Fire, Flood, and Lifeboats: Policy Responses to the Global Crisis of 2007–09

Takatoshi Ito

1. Introduction and Key Observations

The objective of this paper is to examine the challenges faced by policymakers and their responses to those challenges during the various stages of the global financial crisis of 2007–09. The crisis originated as the burst of a housing bubble in the United States—similar to previous boom-and-bust cycles that had taken place in many countries. However, the size and severity of the crisis became so large that it has affected global financial markets throughout the world.

The crisis occurred over several stages, in which different segments of the economy and financial institutions became vulnerable. At each stage of the crisis, the U.S. Treasury and Federal Reserve took actions that appeared to be adequate to avert the worst possible outcomes. However, in retrospect, more forceful responses in earlier stages of the crisis may have prevented the large damages to the global economy and the burdens placed on taxpayers. Specifically, I argue that a legal mechanism that would allow governments to promptly take over troubled financial institutions in order to restructure or liquidate them should have been obtained by the Treasury and the Federal Reserve in the early stages of the crisis—ideally sometime before September 2008, but certainly immediately after the collapse of Lehman Brothers. A framework that provides for the orderly resolution of troubled institutions is the only way to prevent moral hazard from distorting the incentives faced by lenders, borrowers, shareholders, and management, yet maintain systemic stability.

One might argue that the above assertion is unrealistic and benefits from hindsight. However, there are sufficient lessons from past financial crises, including the United States' own savings and loan (S&L) crisis in the 1980s, the

Author's note: *The author is grateful to Professor Frederic Mishkin, Kevin Warsh, and other participants of the conference for their valuable comments. The author also is grateful to Namie Koyanaka, Paul Sheard, and Akihiro Wani for their help in obtaining market data and news and for their opinions and perspectives.*

Nordic crisis, the Japanese banking crisis, and even the Asian financial crisis in the 1990s, to have anticipated the course of events in the crisis and which policies would or would not work to address the challenges faced by policymakers.

In particular, I argue that in the earlier stages of the crisis policymakers should have pursued crisis management through large liquidity injections and regulatory reform, including the creation of a mechanism for resolving complex financial institutions.

The forced sale of Bear Stearns in March 2008 was a clear sign that the crisis had become sufficiently severe to threaten the stability of the entire financial system. An analogy would be a fire in an ammunition warehouse that threatened an entire neighborhood. From April to August 2008, financial market conditions deteriorated steadily. The crisis spread to Fannie Mae and Freddie Mac and to weaker investment banks. There were ample signs that the "fire" of crisis was spreading fast. However, policy measures at this stage were minimal. There was a perception that difficulties were limited to U.S. and European investment banks that were exposed to toxic assets.

The next shock was pivotal in the history of financial crisis. On Monday, September 15, 2008, Lehman Brothers filed for Chapter 11 bankruptcy protection after negotiations for a rescue merger broke down over the weekend. This changed the financial market conditions completely. Investors rushed to sell their risky assets and take cover in cash and Treasuries. A primary reason for the extreme volatility that arose was that prior to the weekend almost all market participants expected a Lehman Brothers rescue merger with public support, following the pattern of the Bear Stearns rescue merger. Letting Lehman fail avoided the moral hazard issues raised by critics of the Bear Stearns rescue, but the costs were very large.

The Lehman failure led to severe market reactions. Many markets became dysfunctional as buyers shied away from risky securities and refused to accept large institutions as counterparties in trades. The crisis fire rapidly spread to financial markets in many countries. Trouble was not limited to investment banks. The world's largest insurer, AIG, developed an acute liquidity crisis, prompting the Federal Reserve to arrange for an $85 billion loan. The problems at AIG would become deeper and would require much more assistance from the Treasury and the Federal Reserve in the coming months.

The responses of the Federal Reserve just before and after the Lehman failure were both innovative and far-reaching. The federal funds rate was quickly lowered from 2 percent to 1 percent by the end of October, and to the range of 0 to 0.25 percent (a de facto zero interest rate policy) on December 16. On October 9, excess reserves at the Federal Reserve became interest-bearing. The

policy target rate became a "corridor system," with the floor at the interest rate earned by excess reserves and the ceiling at the high of the federal funds rate range. This stabilized the interbank market.

The Federal Reserve created many facilities in response to the numerous markets that had become dysfunctional. This long list of unconventional policies pursued by the Federal Reserve has been summarily termed "credit-easing" policy. On the international front, the Federal Reserve extended dollar swaps to a number of countries.

The most intense crisis period, from September 15 to the end of November, opened two doors, one to financial meltdown and one to regulatory reform. A crisis can also be an opportunity. Although wide-ranging, timely policy measures—essentially through a flood of liquidity—managed to shut the door to hell, policymakers did not go through the opportunity door. Efforts to achieve comprehensive regulatory reform were inadequate. Regulatory failure over investment banks, insurance companies, and nonbanks was evident, but a reform proposal to create an integrated regulatory body was absent. Instead, proposals stopped at increased coordination.

The most notable effort to stabilize the financial sector was the Troubled Asset Relief Program (TARP). A three-page outline of a fund to purchase troubled assets from banks was presented by Treasury Secretary Henry Paulson on September 21 (four days after the Lehman failure). A revised Treasury proposal was passed by both houses of Congress on October 3, and was immediately signed into law by President George W. Bush.

TARP was then slightly redirected to provide capital injections to financial institutions. On October 14, nine large banks received capital injections. Later, TARP was used for a variety of additional troubled asset purchases.

The Treasury and the Federal Reserve missed a crucial opportunity in the weeks following the Lehman failure with the explosion of the crisis across financial markets. This period was a window of opportunity to propose something more comprehensive and tough on banks. First, having just experienced two undesirable events—the Lehman Brothers bankruptcy and the large loan to AIG—the regulatory authorities should have proposed an orderly resolution mechanism for large complex financial institutions. Such a mechanism could achieve systemic stability by ensuring that very short-term obligations would be honored, while moral hazard—created by bailing out shareholders, bondholders, and subordinated debt holders, and, of course, by awarding executive bonuses—could be avoided. Having an orderly resolution mechanism provides a threat that can motivate serious restructuring. The original purpose of TARP, that is, separating out the bad assets and selling them to the

government—presumably at a deep discount—would not work without the threat that failed institutions would close.

The history of banking crises shows that it is important first to introduce due diligence (through asset examinations or stress tests) in order to determine whether banks are insolvent or solvent but undercapitalized. Given insolvency, a resolution mechanism should be applied. For large, complex, internationally active financial institutions, the resolution mechanism must be designed to allow competent replacement management to take over quickly. For undercapitalized banks, capital injections can be made, with conditions for reform that lead to a successful recovery plan. Capital injections without an examination of assets and a reform plan are tantamount to pure subsidy.

In sum, the Treasury and Federal Reserve missed two opportunities between September 15 and the end of December: First, they should have conducted asset appraisals (or stress tests) prior to granting capital injections. In this respect, the U.S. authorities repeated the same mistakes made by the Japanese government in their capital injections of March 1998 (no asset examinations, almost equal amounts of capital injection) and did not learn from the successful capital injections of March 1999 (which were made after asset examinations). Second, a resolution mechanism should have been sought immediately following the Lehman failure. With resolution authority, bank leverage would have been increased and the subsequent problem of executive compensation could have been prevented. Japan is often taken as a bad example of protracted banking crisis. However, Japan introduced its resolution authority and implemented it within a year of its financial meltdown in November 1997.

Although financial markets and financial institutions were somewhat stabilized by the end of December, and the worst appeared to be behind us by spring 2009, the financial system remained fragile, even with all of the liquidity provisions in place. On June 25, 2009, it was decided that all of the Federal Reserve facilities and the dollar swap agreements with 14 other central banks were to be extended to February 2010.

By the summer of 2009, most market indicators of risk were back to levels that prevailed before the summer of 2007. The worst is over and the Great Depression of the 21st century has been averted. However, two concerns remain. First, the market calmness is partly attributable to the continued provision of liquidity floods and liability guarantees. It is unclear how to withdraw these unconventional monetary policy measures and raise the policy rate, once the real side of the economy becomes strong enough, in a manner that minimizes the risk of reigniting a crisis fire. Second, the recovery of the real side of the

economy has been slow and the commercial real estate market is deteriorating quickly. It therefore may not be too late to establish a resolution mechanism.

The rest of this paper is organized as follows: Section 2 reviews the timeline of the crisis, with a focus on the behavior of market spreads as indicators of risk. The section also describes several important policy responses, both conventional and unconventional, in response to various financial shocks and market developments. Section 3 is dedicated to global reactions and policy measures. Section 4 provides assessments of policy responses to the global crisis. Conventional and unconventional monetary policy are examined, the quantitative easing pursued by the Bank of Japan (BOJ) in 2001–06 and the current credit easing of the Federal Reserve are compared, and the bank restructuring efforts in the crisis will be discussed in light of previous crisis experiences and the literature. Section 5 assesses key decisions leading to the Lehman Brothers failure and the AIG bailout. Section 6 discusses the remaining challenges for the United States and the rest of the world in order not to repeat the crisis of 2007–09 in the future. In the end, I argue that it is important to establish an internationally coordinated, publicly supported (through temporary nationalization), orderly resolution mechanism for troubled large, complex, internationally active financial institutions.

