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Source: *The Journal of Economic Perspectives*, Vol. 25, No. 1 (Winter 2011), pp. 71-90

Published by: [American Economic Association](#)

Stable URL: <http://www.jstor.org/stable/23049439>

Accessed: 15-08-2014 17:08 UTC

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A Year of Living Dangerously: The Management of the Financial Crisis in 2008

Vincent Reinhart

Metaphors shape understanding of the narrative of events (Reinhart, 2009). For example, the received wisdom in the years following the Great Crash of 1929 and the attendant crushing economic contraction was that it had resulted from excesses of speculation and competition. Some of the policy lessons drawn in the 1930s were that cartelization of industry could promote growth, that restrictions on financial firms and transactions in the financial sector were a preferred way to dampen volatility, that flexible exchange rates were destabilizing, and that fiscal policy could stimulate expansion. It took decades for the economics profession to revise this narrative, beginning with the efforts of Friedman and Schwartz (1963), to put the effect of the supply of money and credit at the center of the story of the Depression. It took longer still to pare back the institutional edifice of banking and financial regulation erected as a consequence of the initial misreading of the events of the 1920s and 1930s.

In this paper, I argue that the evolving narrative of the events of 2008 represents a similar error in our understanding. The current metaphor seems to be that the global economy was hit by a “perfect storm” of disruptive forces late in 2008. A prime-time example of this interpretation came in a nationally televised broadcast in July 2009, when Federal Reserve Chairman Ben Bernanke answered questions about the economy and monetary policy in a town-hall format. Interspersed with

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doi=10.1257/jep.25.1.71

the give-and-take was footage of vast waves battering ship and shore. This metaphor suggests that the economy was lashed by events in 2008, while key financial authorities in yellow slickers—a sort of Corps of Financial Engineers—fought the elements and made decisions about which flood waters to divert, which levees to reinforce, and which sluice gates to open.

A more appropriate narrative of the financial crisis that exploded in September 2008 would begin with how the Corps of Financial Engineers—comprising chiefly the Secretary of the Treasury, the Chairman of the Federal Reserve, and the President of the Federal Reserve Bank of New York—inserted the government into the resolution of the investment bank Bear Stearns in March 2008. The financial authorities interpreted the death throes of the mid-sized investment bank as a problem of systemic importance and, with an ill-considered and unprecedented decision, intervened in a way that protected the uninsured creditors of Bear Stearns and raised the expectations of future bailouts. When the same Corps of Financial Engineers then failed to intervene in September 2008, Lehman Brothers entered bankruptcy. The resulting market seizure was in large part a counter-reaction based on the prior official decision just six months earlier to protect Bear Stearns.

Many observers, including the Secretary of the Treasury at that time Hank Paulson (2010) and Federal Reserve Chairman Ben Bernanke (2010), have looked back at the decision to let Lehman slip into bankruptcy on September 14, 2008, with regret and bemoaned the lack of tools available to them at the time to prevent the outcome. I will argue that Lehman's failure had widespread consequences because of the false hopes engendered by Fed support to Bear Stearns. Instead of asking "Why not save Lehman?" a more useful and consequential question is "Why save Bear Stearns?"

In this essay, I will not seek to offer a comprehensive review of official actions during the financial crisis. There have already been popular renderings (including Ross-Sorkin, 2009; Wessel, 2009) and more academic treatments (Cochrane, 2009; Levine, 2010; Swagel, 2009). Nor will I offer a theoretical explanation of how financial crises emerge: useful starting points to this literature are the articles by Brunnermeier (2009) and Shin (2009) in this journal. I will also not seek to list the litany of governmental failures that contributed to the housing excesses, along with potential reforms; that ground has been covered, respectively, by Wallison and Calomiris (2009) and Kashyap, Rajan, and Stein (2008).

Instead, I will focus here on the fork in the river in March 2008 when the government intervened in the resolution of Bear Stearns. I will review enough of the region upstream and downstream to demonstrate the consequence of the decision. I begin with a review of events leading up to the Bear Stearns bailout and some key details of that event. I then draw on the celebrated Diamond–Dybvig (1983) model to provide a framework for thinking about what engendered the financial crisis in September 2008. The Diamond–Dybvig model is often referenced to emphasize one of its implications: that there might be self-fulfilling crises of confidence. I will

emphasize that the same model also suggests more relevant messages, including that the prices creditors expect to receive in the future are critical in determining their behavior.

The conclusion considers a course not taken in March 2008: that is, prompt recognition of economic losses and forced markdowns. But this policy choice has implications that go beyond events at Bear Stearns in March 2008 and Lehman Brothers in September 2008. In Reinhart and Rogoff's (2009) chronicling of the economic crises over the past eight centuries, one theme is that while countries and crises differ considerably, no country has avoided financial crisis. This universality suggests that financial crises will recur, despite the promises of legislation and enlightened oversight. If financial crises will be ever with us, it is important to have a strategy concerning how they will be managed. Among the areas where progress can be made is in identifying the inherent tensions and uncertainties that hinder decision making (for example, Claessens, Klingebiel, and Laeven, 2005, offer a systematic effort to learn lessons). Thus, I will discuss why the path of recognizing losses and forced markdowns might not have been taken in March 2008 and describe the biases inherent in crisis management that make similar mistakes likely in the future.

