fannie Mae and Freddie Mac, the government-sponsored mortgage investors, who were the focus of intense rumors of instability. The Federal Deposit Insurance Corporation seized IndyMac, a large California-based financial institution.

In early August, the Federal Open Market Committee, a unit of the Fed, indicated its alarm when it declared that “the downside risks to growth have increased appreciably.”⁴¹ The credit crisis was not limited strictly to mortgages. Banks simply exited from the intercorporate loan market and waited to see which counterparties were solvent and would survive the crisis. Measures of lender anxiety, such as risk premiums and the premium for credit default swaps, skyrocketed. In Mufson (2008), Mohamed A. El-Erian, a prominent investment manager, asserted that the money market among corporations—the commercial paper market—had “essentially shut down.”

⁴¹Quoted from a press release of the Federal Open Market Committee, Federal Reserve Board (17 August 2008).

In September 2008, the crisis intensified: Investor confidence plummeted, credit market liquidity evaporated, and institutions crumbled. The U.S. government assumed direct control (called “conservatorship”) of Fannie Mae and Freddie Mac, in effect nationalizing \$5 trillion of mortgage loans.⁴² On 15 September, Lehman Brothers, one of the largest investment banks, declared bankruptcy, having failed to find an investor, a buyer, or government guarantees. The failure of Lehman and the government’s determination not to rescue the firm sharply raised investor fears. In response, the stock market plummeted, reaching levels of volatility not seen since the 1930s, with the exception of the single day 19 October 1987.

Also, on 15 September, Merrill Lynch, by some measures the largest investment bank, agreed to be acquired by Bank of America. On 16 September, the government extended an emergency loan to American International Group (AIG), a large insurance and financial services company; in October, more loans were extended to AIG; in November, the government announced it would buy stock in the company, effectively nationalizing it. On 19 September, Wells Fargo Bank announced that it would acquire Wachovia, a bank with sizable exposure to mortgage loans, creating the second-largest bank in the United States by deposits.⁴³ And on that same day, the Fed and Treasury announced measures to support money market mutual funds, some of which were invested in the commercial paper of Lehman Brothers rather than the top-quality commercial paper and Treasury bills that had traditionally been held by these supposedly ultra-safe funds. On 22 September, Goldman Sachs and Morgan Stanley, the two remaining large independent investment banks, announced that they were applying to become bank holding companies—a declaration that marked the end of the large integrated investment banks in the United States. Finally, on 25 September, regulators closed Washington Mutual Bank and sold its operations to JPMorgan Chase. Within a few short weeks, the entire financial services industry in the United States was radically transformed—probably forever.

Politicians and policymakers struggled to find a response that would restore confidence and calm. On 3 October, Congress enacted a \$700 billion Troubled Asset Relief Program (TARP) for the purpose of buying “troubled assets” (such as subprime mortgages) and investing in financial institutions. A storm of criticism ensued. Six weeks later, the Treasury announced that it would not buy troubled assets after all and instead would only invest to rescue tottering institutions.

⁴²The estimate of mortgage loans nationalized is from CNNMoney.com, accessed at http://money.cnn.com/2008/09/07/news/companies/fannie_freddie/index.htm?postversion=2008090711 on 7 September 2008.

⁴³Data on ranking of bank size by deposits drawn from *Infoplease*, at www.infoplease.com/ipa/A0763206.html.

Meanwhile, the subprime crisis continued to spread globally. The United Kingdom nationalized Bradford and Bingley Bank, a large retail institution. Iceland seized its largest banks and then obtained an emergency loan from the International Monetary Fund to prop up the króna. Pakistan and Turkey obtained emergency loans. European regulators nationalized Fortis; Germany rescued Hypobank; and the Dutch rescued Aegon; in Japan, Yamato Life Insurance Company filed for bankruptcy—all were large financial institutions. The Russian stock exchange was closed for several days to stem panic selling, and many countries announced programs of government spending to stimulate their economies.

November and December 2008 revealed more restructuring of the U.S. financial sector. Citigroup was rescued by joint action of several government agencies with a package of guarantees, liquidity access, and capital. CIT Group, a consumer finance concern, applied to become a bank holding company, as did General Motors Acceptance Corporation. The big three U.S. automakers appealed to Congress for emergency financing and were denied, but the Treasury agreed to extend emergency loans under the TARP.