2. Timeline and the Spreads

2.1. Interest Rate Spreads and Credit Default Swaps

Counterparty risk—that is, the degree to which a bank is concerned about default by another bank—was a major cause of turmoil in the financial markets during the global crisis.[1] In particular, the creditworthiness of large American and European banks and investment banks was at the heart of these concerns.[2]

To illustrate this risk, Figure 1 shows two kinds of market spreads for the sample period from July 2007 (the beginning of the crisis) to September 2009. The spread between the three-month London interbank offered rate (Libor) and the overnight index swap (OIS) is a popular measure for counterparty risk and liquidity premium.[3] Another measure of risk is the TED spread, defined by the difference between the Libor and the U.S. Treasury bill (risk-free) rate. The TED spread is a direct measure of credit risk of the large commercial banks that participate in the offshore interbank market. In general the two measures are highly correlated. Occasional deviations between the TED spread and the Libor-OIS spread is likely due to illiquidity.

FIGURE 1
TED Spread and Libor-OIS Spread
July 2007 – September 2009

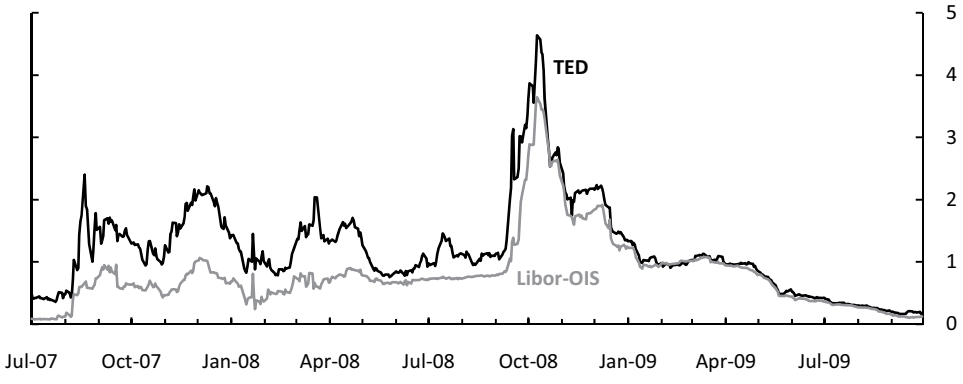


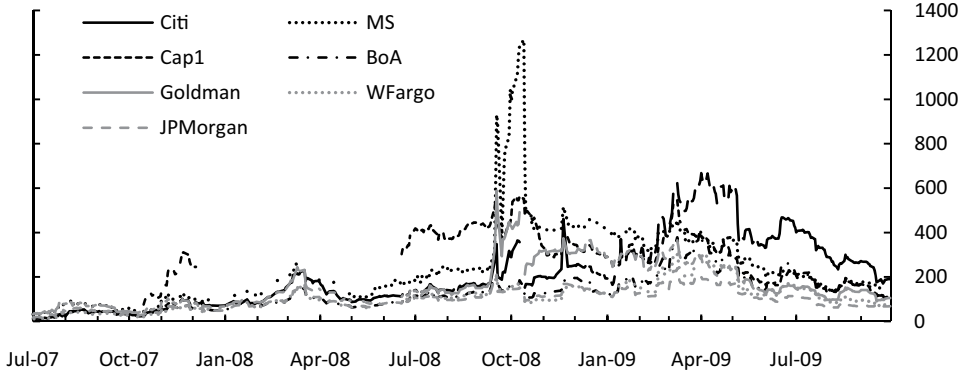
Figure 2 shows the movements of credit default swap (CDS) premia of major banks. This is a direct measure of the default risk of individual banks. Collectively, they should have high correlation with the Libor-OIS spread that measures counterparty risk.

2.2. Pre-Lehman Brothers

The initial stage of the burst of the U.S. housing market started in late 2006, but the ultimate severity of the crisis was not yet obvious. As housing prices continued to fall, some financial institutions started to experience higher default rates, shortages in liquidity, and balance sheet losses. In the first half of 2007, the financial institutions that had increased their leverage to accumulate housing-related securities had to unwind these positions to obtain liquidity, as losses were mounting. The U.S. and European investment banks, hedge funds, and other financial institutions sold assets to accumulate cash positions for possible withdrawals of funds, a phenomenon called "deleveraging." Through the deleveraging process, the downward price pressure on assets became widespread in both major countries and in emerging market countries around the world.

The heightened risk became obvious in July of 2007. Between July 2007 and August 2008, there were three spikes in the spreads (these were more pronounced in the TED spreads): August/September 2007, December 2007, and March 2008. The spikes broadly corresponded to the suspension of the fund withdrawal by BNP Paribas on August 9, 2007, followed by the Northern Rock

FIGURE 2
Credit Default Swaps for Representative Banks



crisis on September 14, 2007; the large write-downs among investment banks' quarterly reports in December 2007; and the rescue merger of Bear Stearns by JPMorgan Chase with Federal Reserve assistance in March 2008.

Both the Libor-OIS and the TED spreads stayed between 50 and 100 basis points from the beginning of May to the end of July 2007. On August 9, 2007, BNP Paribas temporarily stopped withdrawal of three affiliated mutual funds, due to difficulties in calculating asset values of subprime mortgage-related securities. This event made it clear to all market participants that the mortgage problem was deeper and more widespread than previously believed. Market spreads jumped. On August 9 and 10, the TED spread jumped from 50 basis points to 100 basis points, and the Libor-OIS spread jumped from 10 basis points to 50 basis points. The spread continued to increase afterwards. The TED spread peaked at 240 basis points on August 20, while the Libor-OIS spread increased to 80 to 90 basis points in September 2007.

The TED and Libor-OIS spreads then decreased until the end of October, but started to increase again in November. By mid-December the TED spread was elevated to 200 basis points, while the Libor-OIS spread rose to 100 basis points.

Although various spreads had started to widen, the solvency of large financial institutions was not yet seriously questioned. However, the Federal Reserve became sufficiently concerned to begin lowering the interest rate in September 2007 and then establish the Term Auction Facility (TAF) on December 12. The policy rate of the United States was further lowered to 3.00 percent by the end of January, declining 225 basis points in six months.

With these aggressive cuts in the interest rate and the introduction of the TAF, the financial markets appeared to regain stability. The two spreads started to decline. As TAF auctions were planned and implemented, combined with strong messages from the Federal Reserve that these auctions would continue as long as necessary, the declines in spreads continued. It appears that the introduction of the TAF reversed the trends in the TED and Libor-OIS spreads.

The CDS premia showed a very gradual increase from July 2007 to March 2008. The two peaks in August/September 2007 and December 2007, which are evident in the two interest rate spreads, are barely visible in CDS premia. Except for Capital One, all spreads move very close to each other with a slightly increasing trend until March 2008. This implies that the default risk of large investment banks was judged to be low until March 2008.

The rescue merger of Bear Stearns on March 9, 2008, was another major shock. JPMorgan Chase agreed to purchase Bear Stearns on March 16 at $2 a share (a week later, the price was revised to $10 a share), and the Federal Reserve guaranteed $29 billion to offset losses on Bear Stearns assets purchased by JPMorgan Chase. The facility for Bear Stearns assets, Maiden Lane LLC, was created as a subsidiary to the Federal Reserve Bank of New York, in which the first $1 billion in losses would be assumed by JPMorgan Chase and the rest by the Federal Reserve. The loss guarantee, or sweetener for the takeover, was unprecedented.

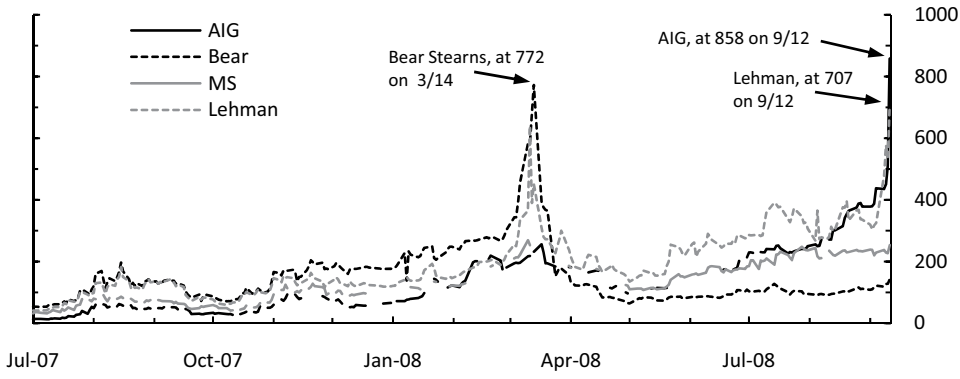
Figure 3 shows CDS spreads for failed institutions AIG, Bear Stearns, and Lehman Brothers, with Morgan Stanley included as a benchmark, through September 12, 2008. During the week prior to the Bear Stearns failure, CDS premia for Bear Stearns suddenly rose from about 400 to 772 (on March 14). The rise in CDS premia was also prominent during the Lehman Brothers failure (451 basis points on March 14), but not for AIG (232 basis points on March 14). This suggests that deterioration of the Bear Stearns portfolio was a surprise to the market. The emergency rescue with sweeteners was therefore attributable to a lack of time to make alternative arrangements.