Context

How the Financial Crisis Unfolded

The housing market in the United States had a remarkable run in the years before the financial crisis. The rise in house prices and step-up of construction activity started around 1992 at a time when the Federal Reserve was holding its policy interest rate at an unusually low level by the standards of the past few decades. The good times lasted until 2005, when monetary policy was tightening after another spell of low interest rates. Over that period, construction activity contributed $\frac{1}{5}$ percentage points annually to the growth rate of real GDP, and the share of employment in construction and finance, out of the total workforce, rose from 10¼ percent to 11¾ percent. That is, over this period, of the 27.4 million people added to work rolls (which ended 2006 with a total of 136 million), 4.8 million were directly related to construction and finance. By the end of the episode, the nation was left with an excess stock of housing, and the heady rates of appreciation in home prices petered out. House price indexes peaked in late 2006. A contraction in construction transpired to wind down the inventory overhang, which is often a feature of economic slowdowns and recessions.

The breathtaking surprise of the correction, however, was the extent to which financial markets and institutions became entangled. In June 2007, the investment bank Bear Stearns admitted that two of the hedge funds it had sponsored were under considerable funding strains associated with their holdings of complicated mortgage-related securities (a selective timeline of significant events of the financial

crisis is provided in Table 1).¹ By early August 2007, the market for these securities was no longer functioning effectively. The Federal Reserve began actions to support the economy as a whole through reductions in the federal funds interest rate as well as the more targeted interventions of creating different lending facilities to make credit more broadly available both to banks and to other major players in the financial industry. Bear Stearns ceased to exist in March 2008 after a government-assisted sale that was backstopped by a \$30 billion loan from the Federal Reserve. Lehman Brothers declared bankruptcy in September 2008, and what had up to that point looked like a fairly mild recession became a wrenching downturn based on a contraction in credit, destruction of wealth, a rise in yields on risky instruments, and deterioration in confidence.

The economic downturn was remarkable in many aspects. In Reinhart and Reinhart (2009), Carmen Reinhart and I emphasize the global shutdown in exports, but the experience stands out domestically as well. In 2008, U.S. households suffered the worst one-year decline in household net worth relative to income in a century of recordkeeping—an amount equal to about a year of nominal GDP in that year.² The wealth-to-income ratio in 2006 was about $3\frac{1}{2}$; thus, a fall in wealth equal to income produced a one-quarter drop in that ratio relative to the initial level. For comparison, the bursting of the tech-stock bubble in 2001–2002 caused net worth to contract 7 percent in real terms.

Comparisons of the tech bubble that burst around the time of the 2001 recession and the housing bubble that burst around the time of the 2007–2009 recession raise a conundrum. Both seemed to stem from speculative excesses. The first involved overvaluation of corporate equities, which amounted to one-quarter of household net worth in 2000 (that is, corporate equities were about \$10.9 trillion of household net worth of \$42.7 trillion in 2000). The second involved overvaluation of housing, about one-third of net worth in 2006 (that is, real estate was \$25.2 trillion of household net worth in 2006 out of a total of \$64.4 trillion). Both corporate equities and real estate fell about 30 percent in the reckoning. (These data are available from the Federal Reserve Flow of Funds Accounts, June 2010, Table B.100.) As housing is a larger share of household wealth than equities, the residential building bust would have presumably created the larger shock wave. In the 2000–2002 episode, other wealth gains offset much of the equity crash; specifically, a rising tide of real estate values washed over much of the equity crash. In the latter one, both housing and equity prices declined, and so losses across the balance sheet were reinforcing.

Central to the economic distress of the 2007–2009 recession is that financial markets amplified the initiating economic shock, rather than damping it as would be expected if financial instruments had hedging and risk-sharing attributes. Part of

¹ A detailed chronology of events can be found at the website of the Federal Reserve Bank of St. Louis at (<http://timeline.stlouisfed.org>).

² These data are available from the Federal Reserve Board *Flow of Funds Accounts* and from the *Historical Statistics of the United States* (Carter et al., 2006).

Table 1
Some Significant Events during the Financial Crisis

<i>Date</i>	<i>Affected institution</i>	<i>Details</i>
2/2/2007	New Century Financial	New Century Financial Corporation, a leading subprime mortgage broker, files for bankruptcy
6/7/2007	Bear Stearns	Bear Stearns suspends redemptions for its High-Grade Structured Credit Strategies Enhanced Leveraged Fund
9/17/07	Northern Rock (U.K.)	Liquidity support is provided after a deposit run
1/22/08		FOMC lowers its fed funds target from 4¼ percent to 3½ percent
1/30/08		FOMC lowers its fed funds target from 3½ percent to 3 percent
3/11/08	Bank of America and Countrywide	Bank of America acquires Countrywide Financial
3/14/08	Bear Stearns and JPMC	Fed provides \$30 billion to facilitate acquisition of Bear Stearns
3/18/08		FOMC lowers its fed funds target from 3 percent to 2¼ percent
7/30/08	Fannie Mae and Freddie Mac	Enactment of the Housing and Economic Recovery Act reforming supervision of the GSEs
9/7/08	Fannie Mae and Freddie Mac	The Treasury places Fannie and Freddie under conservatorship
9/16/08	AIG	Fed provides AIG with access to a \$85 billion credit line
9/19/08		Treasury uses the Exchange Stabilization Fund to insure money market funds
9/25/08	JPMC, Washington Mutual	JPMC acquires Washington Mutual
9/29/08	Citi	The Fed promises liquidity to support Citi's takeover of Wachovia
10/3/08		TARP is signed into legislation
10/8/08	AIG	Treasury restructures bailout of AIG, providing \$37.8 billion more in credit
10/14/08		Paulson announces a program to invest up to \$250 billion in banks
11/10/08	AIG	Treasury announces it will invest \$40 billion in AIG
11/12/08		Treasury announces that it will not buy troubled assets, but inject capital
12/19/08	GM and Chrysler	Treasury announces 3-month loans to GM and Chrysler in order to prevent bankruptcy
1/15/09		Second half of TARP funding is released
2/25/09		The Treasury begins its stress tests of financial institutions
3/19/09	Auto industry	The Treasury announces plan to provide \$5 billion in loans to auto parts companies
3/23/09		The Treasury announces a plan to encourage purchases of troubled assets
4/30/09	Chrysler	Chrysler files for bankruptcy protection and the Treasury agrees to provide \$8 billion in loans
5/7/09		Stress tests are completed
6/1/09	GM	GM files bankruptcy and the Treasury agrees to provide \$30.1 billion
6/9/09		10 banks are approved to repay funds to the TARP fund.