By the end of 2008, the financial crisis had affected markets, industries, and the assets of millions of investors and depositors. Damage inflicted by the subprime crisis was enormous. The Conference Board's index of consumer confidence had plummeted from a peak of 112.6 (on 31 July 2007) to just 38 at the end of 2008.⁴⁴ The contraction was spreading deep into the real economy. The ISM Business Activity Index had fallen to a 26-year low of 32.4⁴⁵ from a peak of 60.7 in June 2007.⁴⁶ Unemployment had risen from 4.5 percent in June 2007 to 6.7 percent at November 2008.⁴⁷ Financial commitments made by the U.S. government to fight the crisis stood at \$8.2 trillion; of these, the government had actually disbursed \$3.9 trillion.⁴⁸ Financial support by the government extended farther into the private sector than at any time since the Great Depression. The Treasury had purchased a total of \$229 billion in the preferred stock of 209 financial institutions⁴⁹ and had

⁴⁴Consumer confidence data are from www.conference-board.org/economics/ConsumerConfidence.cfm.

⁴⁵ISM Business Activity Index data are for December 2008 and are drawn from ISM Report on Business, at Wall Street Journal, <http://online.wsj.com/article/SB123090812392149093.html>.

⁴⁶ISM Business Activity Index from *ISM Report on Business* June 2007, at www.ism.ws/files/ISMReport/ROB072007.pdf.

⁴⁷Unemployment data from the Bureau of Labor Statistics, at www.bls.gov/.

⁴⁸Data for U.S. government commitments in fighting the crisis drawn from "Parsing the Bailout," *Washington Post* (26 November 2008):A10.

⁴⁹Data from the U.S. Federal Reserve, "The Financial Crisis: A Timeline of Events and Policy Actions" (31 December 2008).

invested \$151 billion in nonbank corporations,⁵⁰ yielding a total of \$375 billion invested under the TARP. Corporate bankruptcies rose significantly. By April, bankruptcies were up more than 40 percent from the previous year.⁵¹ Seizures of financial institutions by federal regulators had risen to 25 in 2008 from 3 in 2007.⁵² The stock market in 2008 fell 38.5 percent for the year. Globally, equity investors lost \$30 trillion in value.⁵³

The events of the Panic of 1907 highlighted four aspects of the dynamics of crises: (1) Financial institutions form a system; (2) the system grows unstable; (3) a shock occurs; (4) response proves to be inadequate. Consider how these elements map onto the events of the subprime crisis.

Financial Institutions Form a Complex System. By late 2006, the global financial system had grown extraordinarily complex in terms of the interdependencies that created the system.⁵⁴ This complexity made it hard for decision makers of all kinds, from CEOs to individual investors, to know what was going on and to make intelligent choices. Growing complexity bred information asymmetries at all levels of the financial system.

■ *Individual securities.* Innovations in the design of individual mortgages amplified complexity. For example, a “subprime loan” was a loan extended to a risky borrower, one who has had some payment delinquencies, a bankruptcy judgment, a high debt-to-income ratio, or a low credit score. After 2001, the volume of new subprime mortgages increased and shifted away from the simple fixed-rate structure and materially toward adjustable-rate mortgages (ARMs). Although historically ARMs were just mortgages with a variable interest rate that fluctuated with short-term Treasury yields, the type of ARM that became popular prior to the subprime crisis begins with a low initial interest rate that is adjusted, over time, toward a rate that truly reflects the high credit risk of the borrower. Sometimes called “teaser loans,” these ARMs give the appearance of affordability to the borrower who does not look beyond the initial-period cash flow requirements to reflect on the actual

⁵⁰The figure of \$151 billion is derived from the estimate of \$375 billion committed by the end of November, less the sum of investments in bank preferred stock announced by the Treasury, \$229 billion. The estimate of \$375 billion was published in “Parsing the Bailout,” Footnote 48.

⁵¹Corporate bankruptcies data from www.bankruptcy-statistics.com/index.php?option=com_content&view=article&id=185:corporate-bankruptcies-increase-as-more-near-financial-disaster&catid=84:commercial&Itemid=201.

⁵²Data on bank failures from the Federal Deposit Insurance Corporation, at www.fdic.gov/bank/individual/failed/banklist.html.

⁵³Equity market performance drawn from “After the Collapse, Guarded Hope for 2009,” *Wall Street Journal* (2 January 2009):R1 and from Bloomberg.com, at www.bloomberg.com/apps/news?pid=newsarchive&sid=aYwo1tZqGFgA.