In addition to the merger assistance, the Federal Reserve created two new facilities: the Term Securities Lending Facility (TSLF) on March 11 and the Primary Dealer Credit Facility (PDCF) on March 16, 2008. In addition, the federal funds rate was lowered by 75 basis points to 2.25 percent on March 18, and lowered again by 25 basis points to 2 percent on April 30. The Federal Reserve created the PDCF in response to the loss of liquidity by several investment banks.

FIGURE 3

CDS of AIG, Bear Stearns, Morgan Stanley, and Lehman Brothers

July 2, 2007 – September 12, 2009



These measures seemed to be enough to calm the market, although it took until the end of April to lower the TED spread below 150 basis points. During the Bear Stearns crisis, the CDS spreads of Morgan Stanley and Goldman Sachs disproportionately increased. However, this increase was short-lived compared to the November–December episode.

On March 19, in response to tightening credit in housing markets, capital requirements of Fannie Mae and Freddie Mac were reduced to encourage them to increase their guarantees of mortgage-backed securities. However, this exacerbated their financial fragility. These government-sponsored enterprises (GSEs) are federally created institutions, but are privately owned. Although their liabilities are not explicitly guaranteed by the government, their bonds are widely considered to be implicitly government guaranteed. The yields of their bonds are only slightly above the corresponding level of Treasuries of comparable maturities. In fact, many of them are said to be held by foreign governments as reserves. When the financial soundness of the two GSEs became questioned in the market after June 2009, concerns were quietly expressed by these foreign governments that any hint of default may result in the crash of the U.S. dollar. Paulson requested government funds to support the two GSEs if necessary. Eventually, on September 7, the two GSEs were placed under federal conservatorship. Implicit guarantees thereby became explicit. Although Fannie Mae and Freddie Mac were in crisis from the summer until the first week of September, the spreads for TED, Libor-OIS, and CDS premia of other

financial institutions did not react in any measurable way. The market therefore anticipated the guarantees.

During the pre-Lehman period, the scope of difficulties was limited to U.S. and European investment banks that had created collateralized debt obligations out of subprime mortgages, and investors who bought those securities from them. U.S. dollar liquidity was needed by European investment banks to settle contracts and to deleverage positions. The Federal Reserve established swap lines with the European Central Bank (ECB) and the Swiss National Bank on December 12, 2007 (the same day the TAF was established), with ceiling amounts of $20 billion and $4 billion, respectively. It was unusual that European central banks felt the need for dollar liquidity for their large financial institutions. The need for dollar liquidity worldwide intensified, and the swap lines were increased on March 11, and were expanded to other central banks and uncapped after the Lehman failure.

The Federal Reserve's Federal Open Market Committee (FOMC) lowered the interest rate five times between September 2007 and January 2008, by a total of 225 basis points, and by another 75 basis points in March 2008, to help the collapsing housing market and in anticipation of slower growth. Lowering the interest rate was not expected to address the problems associated with deleveraging and the acute shortages of dollar liquidity, since these problems stemmed from counterparty risk. However, lowering the interest rate would help mortgage borrowers by making it easier for them to obtain refinancing with lower interest rates and longer maturities. At the time, inflation concerns were still prevalent, so the FOMC interest rate decisions were explained as based on expectations of weakness in the economy and financial instability. The decisions turned out to be prudent.

The Bank of England (BOE) also started to lower rates in December 2007. However, the ECB and the BOJ did not lower rates during this period. Indeed, the ECB raised its policy rate in July 2008, citing inflationary concerns. This shows that there was initially a lack of a sense of urgency in continental Europe and Japan before the Lehman failure.

In the pre-Lehman period, Asian financial institutions had suffered little damage, and the Asian financial markets and currencies remained stable. In fact, there was a sense of *schadenfreude* in Asia. All of the problems and policy advice that they had received during the Asian currency crisis and the Japanese banking crisis in 1997–98 was now being directed towards the United States.

When U.S. financial institutions such as Citigroup and Morgan Stanley asked for capital, Asian and Middle Eastern sovereign wealth funds were eager

to invest in these institutions. On November 26, 2007, it was announced that Abu Dhabi Investment Authority (ADIA), along with the government of Singapore, would invest $7.5 billion in Citigroup, for a bond that carried an 11 percent yield, which would have a 4.9 percent stake in Citigroup when converted. On December 19, 2007, Morgan Stanley accepted $5 billion for a 9.9 percent stake from the Chinese Investment Corporation (CIC), the sovereign wealth fund of China. These investments show that the governments and the financial institutions in China, Japan, and the Middle East considered the weakness in U.S. financial institutions to be manageable. Moreover, it provided an opportunity to invest in these institutions without political backlash, as they were assisting them in a period of distress.

2.3. Post-Lehman Brothers, United States

The financial vulnerabilities of several large investment banks became apparent in September 2008. By September 12, the CDS spread for Morgan Stanley matched levels reached immediately after the Bear Stearns failure. CDS spreads for other institutions had also been rising, but their levels were not alarming given the events in March. In particular, the TED and Libor-OIS spreads were stable in the week preceding the Lehman crash.

On September 10, Lehman Brothers announced losses of $3.9 billion for the third quarter, an almost 50 percent increase from the $2.8 billion lost in the second quarter. On September 12, Moody's and Standard & Poor's threatened to downgrade Lehman Brothers.

News media were reporting a possible rescue of Lehman Brothers by another financial institution. Earlier, the Korean Development Bank was reported to have considered investing in Lehman but had withdrawn. Instead Bank of America and Barclays were mentioned as institutions that might be interested in taking over Lehman Brothers. Almost all market participants expected that arrangements would be made that would allow Lehman Brothers to be bought by another financial institution.[4]

The CDS premium for Lehman Brothers on Friday, September 12, was 706.7, about 70 points lower than the level for Bear Stearns immediately before its demise. This demonstrates that the market was less worried about the possibility of Lehman's demise than it was about Bear Stearns at a comparable point in time. The market was clearly expecting a merger or some other form of rescue.

The market confidence that something would be done may have stemmed from the successful rescue of Bear Stearns in March. The market sentiment is a sign of moral hazard under the "too-big-to-fail" principle. The regulator was

the victim of its own success in extending a lifeboat to Bear Stearns, or to be precise, a subsidy to JPMorgan. Market participants expected another lifeboat for Lehman Brothers.

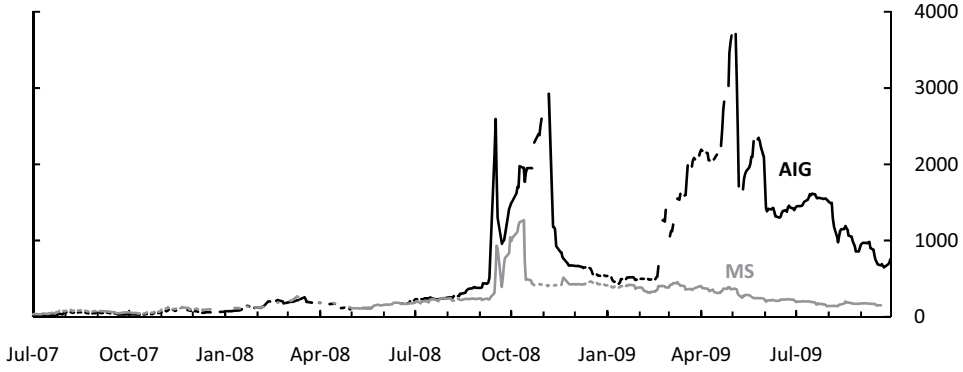
Intense negotiations regarding how to rescue Lehman Brothers took place in the Federal Reserve Bank of New York, with participants from the Treasury, the Federal Reserve, and major financial institutions. Bank of America and Barclays had expressed interest in purchasing Lehman, but they had demanded government assistance in the form of loss guarantees, similar to those given to JPMorgan when it purchased Bear Stearns in March. However, federal assistance was not forthcoming. Bank of America decided to purchase Merrill Lynch instead. Barclays remained in negotiation until Sunday afternoon. Finally, the Treasury made it clear that no government money would be added to the deal, and Barclays backed out.[5]

Lehman Brothers filed for Chapter 11 on September 15, 2008, which sent a shock wave to the financial centers throughout the world. Almost all of the financial markets in the United States ceased to function properly. In many securities markets, buyers disappeared as trading prices could not be found. Crisis spread from investment banks to money markets, and adverse effects also spread to financial institutions in other countries. This latter development put great stress on governments when these troubled financial institutions required nationalization.

Another crisis was imminent that same weekend. On Friday, September 12, the CDS premium for AIG hit 858 basis points, 150 points higher than that of Lehman Brothers. The source of AIG's financial problems was its huge exposure (selling) of CDSs to other financial institutions and investors. The fact that the CDS premium for AIG signaled its weakness was ironic. Market participants thought that AIG was in much worse shape than Lehman Brothers prior to the critical weekend.