Source: "The Financial Crisis: A Timeline of Events and Policy Actions," Federal Reserve Bank of St. Louis, <http://timeline.stlouisfed.org/>.

Note: FOMC is the Federal Open Market Committee. GSEs are government-sponsored enterprises.

the explanation no doubt lies in the complexity of the instruments using residential mortgages as collateral and the opaqueness and leverage of the balance sheets of many intermediaries that held them. But part of the reason that financial markets amplified the negative economic shock from the bursting of the housing bubble lies in the policy response: in particular, the change in direction from aggressively intervening to save Bear Stearns and then six months later not intervening to save Lehman Brothers.

The Bear Stearns Intervention

Bear Stearns was an intermediate-sized investment bank, particularly active in the market for fixed-income securities. It was an important underwriter of mortgage-related securities, a market maker in secondary trading, and a sponsor of various investment vehicles. Those activities were related. As an underwriter of fixed-income securities, Bear Stearns pooled mortgages together and issued securities using them as collateral. By the mid-2000s, the stream of income from those mortgage-backed securities was split up into more senior and more junior claims, in which those holding the most junior claims would experience any losses first, thereby providing some protection to those holding more senior claims. Because the senior claims appeared to be safe, they were held by banks and others looking for extremely safe assets. Indeed, international bank regulations (specifically the Basel II accords) were such that if those lower-risk tranches received a triple-A stamp from an accredited rating agency, then a commercial bank could hold them and only have to set aside a small amount of capital.

The high-risk portions of these securities representing more junior claims were more difficult to sell. In some cases, sponsoring an investment vehicle was a mechanism to move those illiquid assets off the balance sheet. But in many cases they were retained on the balance sheet.

Table 2 offers an overview of the Bear Stearns balance sheet in 2007 and how it had evolved since 2004. Total assets grew 54 percent from end-2004 to end-2007. Growth was especially large in “Total financial instruments owned, at fair value” and in “Assets of variable interest entities and mortgage loan special purpose entities.” Given what seemed at the time to be a low level of money market interest rates (with the overnight federal funds rate at 5¼ percent), the management of Bear Stearns chose to fund its positions at short-term maturities. Thus, the liabilities show a large gain in short-term borrowing under “Securities sold under agreements to repurchase.” Bear Stearns’ capital buffer, which is the “Stockholders’ Equity” shown in the bottom row, did not grow commensurately with its balance sheet. By the end of 2007, Bear Stearns was leveraged at 35 to 1.

As housing prices slid and mortgage delinquency rates rose, market participants became increasingly concerned about firms with the business model of borrowing short term to fund illiquid long-term mortgage-related assets. In January 2008, the large thrift Countrywide Financial was bought by Bank of America at what then was thought to be a bargain price. By February 2008, the British trust Northern Rock

Table 2

Bear Stearns, Consolidated Statements of Financial Condition

(in millions of dollars)

		Change from 2004 to 2007	
	2007	in dollars	percent
ASSETS			
Cash and cash equivalents	21,406	17,233	413
Cash and securities deposited with clearing organizations or segregated in compliance with federal regulations	12,890	8,467	191
Securities received as collateral	15,599	6,776	77
Collateralized agreements:			
Securities purchased under agreements to resell	27,878	-17,517	-39
Securities borrowed	82,245	12,452	18
Receivables:			
Customers	41,115	9,001	28
Brokers, dealers and others	11,622	8,688	296
Interest and dividends	785	469	148
Total financial instruments owned, at fair value	138,242	59,845	76
Assets of variable interest entities and mortgage loan special purpose entities	33,553	28,716	594
Property, equipment and leasehold improvements, net of accumulated depreciation	605	224	59
Other assets	9,422	5,060	116
Total Assets	395,362	139,412	54
LIABILITIES AND STOCKHOLDERS' EQUITY			
Unsecured short-term borrowings	11,643	-568	-5
Obligation to return securities received as collateral	15,599	6,776	77
Collateralized financings:			
Securities sold under agreements to repurchase	102,373	43,769	75
Securities loaned	3,935	-6,784	-63
Other secured borrowings	12,361	12,361	—
Payables:			
Customers	83,204	3,820	5
Brokers, dealers, and others	4,101	1,756	75
Interest and dividends	1,301	732	129
Financial instruments sold, but not yet purchased, at fair value	43,807	14,331	49
Liabilities of variable interest entities and mortgage loan special purpose entities	30,605	25,843	543
Accrued employee compensation and benefits	1,651	-27	-2
Other liabilities and accrued expenses	4,451	2,905	188
Long-term borrowings	68,538	31,695	86
Total Liabilities	383,569	136,610	55
STOCKHOLDERS' EQUITY	11,793	2,802	31

Source: SEC Info, (www.secinfo.com).

experienced a deposit run and was taken over by the U.K. government (as described in this journal by Shin, 2009).