⁵⁴A very detailed discussion of complexity in the subprime crisis may be found in Gorton (2008).

total cost of the mortgage over time. In fact, many ARMs are bets that the value of the house will rise such that the borrower can refinance on more attractive terms than the imminent reset rate embedded in the original ARM.

In effect, the ARM is a string of refinancings, a stream of options to default or refinance, where the strike price is the value of the house. The borrower stays in the loan as long as the value of the house always rises. If the subprime borrower cannot make the higher payment required as of the reset date, he or she will be compelled to refinance or default. The lender, not the borrower, has the choice to fulfill the borrower's request to refinance: If the credit standing of the borrower or the collateral value of the house has fallen, the lender will choose to decline the request. The borrower has the choice to extract equity if the value of the house has risen materially.

These embedded options are very hard to value. Complexity and opacity were amplified by the bundling of subprime mortgages into residential mortgage-backed securities (RMBS). Particularly difficult to evaluate are the RMBS that are further decomposed into securities called "collateralized mortgage obligations" (CMOs), in which various senior and junior debt "tranches," or slices, as well as an equity tranche, are created from the same underlying mortgage cash flows. Like subprime loans, RMBS and CMOs are hard to value and are very sensitive to variation in the value of house prices.

■ *Trading positions.* Financial innovations made it possible for investors to buy or sell risk depending on their appetites. The primary vehicles for such trading were credit derivatives, of which the credit default swap (CDS) was the simplest structure. In a CDS, one party agrees to pay the other in case of default on a specific bond: One party sheds default risk, and the other party assumes the risk. Synthetic collateralized debt obligations (CDOs) are a related kind of default risk insurance that bundle CDS. Insurance of all kinds is based on this type of exchange.

What makes such an exchange rational for either party is the price or premium of this protection and a rigorous assessment of the risk involved. CDS and CDOs, like ARMs and RMBS, are challenging to value. Credit rating agencies, such as Moody's Investors Service, Standard & Poor's, and Fitch Ratings, used computer models that would simulate the probability of default on these instruments; on that basis, they would issue a credit rating. The models apparently were based on optimistic assumptions that produced low probabilities of default; in the words of one critic, this was a problem of "garbage in, garbage out."⁵⁵

In short, the risk of default was mispriced in the credit derivative market between 2004 and 2007.⁵⁶ Warren Buffett, CEO of the insurance holding company Berkshire Hathaway, had earlier criticized credit derivatives as "weapons of mass

⁵⁵ See Partnoy (2006, p. 77).

⁵⁶ The President's Working Group on Financial Markets, in a report dated March 2008, stated that underwriting standards had declined. See Gorton (2008, p. 73).

destruction,”⁵⁷ a characterization that was to resurface repeatedly during the subprime crisis. The various forms of credit default insurance combined with the underlying securities to form extremely complex trading positions.

■ *Institutions.* Complexity grew within established institutions as they founded proprietary trading desks and in-house hedge funds that sought to profit from trading in mortgage-backed securities and in specialized investment vehicles (SIVs)—off-balance-sheet entities that warehoused mortgage securities. Monitoring the risk position of the entire institution proved daunting, and the task of doing so was often assigned to a specialist in risk management. One such manager, Richard Bookstaber (2007), wrote, “My great concern was that the sheer complexity of Citigroup would add so much structural uncertainty that it would become nearly impossible to react to events that were not already on the radar screen” (p. 126).

Complementing the formal financial system of banks and other well-known institutions was a “shadow financial system,” consisting of new and unregulated institutions—hedge funds—that arose to speculate on the expansion, with between \$2.5 trillion and \$4.0 trillion of capital under management.⁵⁸ Similarly, mortgage loan originators competed to write new residential home loans. Securitization of residential mortgages enabled mortgage originators to move the assets off their books and into the hands of institutional investors. The resulting mortgage-backed securities (MBS) and CDOs swelled in volume. The separation of origination and distribution (or securitization) distorted the incentives, created agency problems, and amplified complexity and opacity.

A related novelty within financial institutions was *mark-to-market accounting*, which increased transparency somewhat but also amplified liquidity risk within institutions: As the markets in credit securities froze, it became impossible to tell *what* the securities were worth. Ultimately, mark-to-market accounting would worsen opacity during the panic rather than improve transparency.