On Monday, as the Lehman filing for Chapter 11 hit the media headlines, AIG debt was downgraded by the three major credit rating agencies. With the downgrade, AIG had to supply large quantities of collateral, analogous to margin calls, which were difficult to raise. In the evening, The Federal Reserve provided an $85 billion loan to AIG in exchange for a stake in the company. The decision was made under Section 13(3) of the Federal Reserve Act.[6] However, CDS premia for AIG did not fall immediately. Figure 4 shows the CDS premia for AIG from July 2, 2007, to September 30, 2009, with Morgan Stanley as a benchmark. The peak was May 5, 2009, at 3700 basis points.

FIGURE 4
CDS Premia for AIG



The market perceived that the $85 billion loan would not be enough to rescue AIG, which turned out to be true. The loan from the Federal Reserve would be restructured on November 10 in coordination with the Treasury.

In response to chaotic market conditions in the aftermath of the Lehman failure, the Federal Reserve quickly created more facilities to help provide liquidity to various types of financial institutions. On September 19, the Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility (AMLF) was created. This was a direct response to the fact that large withdrawals of funds from money market mutual funds (MMMFs) had started to occur in response to news that a money market fund had incurred a loss to principal, or "broke the buck," on September 16. The MMMFs hold a large quantity of commercial papers (CPs). If they liquidated these CPs, many firms would be driven to bankruptcy due to a lack of liquidity and working capital. The AMLF was created to stop this from happening.

Similarly, the Commercial Paper Funding Facility (CPFF) was established on October 7 to allow the Federal Reserve to purchase high-quality CPs. On October 21, the Money Market Investor Funding Facility (MMIFF) was established under the Federal Reserve Act's Section 13(3). (See the discussion on the governance issue regarding Section 13(3).) Under this facility, the New York Fed would provide senior secured funding to a series of special purpose vehicles to facilitate an industry-supported private-sector initiative to finance the

purchase of eligible assets from eligible investors. On November 25, the Term Asset-Backed Securities Loan Facility (TALF) was created. This facility was designed to help market participants meet the credit needs of households and small business by supporting the issuance of asset-backed securities (ABS) collateralized by student loans, auto loans, credit card loans, and loans guaranteed by the Small Business Administration. Under TALF the Federal Reserve Bank of New York would lend up to $200 billion on a nonrecourse basis to holders of certain AAA-rated ABS backed by newly and recently originated consumer and small business loans. The Treasury essentially underwrote these loans so that the Federal Reserve balance sheet would be protected from losses on this facility.

The TAF allotments were also increased on September 29. Goldman Sachs and Morgan Stanley were allowed to become bank holding companies so that they could access the Federal Reserve discount window. This change also meant that their principal regulator was now the Federal Reserve.

On the monetary policy front, the policy rate was cut again on October 8, by 50 basis points to 1.5 percent, as part of an internationally coordinated policy easing. The Fed began paying interest on excess reserves on October 9.[7] The policy rate was then further cut by 50 basis points to 1 percent on October 29. On December 16, the Federal Reserve adopted a new policy rate target range of 0–0.25 percent. This was virtually a zero interest rate policy (ZIRP), reminiscent of the Bank of Japan policy from 1999 to August 2000, and March 2001 to 2006. (The difference between the BOJ's quantitative easing and the Fed's credit easing is discussed in a later section.) The Federal Reserve had then entered the era of ZIRP with unconventional monetary policy.

The TED and Libor-OIS spreads increased sharply on September 15, in the wake of Lehman's demise, and continued to increase until mid-October. The TED spread peaked at 460 basis points, and Libor-OIS at 350 basis points on October 10. CDS premia for Morgan Stanley shot up to 1200 basis points. Other financial institutions also experienced elevated CDS spreads. The CDS spreads became increasingly differentiated among financial institutions. In the immediate months after Lehman's failure, CDS premia for Morgan Stanley, Goldman Sachs, and Capital One remained high, followed by Citigroup. Bank of America and Wells Fargo spreads remained low. After March 2009, CDS premia for Citigroup increased sharply, while others were on a gradual decline. CDS spreads for Citigroup remained higher than others until September 2009, when all CDS spreads fell below 200 basis points, the prevailing level before the Lehman failure.

The TED and Libor-OIS spreads came down to around 100 basis points in mid-January 2009. The deviation between the two spreads then disappeared. Spreads remained around 100 basis points until the end of April. The two spreads started to decline in May, and fell below 50 basis points in late May. The two spreads became less than 20 by the end of September, clearly suggesting that conditions were again normal as far as liquidity and counterparty risk was concerned. CDS market spreads also indicate that market participants now believe the extreme turmoil in the financial markets is over. However, these assessments should be qualified as the calmness has been attained partly due to ZIRP, all those "facilities," and other policy measures.

3. International Responses

3.1. Conventional Monetary Policy and Policy Rate Cuts

I next examine the timing of monetary easing among the Fed, the ECB, the BOE, and the BOJ. As explained in earlier sections, only the United States was engaged in aggressive interest rate cuts before Lehman's failure in September 2008. After the events of September, the Bank of England aggressively cut the interest rate from 5 percent in that month to 0.5 percent in March 2009.

The ECB was more cautious about inflation in 2007. It even raised interest rates from 4 percent to 4.25 percent in July. However, in the following month, the ECB cut the interest rate to 3.75 percent. The decline in ECB interest rates was slower than for the Fed or the BOE and reached 1 percent in May 2009. The more cautious policy stance at the ECB may be due to its self-imposed policy mandate that keeps its reference rate of desirable inflation "below but close to 2 percent," which contrasts with the Bank of England target of 2 percent with a symmetric tolerance band of 1 percent. The inflation rate in mid-2008 was still running high in Europe, the U.K., and the U.S. because of commodity price increases in the preceding year.

At the beginning of the current global crisis, Japan had the lowest policy interest rate because it had just escaped deflation. As the consumer price index (CPI) inflation rate had become positive, the Bank of Japan cautiously raised its policy rate, the call rate, from 0 percent to 0.25 percent in July 2006, and to 0.5 percent in February 2007. Just when the economy was thought to be out of deflation, the global crisis occurred. The BOJ only started to lower its interest rate after the Lehman collapse, cutting rates in October 2008 by 0.2 percentage point to 0.3 percent, and again by the same amount to 0.1 percent in December of that year. In the December decision, the BOJ also began paying interest

on excess reserves. The interest rate paid on excess reserves was set equal to the policy rate, 0.10 percent. The rate forms the floor in the interbank rate. Therefore this is virtually a zero interest rate policy, but with rates slightly above zero. As of September 2009, the inflation rate (excluding fresh food) is about –2 percent, so that the real interest rate has become positive. Therefore, Japan is again suffering from the zero interest rate bound as a constraint in its fight against deflation. The policy rate cuts by the four major central banks are shown in Figure 5.

So far, my description of the policy interest rate is in nominal terms. However, one should judge whether monetary policy is tight or loose using the *real* interest rate. For the U.S. and Japan this means when prices are declining and nominal rates are at the zero bound. Here, the inflation rate is defined as the percent change in CPI from 12 months earlier.[8] Figure 6 shows the real interest rates of the four countries.

Figure 6 shows a picture quite different from Figure 5. The real interest rate in the United States and Japan declined sharply from June 2007 to July 2008 due to a sharply increasing inflation rate (in both countries) and aggressive cuts in the nominal interest rate (in the U.S. only). The real interest rates of the United States and Japan in July 2008 were well in the negative territory, with the United States at –3.6 percent and Japan at –1.8 percent. The real interest rates in the U.K. and the European Monetary Union had declined gradually from June 2007 to July 2008, but levels were still around positive 1 percent.

FIGURE 5
Policy Rates of the Fed, ECB, BOJ, and BOE

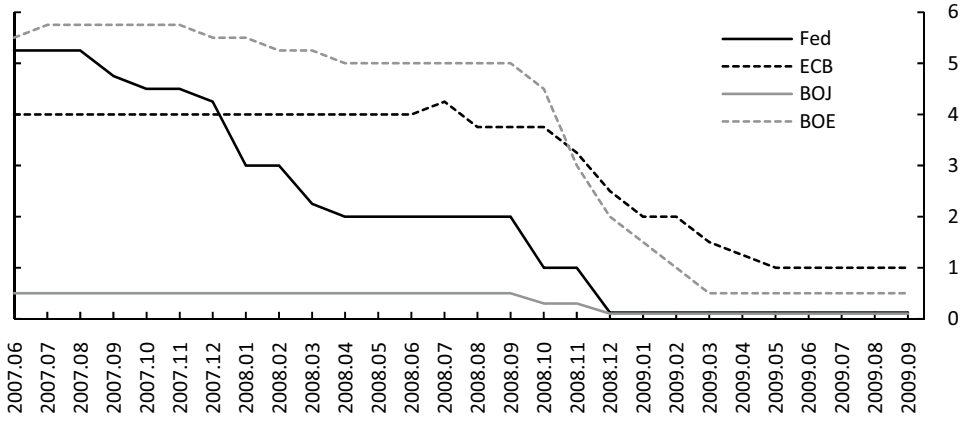
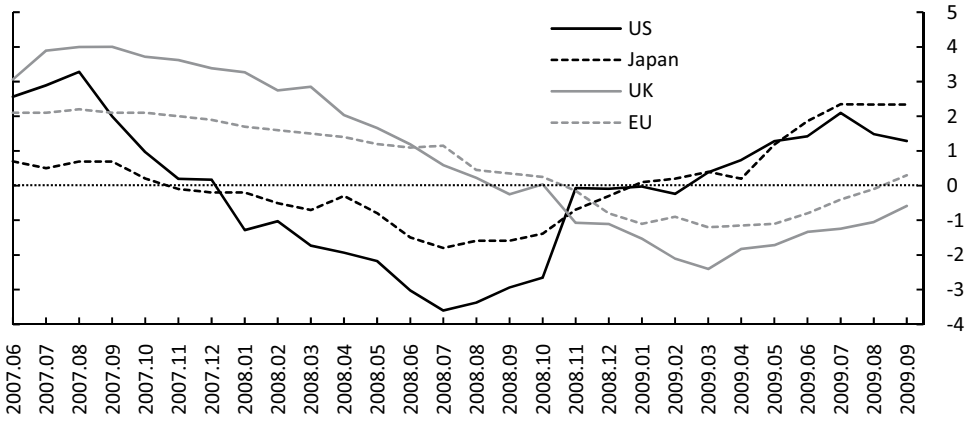