The ability of Bear Stearns to roll over its short-term debt proved increasingly unsupportable as creditors became less tolerant of risk. Faced with a funding run at Bear, financial authorities sought a strong partner to assume the firm's obligations. After some negotiation, that partner turned out to be JPMorgan Chase (JPMC), a \$1.3 trillion financial holding company.³ Worried by the weakness of the Bear Stearns portfolio, JPMC's management only agreed to acquire the failing firm if \$30 billion of assets were lifted from its portfolio.

Bear Stearns was a nondepository institution. Thus, it was outside the purview of the usual vehicles to facilitate its resolution, like the Federal Deposit Insurance Corporation (FDIC) and the Federal Reserve. Neither the U.S. Treasury nor the Securities and Exchange Commission (SEC) had funds appropriated by the Congress at hand that could be used for resolving a nondepository institution. Only one entity was poised to step into the policy void: the Federal Reserve.

As the nation's central bank, the Federal Reserve had, through an uneven and uncertain process, achieved a measure of independence from the rest of the government over the years (Meltzer, 2003). The Fed's balance sheet is separated from the federal budget: the Fed does not rely on authorized outlays, but rather funds itself from seigniorage and turns over any surplus to the Treasury. Decisions on the Fed's portfolio are its own, subject to limitations in the Federal Reserve Act. This independence had been won gradually as politicians learned that it would produce better monetary policy and commensurate economic outcomes. The structure that provided independence in monetary policy, however, also allowed financial authorities room to improvise in a crisis.

On March 14, 2008, \$30 billion of securities were removed from Bear Stearns' portfolio in a purchase that was legally structured as a discount loan from the Federal Reserve. As Bear Stearns was not a depository, the loan was made under Section 13(3) of the Federal Reserve Act, which empowers Federal Reserve lending to individuals, partnerships, and corporations provided that a supermajority of the Fed's Board of Governors determines that "unusual and exigent conditions" exist and the reserve banks hold that credit is not available from the private sector. JPMC did provide a measure of credit protection by pledging to absorb the first \$1 billion of losses on the portfolio.

The loan to purchase Bear Stearns assets was unique in several respects. It was made under the explicit authority of Section 13(3) of the Federal Reserve Act, overriding the Fed Board's own Regulation A, which had been previously promulgated to govern such lending. This change in policy allowed the loan to be structured as a discount (in which the Fed acquired securities at a marked-down price at the outset as repayment of the loan) rather than a traditional advance (in which the securities

³ Data on assets under management at the bank portion of JPMC can be found at (<http://www.federalreserve.gov/releases/lbr/current/default.htm>).

served as collateral and would be repaid on the return of funds). In other words, the loans were made without recourse. This implies that any losses on those securities would accrue to the Fed, giving it the economic equivalent of an ownership interest in these securities. In Wessel's (2009, p. 168) nice turn of phrase, "To satisfy Fed lawyers, the Fed subsidy was cast in the rhetoric of a loan." To hold securities that it otherwise could not legally own, the Fed had to create an off-balance-sheet entity, the special investment vehicle "Maiden Lane," apparently so named because it was the back-door access to the main building of the Federal Reserve Bank of New York. In addition, the rate charged on the loan was below that previously specified under Regulation A.

Financial authorities like Bernanke (2008a) and Geithner (2008) justified this action on a variety of grounds. First, Bear Stearns had a large, opaque, and complicated balance sheet. This situation implied that if Bear entered bankruptcy, many counterparties might be hurt, and that the scale and scope of the fall-out was uncertain. Second, Bear Stearns provided important brokering and clearing services to the financial industry (including what was known as "prime brokerage" to hedge funds), and these utility-like functions might be impaired in a disorderly closure of the firm. Third, at a time when financial markets were strained and capital was being withdrawn from trading, a further blow to confidence might topple many other dominoes. Fourth, it was claimed that the assets acquired from Bear Stearns by the Federal Reserve were temporarily undervalued by irrational investor flight toward safe assets. As markets returned to a more proper footing, the Maiden Lane vehicle should turn a profit. Thus, intervention could be justified as following Bagehot's (1873) dictum of lending on good collateral, and could be validated by eventual profits in the Maiden Lane portfolio, thereby meeting the standard for stabilizing intervention as put forth by Friedman (1953).

But regardless of the rationale given, the U.S. government had widened the perimeter of its safety net for systemically important financial institutions to include a mid-sized investment bank. Bear Stearns shareholders suffered, but the Fed structured the JPMC purchase so that it protected all creditors, insured and uninsured and including some of the most sophisticated financial firms on Earth. The federal government also showed a willingness to act quickly. The rationale for a prompt response was that uncertainty about U.S. institutions would be especially damaging in foreign financial markets. In his memoirs, then-Treasury Secretary Paulson (2010) expresses a worry about acting "before Asian markets open" four separate times.