■ *Markets.* The placement of U.S. residential mortgage-backed securities spread worldwide. RMBS came to rest in pension funds, the portfolios of a village in Norway, and banks in Germany, France, Switzerland, and Australia. Like a game of Old Maid on a massive scale, it became impossible to tell who held the fatal cards. The global financial system in the 21st century grew vastly larger and more complicated owing to economic development, globalization, trade liberalization, technological innovation, proliferation of products and services, entry of new players (such as hedge funds and institutions from emerging countries), cross-listing of securities among global markets, arbitrage among markets, and other factors.

⁵⁷See Management Letter to Shareholders of Berkshire Hathaway (21 February 2003):15, at www.berkshirehathaway.com/letters/2002pdf.pdf.

⁵⁸See *AIMA's Roadmap to Hedge Funds*, November 2008, at www.aima.org.

The System Grew Unstable. Globally, the economy grew rapidly in the years immediately following the recession of 2001–2002. The growth of the world’s real GDP averaged 4.5 percent annually from 2003 to 2006—compared with about 3 percent for the previous quarter-century⁵⁹—driven partly by explosive growth in emerging countries, such as China, India, Brazil, and Russia. In the United States, GDP grew more sedately at 3 percent, although investment in U.S. real estate took off, running at about 4 percent per year, much faster than the average annual growth rate during the preceding 25 years (0.5 percent).⁶⁰

The buoyant growth in the United States was partly stimulated by policies of the U.S. Federal Reserve Board, which had held interest rates low to stimulate recovery from the 2001–02 recession. The Fed had lowered the targeted federal funds rate from 6.5 percent at the end of 2000 to 1 percent in June 2003—even though by then the U.S. economy had already emerged from the recession.⁶¹ Annual inflation in consumer prices ran at 2.3 percent, 2.7 percent, and 3.4 percent in 2003, 2004, and 2005, respectively,⁶² but it was not until August 2005 that the federal funds rate exceeded the rate of inflation. During this time, then, the real interest rate was negative; the Fed was essentially giving money away to stimulate the economy. Critics charged that the Fed had kept interest rates too low for too long, but Federal Reserve chairmen Alan Greenspan and Ben Bernanke responded that it was not *their* fault: The U.S. capital markets were flooded with investments from foreign countries—a “savings glut”—that had depressed interest rates.⁶³

A speculative boom in housing ensued. The volume of all mortgage loans skyrocketed in the mid-2000s, and subprime lending took off in 2003. As housing prices rose, homeowners borrowed against the equity in their homes to finance increased consumption. Indebtedness of the U.S. populace reached record levels: All debt (the sum of household, business, and government debt) as a percentage of U.S. GDP reached 350 percent by 2006, having doubled since 1984. Much of the increased consumer spending that was financed by rising debt levels was for goods

⁵⁹World GDP statistics drawn from IMF *Factbook*, reported at www.econstats.com.

⁶⁰U.S. GDP growth statistics drawn from the Bureau of Economic Analysis, at www.bea.gov/national/nipaweb/TableView.asp?SelectedTable=1&ViewSeries=NO&Java=no&Request3Place=N&3Place=N&FromView=YES&Freq=Qtr&FirstYear=1947&LastYear=2008&3Place=N&AllYearsChk=YES&Update=Update&JavaBox=no#.

⁶¹The historical record of federal funds rate targets was obtained from the New York Federal Reserve Bank, at www.newyorkfed.org/markets/statistics/dlyrates/fedrate.html.

⁶²Data on inflation in consumer prices in the United States were obtained from the World Economic Outlook Database of the International Monetary Fund, at www.imf.org/external/pubs/ft/weo/2008/01/weodata/weorept.aspx?sy=1980&ey=2013&scsm=1&cssd=1&sort=country&ds=.&br=1&cc=111&s=NGDP_Rpercent2CNGDP_Dpercent2CPCPIpercent2CFLIBOR6percent2CGGBpercent2BCA&grp=0&a=&pr.x=78&pr.y=4.

⁶³See Greenspan (2007, p. 13) and Bernanke’s speech on the savings glut, at www.federalreserve.gov/boarddocs/speeches/2005/200503102/.

and services produced outside the United States. The United States had run current account and fiscal deficits for 22 of the 25 previous years; trade and fiscal deficits were financed by the sale of debt securities to non-U.S. investors.⁶⁴ The expansive use of “leverage” or debt to finance various economic activities is a common feature of booms that precede crises.⁶⁵

Of course, the boom had other long-term drivers as well: innovation (both technological and financial), deregulation (in finance and other industries), globalization, trade liberalization, and demographic changes. Like the mechanics of the “perfect storm” of a financial crisis, these drivers also reinforced each other, producing an era of dramatic change and buoyancy. Consistent with the boom were sharp increases in the prices of oil, gold, and other commodities in the quarters leading up to the crisis. This boom had all the earmarks of a “bubble.”