FIGURE 6
Real Interest Rates
Policy Rate Minus CPI Inflation Rate, Backward 12 Months



The policy stance measured by the real interest rate changed dramatically after July 2008. Despite the Lehman failure and financial chaos, the real interest rate of the U.S. and Japan continued to rise from August 2008 to June 2009. The lowering of the policy rate in the two countries was far too small to offset declining inflation rates. Eventually, both policy rates hit the de facto zero interest rate bound. Conventional monetary policy then ceased to function by the end of 2008 in the two countries.

In the U.K. and euro area, real interest rates continued to decline until March 2009. The real interest rate became –1.2 percent for the euro area and –2.4 percent in the U.K. The monetary stimulus continued to work in the euro area and the United Kingdom. For the U.K., the inflation rate and the policy rate were around 5 percent, much higher than the other three areas in the summer of 2008, so it had substantial room to maneuver. Policy rate cuts were swift enough to mitigate the real and financial downturns in the United States and the United Kingdom. That could have been expected due to the desire to protect the large financial sectors in the two countries. The ECB was much more cautious. The BOJ never had room to lower rates any further.

3.2. (Un)conventional Monetary Policy: Balance Sheet Expansion

When the interest rate approaches zero, a central bank can still expand its balance sheet by providing more liquidity to the market. This can provide liquidity to financial institutions that face funding difficulties and provide increased incentives to banks to lend to corporate and household sectors. Expansion of the

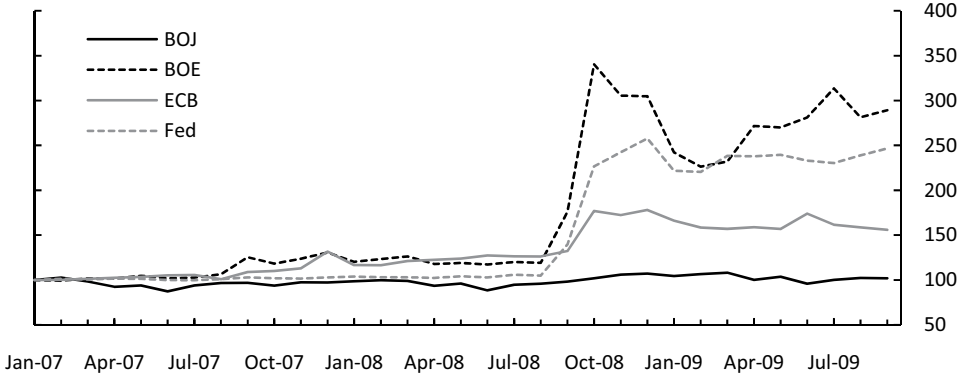
balance sheet itself does not necessarily constitute unconventional monetary policy. The policy becomes unconventional when a central bank broadens its purchases to include assets that are not purchased under normal circumstances.

The first central bank to attempt balance sheet expansion was the Bank of Japan. Japan had fallen into deflation and the BOJ struggled to find ways to stimulate the economy beyond its zero interest rate policy (ZIRP) during the 1999–2006 period.[9] Specifically, within the ZIRP era, the BOJ targeted its current account balance (essentially the sum of commercial bank required and excess reserves) as a policy target from March 2001 to March 2006.[10] This is known as the period of quantitative easing (QE). As reserves did not earn interest, when the Bank provided sufficient liquidity so that banks would hold excess reserves, the interbank interest rate was expected to fall to zero. So, QE was considered to be a further expansion step beyond the ZIRP.

In this crisis, both the Fed and the BOE aggressively expanded their balance sheets, much more than the BOJ during its QE era. The ECB also expanded its balance sheet, but to a much lesser extent. The Bank of Japan did not expand its balance sheet in any measurable way. An index of the balance sheet sizes of the four central banks, in ratio to the respective size of their balance sheets in January 2007, are shown in Figure 7.

The Fed doubled its balance sheet in the two months following the Lehman failure. The BOE's expansion of its balance sheet, which tripled over the same time period, was even more remarkable. The ECB also added about 50 percent to its euro-area consolidated balance sheet during this period.

FIGURE 7
Balance Sheets of Four Major Central Banks
January 2007 = 100



The Fed called the action credit easing (CE), rather than quantitative easing, the name used earlier by the Bank of Japan and also by the Bank of England in this crisis. The difference between CE and QE will be examined in the next section.

In the pre-Lehman environment, the Fed was well prepared to combat the burst of the housing bubble and its deflationary impact. Chairman Ben Bernanke and the Federal Reserve staff had studied what happened in Japan and understood their options to avoid deflation.[11] Ahearne et al. (2002), Bernanke (2003), and Clouse et al. (2000) all studied and discussed the Japanese experiences and discussed the use of unconventional instruments. Bernanke (2002) expressed confidence in the ability of the United States to avoid deflation after the burst of the information technology bubble, and Bernanke (2003) argued that Japan could find ways to expand its balance sheet even at the zero interest rate, although he did express sympathy concerning the risk of asset deterioration of the central bank. However, he argued that this could be avoided through guarantees from the Ministry of Finance.

Among academics, Krugman (1998) offered the advice of generating expectations of higher-than-usual inflation rates during the phase of deflation so that the expected real interest rate would become even lower. Eggertsson and Woodford (2003) analyzed the issue of optimal monetary policy under the zero bound of the interest rate. They also argued that it is important to communicate the central bank's commitment to its future interest rate path.

Svensson (2001) provided a policy prescription for Japan that uses unsterilized intervention with a depreciated level of the target exchange rate. His "foolproof" way of getting out of deflation is based on promoting exports and importing inflation. However, the difficulty in applying Svensson's proposal to this crisis is obvious. The four major central banks had already adopted virtual ZIRP, so that there was little room to expect depreciation of the exchange rate from following the ZIRP.

So what would the expansion of the balance sheet do? The Bank of Japan during the 2001–06 episode argued that it contributed to flattening the yield curve by convincing the public that the ZIRP would continue a long time (known as the "policy duration effect").[12] In this crisis, the Bank of England argued that the expansion of the balance sheet would contribute to keeping the economy out of deflation.

3.3. Expectations Management

Even at zero interest rates, managing inflation expectations remains an important component of conventional monetary policy. As Krugman (1998) and

Eggertsson and Woodford (2003) emphasized, managing inflation expectations can prevent the forward-looking real interest rate from undesirable increases. For the inflation targeting central bank, e.g., the Bank of England, maintaining the inflation target and communicating the intention of achieving the target in the medium term can still act as an anchor for expectations during a crisis.

The fan chart of the Bank of England, which displays inflation projections, had in the past almost always predicted achievement of its 2 percent target with high probability over a two- to three-year horizon. However, at the height of the current crisis, the inflation reports of November 2008 and February 2009 contained fan charts that implied that achieving the 2 percent target within three years was unlikely. The most likely projection was that inflation would be around 1 percent by end of 2011, as shown in Figure 8A (reproduced from the Bank of England's *Inflation Report*). This posed quite a difficult situation for the central bank. Did the Bank of England abandon inflation targeting, or was it unable to achieve its target?

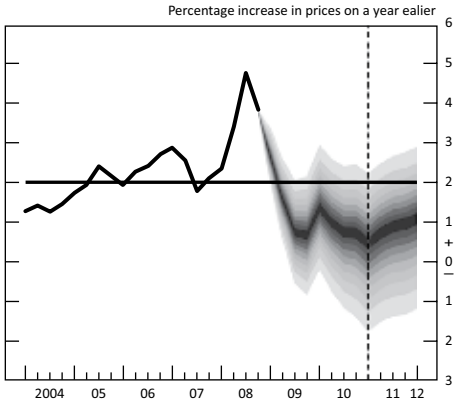
The Bank of England started to purchase high quality securities, including British government gilts in March, and subsequently raised its ceiling on purchases three times.[13] In its August 2009 inflation report, the fan chart indicated that the 2 percent target would be achieved by mid-2011, based on the assumption that the policy rate would be maintained at 0.5 percent and the bank would purchase an additional £175 billion in assets (Figure 8B). However, the projection based on market expectations still indicated that the BOE would miss the target over the three-year horizon.