Prelude, not Codea

At the time, the unusual actions associated with the Bear Stearns resolution were mostly well received in the media and by elected officials. Equity prices rallied 9 percent within six weeks after the action. Interest risk spreads, as proxied by the rate on three-month Eurodollar deposits less the comparable Treasury bill rate, remained wide, suggestive of lingering counterparty concerns. Nor did pressures on specific other financial firms let up.

During summer 2008, the two main housing-related government-sponsored enterprises, Fannie Mae and Freddie Mac, became the center of market attention.⁴ The housing finance twins virtually wrote the script for many firms in the residential mortgage industry. They had considerable, often complicated, exposures to the U.S. housing sector in their portfolios, financed short-term and with large leverage. According to their annual reports at the end of 2007, the two had combined assets of \$1.6 trillion on a capital base of about \$70 billion. Fannie Mae was levered 20 to 1 and Freddie Mac was levered 29 to 1. Unlike purely private firms, the government-sponsored enterprises benefited from the impression among many investors that their debt was backstopped by the U.S. Treasury. As concerns about the solvency of these firms increased, the government made this implicit guarantee explicit with the Housing and Economic Recovery Act, signed into law on July 30, 2008.

The rationale for the law as publicly expressed by financial officials was already voiced in the Bear Stearns' experience—that Fannie Mae and Freddie Mac were subject to liquidity pressures because of the temporary undervaluation of their mortgage assets. Thus, public support would reassure investors at what was expected to be no cost to the government. But regardless of such reassurance, the backstop was called upon quickly and, on September 7, 2008, the two government-sponsored enterprises were put into government conservatorship.

Again, this did not stem market strains. One weekend later, the investment bank Lehman Brothers faced dire funding problems. This time, the government investigated the possibility of brokering another buyout, but in the end, did not offer support in the form of taking assets off the Lehman balance sheet, and the firm filed for bankruptcy protection on September 16, 2008. Paulson (2010, chap. 7) provides a useful and accessible rendering of how these events unfolded.

The rationale given for the Lehman decision evolved over time. For example, Chairman Bernanke (2008b) told a congressional committee on September 23, 2008, that “the troubles at Lehman had been well known for some time and investors clearly recognized—as evidenced, for example, by the high cost of insuring Lehman’s debt in the market for credit default swaps—that the failure of the firm was a significant possibility. Thus, we judged that investors and counterparties had had time to take precautionary measures.” In short, this explanation holds that the Corps of Financial Engineers did not act because they believed financial markets could absorb the firm’s failure. The rationale for not acting subsequently switched to the lack of tools. In April 2010, Bernanke (2010) told a congressional committee: “The Federal Reserve fully understood that the failure of Lehman would shake the financial system and the economy. However, the only tool available to the Federal Reserve to address the situation was its ability to provide short-term liquidity against adequate collateral.”

⁴ Wallison and Calomiris (2009) suggest the potential roles of these government-sponsored enterprises in propagating the financial crisis in the first place.

Whatever the rationale for not acting to save Lehman, when it was allowed to fail, market pressures mounted dramatically. The next day, September 16, the insurance giant American International Group (AIG) received massive support from the Federal Reserve, and would later receive additional funds from the Treasury. As many large, complex financial institutions faced financial difficulties, on October 3, the Troubled Asset Relief Program (TARP) was signed into law, giving the Secretary of Treasury \$700 billion to purchase assets so as to shore up the value of mortgage portfolios that were weighing down intermediaries' balance sheets.⁵ Not long after passage, TARP resources were redirected to inject capital directly into financial institutions. In the end, the U.S. government became a co-owner of some of the largest financial institutions in the country.

At this point late in 2008, the deep financial crisis was underway. Over the next two months into November 2008, major equity indexes dropped 44 percent and the risk spreads that had been 230 basis points back at the time of the Bear Stearns bailout six months earlier blew out beyond 500 basis points.

The Many Implications of a Crisis of Confidence

The arguments for government intervention during a financial crisis have a common tone. They emphasize that the financial institutions are large and/or highly interconnected. They emphasize that the financial situation is opaque and unclear, but that there is a clear risk of a financial run with dire consequences. They then argue that government assistance will avoid a crisis and provide time for a more gradual adjustment—and even that the government can sometimes turn a profit as the provider of liquidity in these situations. This line of argument often cites as its guiding authority Diamond and Dybvig's (1983) seminal explanation of bank runs (which in turn built on the important work of Bryant, 1980). Given the importance of the deservedly famous Diamond and Dybvig model, I will begin here by exploring the most common interpretation of that model. However, I will then point out that the complete model is more subtle and can be taken in many different directions (as in Allen and Gale, 2007). The same model that is commonly cited as justification for government intervention during a financial crisis also provides a framework for understanding the possibility that government may make critical missteps when it intervenes.

Financial Runs and the Role for Government Intervention

This Diamond and Dybvig (1983) model explores how a financial intermediary offering a liquid deposit product but investing in illiquid assets may be subject to sudden withdrawals if it falls into public disfavor. That intuition was

⁵ TARP was a complicated piece of legislation. Included was the creation of a congressional oversight panel that has written regular reports on official performance, at <http://cop.senate.gov/>.