Rising leverage in the 2003–06 boom had eroded the “shock absorbers” that had existed among individuals, households, corporations, financial institutions, and governments. Equity is the principal shock absorber, enabling small or even medium-sized losses to occur without affecting an individual’s or organization’s consumption patterns or ability to service debt; income or cash flow is another shock absorber in that equity lost in one period is refreshed by the part of income that can be saved in the next. The inflexibility, or inability to tolerate losses, that so greatly contributed to the panic in 2008 was a consequence of the increase in debt-financed consumption by consumers and households in the United States. It also reflected the increased use of leverage by financial institutions, especially among investment banks and hedge funds. In 2004, the SEC suspended the “net capital rule” for five large investment banks that had limited their debt-to-equity ratio to 12:1.⁶⁶ By early 2007, the major investment banks had dramatically increased their leverage. When Lehman Brothers collapsed, it was capitalized at 30 parts debt to 1 part equity—compared with 13:1 at JPMorgan Chase. The roughly 15,000 hedge funds followed various financing strategies and could lever their equity capital 4 to 10 times, yielding total assets of \$10 trillion to \$40 trillion.⁶⁷ Many of these funds were conservatively managed; others used aggressive investing strategies. The erosion of safety buffers meant that trouble could travel quickly through the financial system.

⁶⁴Trade and fiscal data from World Economic Outlook Database of the International Monetary Fund, at www.imf.org/external/pubs/ft/weo/2008/01/weodata/weorept.aspx?sy=1980&ey=2013&scsm=1&ssd=1&sort=country&ds=.&br=1&c=111&s=NGDP_Rpercent2CNGSD_NGDPpercent2CGGB_percent2BCA&grp=0&a=&pr.x=63&pr.y=10.

⁶⁵The research by Reinhart and Rogoff and the task force chaired by Gerald Corrigan (CRPMG III, August 2008, at www.crmpolicygroup.org/docs/CRPMG-III.pdf) point to the heavy use of leverage as a precursor of financial crises.

⁶⁶For more on the consequences of the suspension of the net capital rule, see Satow (2008).

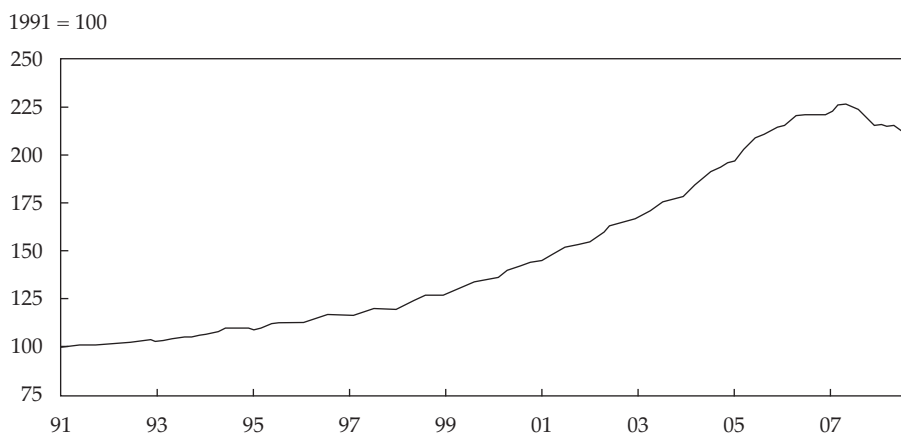
⁶⁷Count of hedge funds is from PerTrac Financial Solutions as reported in *The Trade News* (5 March 2007), at www.thetradenews.com/hedge-funds/prime-brokerage/613.