The BOE took advantage of its *Inflation Report* to anchor expectations, and its unconventional asset purchases were integrated into its inflation targeting framework. Under inflation targeting, a transition from conventional to unconventional policies could be easily communicated by articulating that without unconventional policy the inflation target would not be achieved. In addition, it would also be easy to rationalize the Bank's exit from unconventional policies by showing that, even without quantitative easing, the inflation target will be achieved.

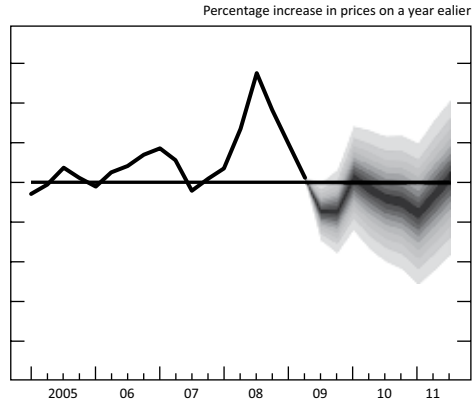
Expectations management posed a similar problem at the Federal Reserve. Although it does not explicitly target inflation, the Fed considers the appropriate inflation rate to be between 1 percent and 2 percent.[14] The Federal Reserve does not publish an inflation report, but it produces a distribution of FOMC members' personal forecasts. Forecasts are shown twice a year at the time of the Monetary Policy Report to Congress (formerly the Humphrey-Hawkins testimony). In its February report (based on polls taken in January), the lower bound of its range of forecasts fell below 1 percent even over a three-year horizon (forecasts

FIGURE 8

A Bank of England, CPI Inflation Projection Based on Market Interest Rate Expectations



B CPI Inflation Projection Based on Constant Nominal Interest Rates at 0.5% and £175 Billion Asset Purchases, August 2009



Source: Bank of England, *Inflation Report*, February 2009.

for 2011). It had to be more than just a coincidence that in this report "long-run" forecasts were also surveyed, where long-run forecasts are defined as follows: "Longer-run projections represent each participant's assessment of the rate to which each variable would be expected to *converge under appropriate monetary policy* and in the absence of further shocks to the economy."[15] This language is very close to those used by central banks under inflation targeting. According to the documents, the long-run projection, the central tendency range for inflation was [1.7, 2.0], while the range of all members was [1.5, 2.0]. The Federal Reserve felt adding these projections was important for managing expectations and communicating to the public. That logic is precisely the reason for having a numerical inflation target. It seems that the Federal Reserve, with its long-run projections, is now a step closer to adopting inflation targeting without declaring so explicitly.

The Bank of Japan publishes the Monetary Policy committee members' forecasts twice a year. It had its inflation forecast in its April publication. According to the April 2009 forecasts for fiscal year 2010, the central tendency for inflation (trimming the max and the min) is [–1.1, –0.8] and the range of forecasts of all members is [–1.2, –0.4]. The forecasts were updated in October 2009, as follows: The majority viewed that the range of CPI inflation rate (excluding fresh food)

would be [–0.9, –0.7] in 2010, and [–0.7, –0.4] in 2011. It is remarkable to have a forecast of deflation for the next two to three years. There is no extra policy measure, like the QE pursued by the Bank of England. There is also no "long-run forecast," like that given by the Federal Reserve, to show policymakers' views on the desirable medium-term inflation rate. The Bank of Japan therefore shows no sign at this point of using expectation management to reduce forward-looking real interest rates.

3.4. Liquidity Support and Asset Purchase

Although the origin of the current crisis was in the United States, the securitized assets that caused these problems were distributed by European investment banks and bought by European investors. In contrast, there were only modest holdings of these assets in Asia.[16] As discussed above, U.S. dollar swap lines were introduced as early as December 2007 with the ECB ($20 billion) and the Swiss National Bank ($4 billion). This was the first sign that the crisis had spread from the United States to the rest of the world. The U.S. dollar is the key international currency, at least in financial products and transactions.

Some European banks held large exposures to toxic assets (subprime related securities and other risky securitized assets). Other Western European banks had exposure to Hungary and Latvia, whose economies experienced difficulties from capital outflows. A large multinational banking group, Fortis, had balance sheet difficulties due to losses on its assets, and its Dutch operations had to be injected with capital in September, and then nationalized by the Netherlands government in October of 2008. The French government recapitalized Dexia at the end of September 2008, in cooperation with Belgium and Luxembourg.

In the first half of October, many banks became fragile worldwide and many countries announced comprehensive rescue packages. (See Panetta et al. 2009 for the list.) The concerted action was partly due to coordination under the G-7 on October 10, which established guidelines for assistance to systemically relevant institutions.

During the month of October, the flight to quality intensified, and the U.S. dollar appreciated against the euro as investors regarded it as a safe haven and as U.S. financial institutions accelerated their deleveraging efforts (repatriating dollars back to their U.S. headquarters). The U.S. dollar appreciated against almost all currencies except the Japanese yen. The yen appreciated due to the unwinding of carry trades, repaying outstanding yen-denominated debts incurred to invest in high-yielding currencies, such as the Australian dollar.

Panetta et al. (2009) provides a comprehensive survey of the various policy measures (including capital injections, liability guarantees, asset purchases, and asset guarantees) of 11 countries. They report that a total of €5 trillion has been committed and €2 trillion has been spent in the 11 countries. The outlay of U.K. assistance reached 44 percent of gross domestic product (GDP); that of the Netherlands reached 17 percent of GDP; while those of the U.S. and Japan reached 7.4 percent and 0.1 percent, respectively. Details are shown in Table 1. Panetta et al. (2009) conclude that, based on bank CDS premia, the market had regained stability by the end of May 2009, and they attribute this to the government interventions mentioned above.

The ECB started its liquidity provision in the aftermath of the Lehman failure. Its policy of enhancing credit provision and its effects on the spread are examined in Čihák, Harjes, and Stavrev (2009). Their conclusion is that the ECB expansion continued to operate during the global crisis. Policies included lengthening the maturity of monetary policy operations, providing liquidity at fixed rates, and reducing money market term spreads. They also concluded that the substantial increase in the ECB's balance sheet contributed to a reduction in government bond spreads.

On May 7, 2009, the ECB announced that it would start purchasing euro-denominated covered bonds issued in the euro area. Purchases would start in July, and the target amount would be €60 billion, to be completed by June 2010. The purchases would be directly from primary and secondary markets. High-grade assets (AA or above) are preferred.

3.5. International Monetary Fund

As risk aversion increased, institutional investors pulled their funds out of emerging market economies. Some institutional investors rushed to sell assets in emerging markets to repatriate their assets to their U.S. and European headquarters to raise liquidity—a form of deleveraging. Those countries that relied on capital inflows for real-sector investment were suddenly faced with shortages of U.S. dollar and euro-denominated assets to service their foreign debt obligations. This pattern has been repeated many times in recent history: Mexico in 1994, Asian countries in 1997–1998, Russia in 1998, Brazil in 1999–2000, and Argentina in 2001–2002, to name just the large crises. The International Monetary Fund (IMF) suddenly became busy again and received many requests for assistance.

Borrowers of IMF traditional stand-by arrangement (SBA) loans between September and December of 2008 included Georgia, Hungary, Iceland, and

TABLE 1

Overview of Commitments and Outlays of Rescuing Banks (€ billions)[a]

	Capital injection	Debt guarantees[a]	Asset purchase	Asset guarantees[a]	Total	Total % of GDP	Total %, bank sector assets
Australia							
Commitments	—	UNS	—	—	UNS	UNS	UNS
Outlays	—	62	—	—	62	10.4%	4.6%
Canada							
Commitments	—	UNS	—	—	UNS	UNS	UNS
Outlays	—	0	—	—	—	—	—
France							
Commitments	43	320	—	5	368	18.9%	4.8%
Outlays	28	72	—	5	104	5.3%	1.4%
Germany[b]							
Commitments	80	420	UNS	200	700	28.1%	8.9%
Outlays	22	129	0	0	151	6.1%	1.9%
Italy[c]							
Commitments	20	UNS	—	—	UNS	UNS	UNS
Outlays	10	0	—	—	10	0.6%	0.3%
Japan							
Commitments	105	—	8	—	113	2.7%	0.9%
Outlays	3	—	0	—	3	0.1%	0%
Netherlands							
Commitments	37	200	—	28	265	44.6%	11.9%
Outlays	31	40	—	28	99	16.6%	4.4%
Spain							
Commitments	UNS	100	—	—	UNS	UNS	UNS
Outlays	0	31	—	—	31	2.8%	0.9%
Switzerland							
Commitments	4	UNS	27	—	UNS	UNS	UNS
Outlays	4	0	27	—	31	8.7%	1.5%
United Kingdom							
Commitments	54	269	—	523	845	54%	10.8%
Outlays	54	113	—	523	690	44.1%	8.8%
United States[d]							
Commitments	335	1760	115	281	2491	22.3%	25.5%
Outlays	237	271	36	281	825	7.4%	8.4%
Total Commitments[e]	677	3131	150	1036	4994	18.8%	8.3%
Total Outlays	387	719	64	836	2006	7.6%	3.3%

Notes: As of June 10, 2009, unless otherwise specified. UNS = unspecified amount; "—" = no program/action. Banking sector assets (as of the end of 2008) are consolidated data of the following: for Australia, banks, credit unions, building societies and corporations; for Canada, chartered banks; for Japan, depository corporations (banks and collectively managed trusts); for Switzerland, all domestic banks; for the five euro area countries and the U.K., monetary financial institutions; and for the U.S., commercial banks.

a Outlays indicate the value of liabilities/assets actually under government guarantee. Debt guarantee outlays comprise only bonds publicly issued up to May 29, except for Australia, where they indicate average daily outstanding amounts of both deposits and wholesale funding in May 2009; and except for the United States, where they include all outstanding FDIC-guaranteed liabilities as of May 31.

b Part of the €80 billion set aside for recapitalization can be used also for asset purchases.

c The commitment for capital injection indicates the upper bound of the global budget for the measure as approved by the European Commission; outlays include the intended (publicly announced) requests for funds not yet finalized.

d Figures exclude the capital injections to Freddie Mac and Fannie Mae and the $700 billion TARP commitment to buy illiquid assets (later modified for other purposes); capital injection outlays are net of funds already repaid by the time of writing.

e Unspecified commitments are proxied by actual outlays.