Figure 1
The Diamond–Dybvig Framework

Sequence of financial transactions			
Period	1		2
Capital investors	Invest \$1 in a project		Return an expected $\$(1 + r)$
Intermediaries	Pool deposits Invest in projects Set aside capital of k		Receive an expected $\$(1 + r)$ Return an expected $\$(1 + r - p)$
Savers	Deposit \$1		Receive an expected $\$(1 + r - p)$

also famously spelled out by Bagehot (1873) in *Lombard Street*. Diamond and Dybvig provided a tractable model to show the problem rigorously. A key result is that a spontaneous crisis of confidence could spark a run and that government protection of creditors could avoid such self-fulfilling and wasteful outcomes. The description of intermediation mismatches and funding runs was used repeatedly through 2008. Bear Stearns, the government-sponsored enterprises Fannie Mae and Freddie Mac, and AIG all relied on short-term instruments to finance illiquid obligations. If the market had gotten the prices of those assets temporarily wrong, those institutions might be solvent (at fundamental values) but illiquid and vulnerable. A related description is that of “fire sale,” that an asset would fetch a price well below its longer-term value because of an unusual volume of sellers or retreat of purchasers (in part related to the breakdown of credit markets as described by Krishnamurthy, 2010, in this journal). The description highlights the fundamental inference problem: Is the asset’s value temporarily or permanently low? If values are temporarily low, government action would seem to be potentially justified.

To understand the Diamond–Dybvig framework, consider the example shown in Figure 1. Suppose there are three sets of actors examined in two periods. Capital investors each own a technology that can turn each \$1 invested into an expected value of $\$(1+r)$ by the second period. Savers are each willing to set aside \$1 on the expectation of some return in the second period. The middlemen are intermediaries that put up a capital stake of k , pool the deposits of the many savers, and lend to the many capital investors. Intermediaries set aside the capital in a safe reserve asset, providing the benefits of diversification for the savers and a reserve cushion.

The intermediary earns p per \$1 deposited for this effort. For simplicity of notation, although nothing turns on this assumption, say that the number of savers and investors are equal at n and their respective source and need for funds are each \$1. The figure outlines these activities scaled to each \$1 of deposit, with the first column showing the starting point and the second column showing the hoped-for outcome for each participant.

The investment technology and the deposit contract set the wheels of this model in motion. First, once the capital project is started, it can only be stopped prematurely at a loss. A project halted before completion—that is, in the gap between the two columns—returns $\$(1 - w)$. Another way to think about the intuition behind this assumption is that there would be a fire sale if the asset were put on the market before the second period. If the wastage rate is greater than the capital cushion, then there will not be enough assets to repay depositors completely.

Second, the contract is such that depositors can withdraw their funds at any time and be paid off 100 cents to the dollar unless the intermediary has run out of funds, at which point they receive nothing.

These assumptions are sufficient to deliver Diamond and Dybvig's (1983) best-known result. If depositors fear that the asset would produce a significant loss when held to the second period and the loss will exceed the capital buffer (r will be below $-k$), then they should rush to withdraw their funds in the first period. Because of the wastage from the early termination of the investment project, only the first $(1 + k - w)$ share of depositors will be repaid. Even a depositor who did not believe that there would be a capital loss from the project should rush to withdraw if it were feared that other depositors would begin to queue up. An institution that was solvent, but illiquid, may fail in a depositor run.

The government can step in and protect against a self-fulfilling and suboptimal run by insuring deposit funds. With no advantage to queuing early, no one will get in line. This outcome is close to a free lunch: that is, the assurance of the government avoids losses that would arise in a run without requiring any outlay. Treasury Secretary Hank Paulson offered a colloquial characterization of this view in giving the rationale for legislation to aid the government-sponsored enterprises. He explained that the ability to write a check in support would restore confidence in Fannie Mae and Freddie Mac so that no check would ever have to be cut. As Paulson (2010) put it, the Congress would be giving him a bazooka that he would never have to take out of his pocket.

This message was especially evocative at several times during 2008. According to financial authorities, markets had herded on a pessimistic outcome, and government reassurances of fundamental values could steer investors back toward liquidity and solvency of key financial institutions.

Four Cautions

Economic models are useful because in laying out the assumptions behind a certain result, they also offer a set of cautions about what might happen if those assumptions do not hold. In particular, Diamond and Dybvig (1983) suggest four

cautions that are especially relevant in thinking about the potential role for government intervention in a financial crisis.

First, *insolvency does happen*. Sometimes paranoids are right to be suspicious. If an adverse technology shock significantly impaired the expected value of the investment or a current-period shock effectively raised the demand for cash relative to the deposit, depositors would want the early return of funds. If the government protects deposits in a situation of insolvency, it will have to make up the difference between the value of intermediaries' assets and the deposit repayments.

Second, *runs are about total resources*. In the Diamond–Dybvig world, the possibility of being shut out if late in line creates an incentive to move early. That incentive would still exist under deposit insurance, if there were doubts about the government's credibility. That is, any question in markets about the government's willingness to commit sufficient resources will undercut the confidence in the pledge and keep open the possibility of self-fulfilling runs.

Third, *the repayment schedule matters*. Runs result because the place in line matters—100 cents on the dollar if early, zero if late. If repayment at a time of stress were proportional to total resources, position in the line would not matter and self-fulfilling tests of the government's resolve would be ruled out.

Fourth, *public protection changes private behavior*. If the government protects depositors, the intermediaries lose any reason to search among potential intermediaries for those that seek out more assured investment projects. Similarly, the management of investment projects downplay the possibility that they will be called in early. The twisting of various incentives falls under the rubric of moral hazard.

As Put into Practice

Financial authorities in 2008 quickly gravitated to the headline result from Diamond and Dybvig (1983) while simultaneously acting in a way to hit important tripwires of the complete model. A mapping from theory to practice in the resolution of Bear Stearns suggests how intervention can go wrong.