During the period leading up to the crisis, leaders in government and business had taken actions that elevated the risk exposure of the financial system. Numerous bank CEOs oversaw the debt-financed economic boom. Alan Greenspan admitted in testimony to Congress that he was “partially” wrong, giving too much credence to an ideology based on the self-correcting nature of markets and not anticipating the extraordinary risks embedded in the mortgage lending boom.⁶⁸ Under the guidance of boards of directors and a Congress that was cheerleading for an expansion of mortgage lending, the CEOs of Fannie Mae and Freddie Mac overexpanded the funding of subprime mortgage loans. Some mortgage loan originators practiced fraud and/or predatory lending in the recruitment of borrowers to take out “liar loans” and to agree to the terms of financing for housing they could not afford. The SEC relaxed capital adequacy rules for large broker/dealers that would allow them to increase financial leverage dramatically; by late 2008, three of the five firms that were granted this greater freedom had collapsed into bankruptcy or the arms of a rescuing acquirer (Bear Stearns, Lehman Brothers, and Merrill Lynch) and the other two had converted to commercial bank holding companies to gain access to the Fed’s discount window (Goldman Sachs and Merrill Lynch). Leaders of counties and municipalities (such as Flint, Michigan, and Hattfjelldal, Norway) approved the investment of community funds into securities they did not understand. Christina Kirchner, President of Argentina, nationalized pensions in that country in a move that many fear amounted to a looting of wealth from the middle class. In December 2008, Bernard Madoff, a prominent participant in New York City’s financial circles, confessed to operating a Ponzi scheme with total exposure estimated at \$50 billion; the financial crisis accelerated the collapse of Madoff’s scheme.

Real Economic Shock. The fundamental trigger of the crisis was the decline in housing prices starting in September 2006, as shown in **Figure 2**. Because the current crop of subprime loans was predicated on always-rising housing prices, this turn in the market spelled doom for both debtors and creditors. But the opacity of subprime mortgage securities also meant that the full import of the housing decline would not be known until it showed up in the decline of the security prices themselves, and such news was conveyed in November 2006 by the Markit ABX.HE indices, which measure the risk of default on mortgage-backed securities. First published in early 2006, these indices do not directly measure the value of subprime securities (most of which do not trade frequently and thus cannot offer the prices needed for a conventional market index), but they do measure the premium or price on credit default swaps on those securities that *do* offer frequent prices. Already by February 2007, the ABX.HE index for subprime loans had lost 30 percent of its value. The ABX.HE index was the messenger; the decline in housing prices and rising default rate on subprime loans were the message. The shock set in motion a domino-like reaction among investors and financial institutions.

⁶⁸See Andrews (2008).

Figure 2. Index of House Prices, 1991–2008



Source: Based on data from “Monthly House Price Indexes for Census Divisions and U.S.” data series, Office of Federal Housing Enterprise Oversight (OFHEO).⁶⁹

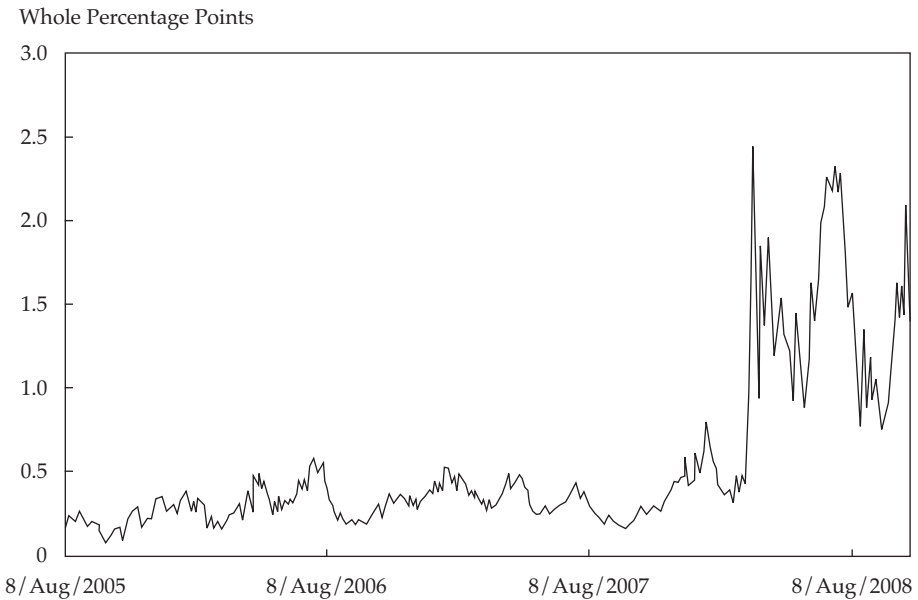
Response. In reaction to the adverse news, market sentiment changed from optimism to pessimism—at first slowly and then with greater speed and severity. For example, **Figure 3** gives the “TED Spread,” the risk premium between LIBOR (the London Interbank Offered Rate, a key benchmark rate of private interbank lending) and the yield on U.S. Treasury securities.⁷⁰ This risk premium rose far beyond past peaks and spiked at points of major tension, especially around the sale of the investment bank Bear Stearns and the bankruptcy of Lehman Brothers in March and September 2008, respectively. Other measures of investor mood were reflected in the premium for default insurance, represented by the price for credit default swaps and the volatility of the U.S. stock market. Both increased dramatically over the crisis and especially in the fall of 2008.