Source: Panetta et al. 2009, table 1.2. http://www.bis.org/publ/bppdf/bispap48.pdf

Latvia. Armenia, Belarus, Bosnia, Romania, and Serbia joined the list in 2009. The IMF created a new facility, Flexible Credit Line (FCL) in March 2009 for countries with strong macro fundamentals but that could be hit by liquidity shortages in the near future. No conditionality for drawing the loan from the facility is attached. Mexico, Poland, and Colombia applied and qualified for FCL in April/May 2009.

3.6. The Real Economy and the Exchange Rate

Financial shocks became widespread in various directions: the U.S. real economy deteriorated, as did foreign exchange markets and both advanced and emerging foreign economies.

Consumption and investment had softened since the collapse of the housing bubble in the United States, and the financial troubles further dampened consumer and corporate activities. The GDP growth rate turned negative in the third quarter of 2008 and declined by more than 5 percent in both the fourth quarter of 2008 and the first quarter of 2009—a severe recession. The Lehman failure and the financial turmoil that followed made real activity plummet. High-end consumer durables, such as electronics and automobiles, were particularly hard hit.

The severe recession in the United States led U.S. imports to decline suddenly, and major exporters to the United States suffered. Postponed purchases of high-end consumer electronics and automobiles hit Japan and Germany disproportionately, with German exports declining significantly. Japan experienced unprecedented declines in industrial production and manufactured exports. Japanese economic growth was lowest among the G-7 countries.

Japan experienced sudden large declines in stock prices, appreciation in the yen, and sudden declines in exports in the fourth quarter of 2008 and the first quarter of 2009. The Japanese declines in GDP and industrial production from October 2008 to March 2009 were the largest among major industrial countries. This is puzzling, since Japanese institutions and investors had held little exposure to the problematic securitized assets that started the crisis.

The government tried to stimulate the economy by introducing several fiscal programs. With the policy interest rate already at 0.5 percent, the BOJ could not produce any additional stimulative measures. The balance sheet expansions and excess reserve targeting that was employed from 2001 to 2006 were not revived at this time. Japan experienced a –3 percent quarter-to-quarter growth rate over two consecutive quarters. Japanese banks, which had little exposure to toxic assets, started to feel pressure in the first quarter of 2009, as stock prices continued to decline and the real domestic economy declined as

well. Some of them recapitalized themselves, diluting the value of holdings by existing shareholders. However, they were not in sufficiently poor condition to request government capital injections or other forms of assistance.

The large shock spilled over to foreign exchange markets. The U.S. dollar appreciated against almost all currencies including the euro, the British pound, and commodity-based currencies. It was unusual that the currency of the country where the crisis originated appreciated during the crisis. This is explained by the fact that many troubled institutions needed U.S. dollars to settle their dollar-denominated contracts and to repatriate their assets to shore up domestic headquarter balance sheets. The only currency that appreciated against the U.S. dollar was the Japanese yen. This was explained by two forces: the unwinding of carry trades and reductions in losses by Japanese retail investors in high-yielding currencies that overwhelmed the repatriation of U.S. financial institutions.

4. Assessment of the Key Policy Responses

4.1. Quantitative Easing vs. Credit Easing

The similarities and differences between quantitative easing (QE), adopted by the Bank of Japan from 2001 to 2006, and the credit easing (CE) policy pursued by the Federal Reserve have been explained by Bernanke (2009).[17] Let me paraphrase his points (all quoted statements in the following several paragraphs are his). Both QE and CE expand the central bank's balance sheet. However, the difference is which side of the central bank's balance sheet is emphasized. The pure form of QE emphasizes the liability side, while the focus of CE is the composition of central bank's assets.

In March 2001, the BOJ replaced the call rate as the policy target with the amount of its current accounts, essentially the excess reserves of financial institutions. The asset side, that is the composition of loans and securities, was then "incidental." The Federal Reserve's CE "focuses on the mix of loans and securities that it holds and on how this composition of assets affects credit conditions for households and businesses." The difference, as Bernanke explained, stems from the difference in financial and economic conditions of Japan in 2001–06 and the U.S. in 2008: "credit spreads are much wider and credit markets more dysfunctional in the United States today than was the case during the Japanese experiment with quantitative easing." The stated policy objective of the Fed's CE is "reducing those spreads and improving the functioning of private credit markets more generally."

When QE was adopted by the Bank of Japan in March 2001, the transmission channels from expanding the central bank balance sheet to stimulate economic activity were not controversial. First, flooding the market with liquidity stabilizes the banking system by erasing the fear that a bank may fail due to a lack of liquidity (as opposed to insolvency). Second, QE may reduce long rates if it contributes to a reduction in short-term rates that will prevail in the future. Long rates are more relevant to stimulating investment activities. The expectation of future ZIRP is also strengthened by clarification of a bank's "exit condition," the characteristics under which the central bank will begin to remove stimulus. This channel is called the "policy duration effect." Third, QE may encourage financial institutions to accept more risks by lending to less creditworthy customers or by purchasing riskier securities such as equities and foreign-currency-denominated securities. These would raise stock prices and depreciate the yen, as well as help small- and medium-sized enterprises (SMEs) survive, encourage venture capital extensions, and make it easier to restructure nonperforming loans. This channel can be called the bank lending channel. Fourth, risk-taking behavior among institutional investors and retail customers may increase due to looser bank lending policies. Again, equities and foreign-currency-denominated securities are likely choices. Thus, QE was a commitment strategy that created expectations of sustained ZIRP going forward. This policy might also have encouraged pursuit of the "carry trade" and led to yen depreciation.

Arguing for this last channel, Svensson (2001) advocated a "foolproof" way of stimulating the economy under ZIRP by conducting targeted depreciation of the currency backed by unlimited unsterilized intervention. Although Japan engaged in massive intervention from January 2003 to March 2004, in parallel with expansion of the Bank of Japan balance sheet, both the Ministry of Finance and the Bank of Japan denied that they were following Svensson's advice: Deputy Governor Kazumasa Iwata once claimed that the simultaneity of the government's intervention and QE were purely a coincidence.

What are the assessments of the effectiveness of various QE transmission channels? There is near consensus that it contributed to financial stability. Beyond financial stability, many agree that the BOJ QE program had a "policy duration" effect and contributed to the flattening of the yield curve.[18] There is some evidence of yen depreciation through the carry trade, but it would be difficult to assess an incremental effect of QE beyond the ZIRP. Most controversial is the bank lending channel. There is little evidence, empirical or anecdotal, that banks lent more because of QE. Banks were worried about their liquidity positions and their capital ratios in 2002–03.[19]

In the credit easing policy, the focus is to restore a dysfunctional bank credit market and to restore the market mechanism in the securities market. This can be better analyzed in the framework of a credit channel of monetary policy. The credit channel, as surveyed in Bernanke, Gertler, and Gilchrist (1999), emphasizes bank lending and firms' usage of the funds in profitable projects. The credit channel links credit quality, bank health, and firms' available resources, and explains how business cycles can be driven by bank credit availability. If the current global crisis is an extreme form of a business downturn, rather than the result of some structural breaks, part of the difficulties must have followed the process described by the credit channel model. Indeed, the large movement of various market interest rate spreads, such as the TED spread and the Libor-OIS spread, can be interpreted as a credit problem in the banking sector that affects bank lending.

One of the stated objectives of credit easing is to restore normal spreads in the credit market. How monetary policy responds to increased credit spreads and whether monetary policy can influence these spreads is a topic of recent investigation.[20]

Bernanke (2009) argues that it is not possible to set a single number, like the Bank of Japan did, for the size of the balance sheet. In the regime of credit easing, the desirable amount of asset purchases is more driven by demand. He admits that this poses a communication challenge. In response he emphasizes that the central bank should be transparent about its credit easing strategy.

I have four observations about and interpretations of the difference between QE and CE. First, since the effectiveness of the BOJ QE in the 2001–06 episode is somewhat controversial, this might have been a reason for Chairman Bernanke to choose a different name for the Fed. However, Governor Mervyn King of the Bank of England designated his policy as quantitative easing.