Most fundamentally, the events of 2008 showed the difficulty of putting Bagehot's dictum into practice. The line between illiquidity and insolvency is only indistinctly sketched for a trading firm having a sizable share of its assets valued at what the market will bear. The significant drop in asset values over the course of 2007 and 2008 was interpreted by senior officials as evidence of an irrational withdrawal from trading or a "fire sale" (as in Bernanke, 2008a, Geithner, 2008, and Paulson, 2010). But Carmen Reinhart and Kenneth Rogoff (2008), in a paper circulated before the events surrounding Bear Stearns, reported that key financial market prices in the unfolding subprime crisis were following the tracks of 15 prior systemic financial crises of the twentieth century. Using the same systemic crises and pre-2008 data, in Reinhart and Reinhart (2010), Carmen Reinhart and I sketched out the persistence of asset price declines and poor economic performance. For the worst 15 crises of the twentieth century, growth of output per capita averaged 1½ percentage points slower for the decade after the crisis

than the decade prior to the crisis; equity prices fell three years running around the peak, and real house prices only stopped dropping six years after their peak. Mimicking the mix evident in the data would prove toxic to many mortgages and mortgage-related securities. Thus, policymakers in 2008 who believed that there was intrinsic value remaining on the balance sheet of Bear Stearns either were denying those lessons of history or had not yet accepted that financial markets and institutions were in a severe crisis.

The Corps of Financial Engineers may have, nonetheless, believed that it was important to arrest an adverse market dynamic driven by outsized pessimism. But such interventions, however well-intentioned, do not necessarily change expectations in a beneficial direction. When the Fed took such a highly innovative and somewhat dubious approach to subsidizing the takeover of Bear Stearns by JPMC, the Fed took on credit risk and cut across the pre-existing boundary between monetary and fiscal policies. Moreover, these decisions were made by unelected officials with access to the considerable potential balance-sheet expansion available only to the central bank. As a consequence, authorities signaled to market participants, to the public, and to Congress that there was substantial capacity for more intervention in the future.

For creditors, the result of this intervention is that they were doubly rewarded. When they originally invested, they had received compensation for the risk of partial repayment in the form of a spread of the private credit rate over the risk-free rate, but then when those risks materialized, the government made them whole.

Worse, the form of the Bear Stearns resolution actually invited another form of speculative attack. The official playbook appeared to protect creditors fully and to wipe out shareholders. This expectation made it profitable to identify the next financial firm to be resolved and then to sell its stock short and use the proceeds to purchase its unsecured debt. If the candidate firm was identified correctly, the debt would appreciate in value and its stock collapse. The basic message is that repaying unsecured creditors at par creates an opportunity for capital gain. When the government creates an expectation that it will intervene in this way, market participants bring forward the pressures officials fear in a classic speculative attack.

It might be argued that full repayment of the Bear Stearns creditors lowered the likelihood that creditors might run on other similarly situated entities (for example, Calvo and Mendoza, 2000). However, repaying creditors at par to prevent runs only works as long as everyone can be repaid at par. The overall economic loss across the financial sector was already expected to be patently too large for unelected officials to make such a credible promise. For example, the International Monetary Fund's *Global Financial Stability Report* (2008a, b) had put the capital loss worldwide at \$1¼ trillion. The Bear Stearns bailout would only stop credit runs at other institutions if the authorities signaled that they would backstop all uninsured creditors—which would effectively need to be a promise to fill the capital hole on intermediary balance sheets caused by the destruction of economic value in the housing bust.

For high-level managers at other financial firms, the Bear Stearns deal suggested that rather than address the problematic assets on its balance sheet, it was time to start planning in terms of the possibility for future federal assistance. An instructive example occurred the week after the Federal Reserve lent to Bear Stearns and created the Primary Dealer Credit Facility as a mechanism for extending liquidity to major investment banks. Lehman Brothers soon issued a structured note, in which it rolled together the bits and pieces of complicated products it had on its cutting room floor, to create a new security. The only evident economic purpose of that new security was that it was structured so it would be eligible for collateral for the Federal Reserve's new lending window. The private sector learned from the Bear Stearns intervention that management had more time to raise capital and address balance sheet problems and creditors did not have to exert as much counterparty discipline.

For the public and the political class, the Bear Stearns intervention in March 2008 showed that the Federal Reserve balance sheet could be used for other purposes. The rank-and-file citizen saw support given to the powerful and connected in an obscure and poorly explained fashion by unelected technicians. The financial elite saw those unelected technicians in a more accommodating light than experience had suggested. In particular, in September 1998, the funding problems of the levered hedge fund Long-Term Capital Management (LTCM) roiled markets, and officials at the Federal Reserve Bank of New York called the leaders of the financial industry into a meeting where they were asked to solve their own problems among themselves. Ten years later, after the Bear Stearns intervention, any discussion among market participants with Fed interlocutors would begin with the presumption that official support would be forthcoming and it was only a question of how much.

For the political class, the Fed's action in the Bear Stearns' resolution set the precedent that large creditors should be protected and that resolutions would be found for the small circle of large and connected firms. Of course, this process is open to political pressures. Why was one firm helped and not another? Is this a new lever of policy? Should Congress be involved? In the models of institution design reviewed in Dixit (1998), government agencies are only imperfectly monitored by the elected officials who created them. Expanding the tools and number of missions for an agency, like the Federal Reserve or the U.S. Treasury, invites pressure from the outside and tradeoff among goals from the inside.