Government leaders addressed the unfolding crisis in varying ways. The classic counsel of Walter Bagehot in 1873 was that in stemming a panic, the central bank should lend liberally on good collateral and at penalty rates of interest—in essence, a policy of flooding the market with liquidity. Today, the systemic dynamics of a crisis suggest that more liquidity should be supplemented by improving transparency and restoring confidence. The events of 2007–2009 showed numerous actions taken in these directions.

⁶⁹For OFHEO data, see www.ofheo.gov.

⁷⁰TED stands for Treasury–eurodollar, the eurodollar being a term for dollars traded in European or other non-U.S.-domiciled markets.

Figure 3. Percentage Spreads between LIBOR and U.S. Treasury Yields, 8 August 2005 through 1 November 2008



Source: Based on U.S. Federal Reserve data.⁷¹

The Fed lowered the federal funds rate, lent liberally to banks through the discount window, arranged liberal swap funding agreements with the central banks of other countries, raised the rate of interest paid to banks on their reserves held by the Fed, and as in the case of JPMorgan Chase's acquisition of Bear Stearns, provided guarantees against potential losses in the acquisition of failing banks. The U.S. Treasury aggressively invested in the preferred stock of financial institutions with funds afforded by the TARP and in 2009 dramatically restructured General Motors and Chrysler Group. Federal and state agencies intervened to assist homeowners facing foreclosure. The U.S. Congress passed an economic stimulus bill in early 2008 and enacted another in 2009. The Federal Deposit Insurance Corporation seized insolvent banks.

As it became clear that the contagion of crisis was spreading to foreign countries, the central banks and finance ministries increasingly coordinated rescue operations globally. By mid-November 2008, leaders of 20 leading developed and emerging countries (the G-20) agreed to commence a series of summit meetings, informally dubbed "Bretton Woods II," that would aim to bolster the infrastructure

⁷¹For U.S. Federal Reserve data, see www.federalreserve.gov/releases/h15/data.htm.

of global financial regulations and crisis management. In April 2009, the G-20 met again and agreed to muster a \$1.1 trillion fund to stimulate global economic growth and repair the financial system. Nevertheless, issues regarding regulations, stimulus programs, and system governance sharply divided emerging from developed countries and Anglo-American from Continental countries.

Conclusion

In the subprime crisis, as with the Panic of 1907, the four factors of system structure, growing instability, shock, and response capture a range of interesting dynamics. Rapid growth leads to optimism that for a time may stimulate more growth. Insufficient information fuels optimism and delays collective action. Imperfect information and optimism promote a tendency to discount the effect of real shocks to the system when they occur. Real shocks, an absence of shock absorbers, and a lack of collective action may amplify the conditions of instability. Several conclusions arise from observing how these dynamics played out during the Panic of 1907 and the subprime crisis of 2007.

Financial crises are a recurring feature of market economies. Hyman Minsky, an economist who analyzed financial crises, concluded that financial fragility is a normal way of life.⁷² According to Minsky, government regulation may be able to mitigate the severity and duration of crises but cannot eliminate them. Investors, bankers, corporate chieftains, government leaders, and the average citizen should manage affairs to be able to withstand the inevitable future crises. With hindsight, it appears that this lesson was widely ignored. The century following the Panic of 1907 witnessed 19 recessions and 15 major stock market crashes.⁷³ The largest of all crises occurred in the 20th century: the crash of 1929 and ensuing Great Depression of 1930–1934. From 1934 to 2007, almost 3,600 financial institutions were seized by regulators; only two years witnessed no bank failures.⁷⁴ Even in the most recent 25 years, we have seen serious financial market instability in equities (1987, 2002), currencies and financial institutions (Mexico in 1994, much of Asia in 1997), and government debt (Russia in 1998). Since 1945, the world has witnessed 18 major bank-centered financial crises.⁷⁵ These are only the major events and ignore a larger number of brief and/or localized events; yet, they all resulted in major declines in asset values, constrictions of credit, and damage to financial institutions. Generally,

⁷²“There is nothing that can be done to eliminate the inevitability of financial fragility as Minsky defined it” (Kregel 2008, p. 6).

⁷³For the data on recessions as declared by the National Bureau of Economic Research (NBER), see www.nber.org/cycles.html. The 15 major stock market crashes of the 20th century are discussed in Mishkin and White (2003, p. 55).

⁷⁴Data on bank failures are drawn from Federal Deposit Insurance Corporation data, at www2.fdic.gov/hsob/SelectRpt.asp?EntryTyp=30.

⁷⁵For discussion of the 18 bank-centered financial crises since 1945, see Reinhart and Rogoff (2008c).

these episodes were followed by contrition and rising government regulation, and unfortunately, such responses proved inadequate to preventing the next episodes. One of the most dangerous statements in the markets is, "This time it is different."

Large institutional rescues seem to mark the start of recovery. The nadir of a panic is marked by the failure, involuntary sale, or seizure of financial institutions, especially those formerly thought to be rock solid. Critics of capitalism have asserted repeatedly that institutional failures in financial crises mark the collapse of the capitalist system, and these voices have been heard especially loudly during the current crisis. Yet, the collective action formed to rescue institutions is like an antibody that fights the virus of panic; in this sense, institutional rescues may mark a strengthening of business and government leadership. In 1907, Morgan asserted, "This is where the trouble stops," and he spent the next three weeks rescuing salvageable institutions. In 2008, the United States and other governments began to intervene massively after the bankruptcy of Lehman Brothers proved to be disastrous, and they helped alleviate the distress of the other large integrated investment banks. Vigorous collective action helps to restore confidence and stability.

Individuals, enterprises, and whole markets prove to be more dynamic and ingenious than those who want to constrain the excesses of the system. Now in the early 21st century, financial markets are protected by regulatory systems vastly stronger than the weak form of oversight that existed in 1907. The regulators and the rules they have now put in place justify a higher degree of confidence in the financial system than was appropriate in the days of Morgan and his contemporaries. Government agencies regulate the entry, exit, and combination of financial institutions; they oversee the transparency of financial reporting and securities underwriting; they influence credit and capital policies of lenders; they manage the money supply, thereby influencing interest rates and inflation expectations; and they provide the electronic system through which vast quantities of cash are transferred. Some central banks are charged with both maintaining full employment and stimulating economic growth. With this much government intervention, it is hard to call the global financial services industry "free-market capitalism," yet this intervention supports a greater degree of freedom to innovate and to direct capital to its highest uses than would be possible without it. Government is involved cheek-by-jowl in the functioning of financial markets. Indeed, government intervention may also play a destabilizing role by creating moral hazard, a tendency on the part of players to be more aggressive in the belief that the government will bail them out.

We should not seek government regulation carelessly. Regulators can become captive to the very industries they regulate. The private sector tends to squirm away from regulators. Make a rule, and executives and their lawyers will find exceptions or a way to skirt it entirely. Private markets innovate relentlessly. This means that, like the general who always prepares to fight the last war, regulators tend to manage the private sector the way it used to be. Like the barking dog that chases, but never

catches, the bus, regulators may never catch the wave of new developments in industry. And finally, it is all too easy to saddle taxpayers with the costs of saving firms, jobs, and industries. Are we willing to pay for an absolutely risk-free society? If we are willing to pay the cost, can we get one? Or is a risk-free society beyond our reach because of the inherently risky nature of human endeavor? And finally, would we want one?

There is no “silver bullet,” single explanation, for financial crises. The thoughtful person must embrace a variety of factors explaining crises—of which this article offers four that are broadly consistent with research assessments of financial crises⁷⁶—that encompass a wide range of other explanations.

One’s perspective on the cause (or causes) of financial crises will have big implications for the actions necessary to fight them. Financial crises are self-reinforcing vicious cycles: Conditions degenerate, impairing confidence and causing investors to withdraw from the markets; their withdrawal causes market conditions to degenerate further. The way to halt a vicious cycle is to intervene, somehow, in the reinforcement process, to flood the system with liquidity and shed some very bright daylight on the value of assets in the institutions’ portfolios. Leadership is the vital commodity needed to achieve all this, as Morgan and people like him showed so instructively more than a century ago.

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⁷⁶Mishkin (1990, pp. 26–27) noted that financial panics were always associated with recessions, that interest rates rose and risk premiums widened before the onset of a panic, that the failure of an institution typically triggered the onset of a panic, and that severe crises are associated with severe economic contractions.

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