Those tradeoffs were clearly evident in the problems that officials had in communicating their actions. Public officials were effectively pulled by two opposite poles in slanting their public statements. Early in 2008, they had a desire to reassure investors so as to ease what they viewed to be a self-fulfilling crisis of confidence. Later in 2008, they had to emphasize financial fragilities to stiffen the spines of elected officials considering remedial legislation.

In short, the bailout of Bear Stearns in March 2008 wasted an educable moment. It was an opportunity for creditors, financial firms, the public, and elected representatives to appreciate that the nation had too much debt secured by too

many overvalued houses. When the Federal Reserve stepped in, incentives changed, and all parties were given an opportunity to delay dealing with the problem.

The Road Not Taken

The government's aid in March 2008 in the resolution of Bear Stearns rewrote the financial and political landscape. Six months later, another levered speculative entity that had profited from the building boom failed. But focusing on Lehman Brothers as the trigger for the financial crisis misrepresents the chain of events. Prior actions by policymakers made Lehman loom larger than it ever should have. Lending to Bear Stearns put a spark to the notion that many institutions were too big or too interconnected to fail.⁶ As the crisis wore on through 2008 and the bail-out tab increased, appointed officials recognized the need to get the approval of the Congress. Because the political system does not get into gear easily, that required that these officials would eventually have to say "no" to someone, sometime. The Corps of Financial Engineers drew the line at Lehman. They might have been able to let the process run a few weeks more and let the bill get bigger, but ultimately they would have had to stop. And when they did, expectations would be dashed and markets would adjust. If Lehman had been saved, someone else would have been allowed to fail. The only consequence would be the date when we commemorate the anniversary of the financial crisis, not that a crisis would have been forever averted.

Although I have emphasized the Bear Stearns intervention as by far the most prominent example of an intervention that altered expectations in one direction, and then Lehman's bankruptcy as the nonintervention that shocked the financial system, the real-world story is of course more complex. The belief that the government was committed to intervening in troubled financial institutions and protecting creditors started to take root late in 2007 and into 2008, as the Federal Reserve created a series of new lending facilities. After the seismic shock of the \$30 billion nonrecourse loan in the resolution of Bear Stearns, the follow-up of bailing out the government-sponsored enterprises certainly seemed to establish by around mid-2008 the principle that the Corps of Financial Engineers at the Federal Reserve and the U.S. Treasury was going to do whatever it took to create a smooth resolution for ailing financial institutions.

The Lehman bankruptcy was the most striking event that changed the perception of market participants about the perimeter of the safety net. But it, too, was not the only event that altered perceptions. Two weeks after the failure of Lehman, the Fed and regulators arranged that any debtors to Wachovia would be kept whole when

⁶ The New York Fed's help in arranging the private-sector rescue of LTCM in 1998 might arguably have been an earlier spark to the idea that many nonbank institutions were protected. However, in 1998, no public funds were used and LTCM seemed to be relatively unique. In the case of Bear Stearns, public resources were put at risk to help one of 20 primary dealers of the Federal Reserve.

that firm was taken over by Citibank. At the same time, different regulators required haircuts for the facilitated takeover of Washington Mutual by JPMC. Lehman not only changed the presumptions, it seemed to scramble the idea that any consistent presumption was possible. Moreover, late in September 2008 as government officials tried to build support for Congressional legislation to fund the TARP bailout legislation, they conveyed that they viewed the financial situation as dire, in a way that seriously damaged the confidence of financial markets.

Consider the alternative had officials from the Federal Reserve not lent to Bear Stearns. That is, imagine that the Corps of Financial Engineers had held a principled line in early March 2008 or, even better, imagine if they and their predecessors had acted consistently in not making private losses a public responsibility for many years before. The Federal Reserve could have then extended credit to any financial institution willing to lift out the position of the defunct Bear Stearns to insure that the financial system continued to function smoothly. At the same time, showing its ingenuity in a different form, the Fed could have begun purchasing the debt of the government-sponsored enterprises and, more importantly, their mortgage-backed securities. The evident support to the prices of mortgage-related securities would have cushioned the market blow of Bear Stearns' failure, preventing a destructive fire sale of assets at temporarily depressed prices.

True, a Federal Reserve that extended credit to another firm that took over the Bear Stearns positions would be exposed to credit risk, as it is now. And public resources would no doubt have been needed to fill the hole blown through financial intermediaries balance sheets by mortgage-related losses. But elected officials would have been involved sooner as the crisis came to a quicker boiling point. With the legislature, rather than unelected technicians, directing decisions, the process would have been more transparent, if not necessarily more efficient. But the nation as a whole would have come to terms sooner with the wealth loss associated with the bursting of the housing bubble.

Most importantly, a more disciplined precedent would have been set that yielded long-term benefits. The failure of Bear Stearns would have provided a useful encouragement to those firms in the core of our financial system to get more capital, and to creditors and counterparties to pay closer attention, and to the public and politicians to realize that limits had been reached. The deeper lesson is that while rescuing firms in distress almost always seems attractive at the time, such decisions can set the stage for long-lasting effects that are far more consequential than their immediate costs.

■ *I appreciate the comments of Ken Rogoff, Carmen Reinhart, and the editors of this journal, David Autor, Chad Jones, John List, and Timothy Taylor. Adam Paul, Rohan Poojara, and Christopher Reilly provided excellent research assistance.*

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