Second, the reduction in mid- and long-term rates had a positive effect on the economy. A similar effect could also be achieved by creating expectations that the ZIRP would be maintained even after the standard policy rule prescribed a rate rise. This could be managed through communication and need not involve expanding the central bank's balance sheet.

Third, Japan suffered acute difficulties in financial and capital markets, similar to the U.S. markets' post-Lehman months, in November 1997 when a major bank and one large and one medium-sized securities firm all failed. The Japanese banks suffered from the "Japan premium," a widened spread for Japanese banks in the dollar interbank markets. There was a widespread credit crunch. Since Japan had and still has a more bank-based financial system

than the United States, this credit crunch had a major impact on the economy. Purchasing various securities, similar to CE, would have had little impact.

Fourth, although Chairman Bernanke dismissed the importance of the asset side considerations of the Bank of Japan's QE policy, the policy did expand the scope of assets admissible as collateral, including corporate bonds and commercial paper. The Bank of Japan also purchased more than ¥2 trillion worth of equities from commercial banks but stressed that this action was not a part of monetary policy, but was intended to address systemic stability.[21]

Shiratsuka (2009) argues that circumstances, including the crisis origin and the way spillovers occurred, were quite different in Japan in 2001–06 than in the United States in 2007–09. A simple comparison of CE and QE policies is therefore difficult. He argues, however, that the BOJ already had employed various unconventional measures, such as purchases of CP and government bonds, which were repeated by the Fed in this crisis.

4.2. Governance and Transparency

Unconventional monetary policy also posed challenges to central banks, the Federal Reserve in particular. After the Lehman failure, several important decisions were made at the Fed, including the creation of facilities to provide financial institutions with liquidity. These unconventional policies were technically not under the auspices of the FOMC, which includes the governors and the regional bank presidents. The unconventional monetary policy measures were instead adopted by the governors of the Federal Reserve Board under Section 13(3).

The Federal Reserve Act says: "In unusual and exigent circumstances, the Board of Governors of the Federal Reserve System, by the affirmative vote of not less than five members, may authorize any Federal Reserve bank, during such periods as the said board may determine, at rates established in accordance with the provisions of section 14, subdivision (d), of this Act, to discount for any individual, partnership, or corporation, notes, drafts, and bills of exchange when such notes, drafts, and bills of exchange are endorsed or otherwise secured to the satisfaction of the Federal Reserve bank."[22]

As a result, as monetary policy moved from conventional to unconventional policy, power shifted from the presidents of the regional banks to the governors in Washington, D.C. In light of the need for a quick response, this may have been necessary and desirable. However, it posed some governance and transparency questions. For example, no minutes were released concerning the Section 13(3) decisions.

In the Bank of Japan and the Bank of England, the discussions and decisions of unconventional measures were made by the same body that determines monetary policy. Therefore unconventional policies were as transparent as conventional measures.[23]

5. Lender of Last Resort and Too-Big-to-Fail

5.1. What Should Have Been Done between March and September 2008

The success of crisis management in dealing with the Bear Stearns failure in March 2008 became a medium-term curse. After Bear Stearns was rescued with assistance from the Federal Reserve, market calm was quickly restored, although spread levels did not go back down to rates that prevailed before the Bear Stearns fall. U.S. and European financial institutions were already deleveraging to shrink their balance sheets.

The Bear Stearns failure had two important effects on market sentiment. First, many market participants and observers realized that investment banks were in serious financial condition. Second, the rescue assured the public that the Treasury and the Fed were prepared to take extraordinary actions to prevent the demise of financial institutions. Counterparties would be protected and no financial meltdowns would be avoided. The relatively small reactions of spreads demonstrates this latter effect.

The bailout generated moral hazard among investors and banks by assuring them risks were limited because the government would rescue a failed institution. In particular, many market participants and observers believed that "too-big-to-fail" policies would apply to investment banks that were larger than Bear Stearns. The bailout also generated complacency among regulators that a future crisis could be averted if problems arose. Some observers criticized the lenient terms for shareholders, but officials defended the bailout by saying that it was the only option since time was pressed.

The Bear Stearns bailout was defensible. However, because it was the first large sudden failure, efforts to achieve regulatory reform after the bailout were insufficient. There could have been calls for a resolution mechanism that would be tougher on the next failing financial institutions. Careful policy analysts, looking at CDS spreads, would have known that there was a good chance that another large institution could fail, raising the need for such a resolution mechanism.

At the Federal Reserve, more efforts were given to the implementation of facilities to provide more liquidity by expanding the set of qualifying institutions and assets admissible as collateral. Before September 2008, most adverse

problems were concentrated in subprime markets and securities that were based on subprime mortgage paper. They were created, sold, and primarily held by institutions in the United States and Europe. Policy responses were mostly restricted to conventional policies, such as the reduction in interest rates in the United States. Several unconventional policy responses were employed in the United States: the creation of the TAF in December 2007; the rescue operation of Bear Stearns and creation of the TSLF and PDCF in March 2008; and the explicit government guarantee of GSEs.

5.2. Shouldn't Lehman Brothers Have Been Saved?

With all these indications, the Lehman Brothers collapse was a watershed. Clearly, conditions that followed the collapse were undesirable. More bluntly, letting Lehman Brothers file for Chapter 11 was a mistake. However, many observers differ on what should have been done and what could have been done. Below I summarize some of the arguments critical of the policy pursued by the Treasury and the Federal Reserve, as well as arguments in defense of their policies.

Naive criticism (by a lender-of-last-resort believer) might go as follows: Given the financial turmoil that was caused by the collapse of Lehman Brothers, it should have been saved by a Bear Stearns-like rescue. In short, sufficient government capital injections to avoid a failure should have been provided. "No sweetener" was too abrupt a policy change, given that markets expected a bailout. The ultimate cost to taxpayers of the financial meltdown that occurred in the wake of Lehman's failure turned out to be much higher than the amount of assistance that would have been required.

Defense of Treasury actions would note that there are three differences between the Bear Stearns case and the Lehman Brothers case. First, some derivative positions were unwound on Sunday, so that systemic risk was expected to be minimized. Second, the deterioration in Bear Stearns's liquidity position took place suddenly, so it lacked adequate time to cope with the change in financial environment and regulators were caught off guard. As such, it was reasonable in that case to extend loss guarantees. Third, after the rescue merger of Bear Stearns, two new facilities, the TSLF and the PDCF, were introduced, so that a mechanism existed for Lehman to raise liquidity. Fourth, financial assistance to Bear Stearns had created a sense that rescues would be assisted by government support. A line had to be drawn somewhere to avoid increased moral hazard.

Against this line of defense, further criticism would go as follows: It may be true that Lehman Brothers management was at fault, but management

failure should not be the criterion for deciding whether a systemically important institution should be rescued. Moral hazard might be evident because the Bear Stearns rescue created a notion that any investment bank larger than Bear Stearns would be rescued. So counterparty risk was not heightened, as shown in earlier sections. If the Treasury and Fed intended to "draw a line," it should have come immediately after the rescue of Bear Stearns, emphasizing it had been an exceptional case and would not be repeated. Instead, a policy shift toward preventing moral hazard seems to have arisen only after criticism of the Bear Stearns rescue. When the Treasury entered negotiations for the acquisition of Lehman Brothers just days before the weekend of September 13, the potential suitors must have expected that similar government assistance would be added to a Lehman rescue deal. By refusing to provide this assistance, the Treasury triggered a financial panic. Ironically, once panic began, the Treasury and the Fed provided "lifeboats" to many institutions, including AIG, Citigroup, and Bank of America.

Even if Lehman Brothers was allowed to fail, Chapter 11 was the worst framework for closing a financial institution. Under Chapter 11, the bankruptcy court freezes assets, while the institution is protected from creditors. All claims on the institution needed to be categorized and sorted out prior to disbursement. This temporary freeze on liability payments, particularly short-term liabilities in swap agreements, derivatives, collateral, and primary brokerage contracts (basically customers' assets in care of the securities firm), it raised the possibility of a financial meltdown. Many of the financial difficulties experienced by other investment banks, institutional investors, and hedge funds were rooted in this asset freeze and protection from creditors.

There is another international dimension to this failure. Immediately after Lehman's filing of Chapter 11 in the United States, its subsidiaries filed similar bankruptcy/rehabilitation plans in Japan and the U.K. Accordingly, financial regulators in those countries ordered that Lehman subsidiaries' assets to be frozen within each country's borders, fearing that assets would be siphoned from each country to the United States. Bankruptcy laws in the three countries have different details, and it became difficult for a subsidiary to resolve its organization within each jurisdiction. Japanese assets that belonged to customers in swap arrangements with New York or London faced difficulties in unwinding those obligations. Even a year later, many assets are still frozen and lawyers in London, New York, and Tokyo are trying to sort out how to settle claims.

In bankruptcy law, proprietary trading and trading accounts for customers are separated, and the latter is fully protected in bankrupt securities firms.

It took months to return those assets to customers. Even a delay of a few days may be too late for some of the institutional investors that faced redemptions and withdrawals of funds from their retail customers.

Considering all these difficulties, it would have been much better if the government nationalized Lehman Brothers and kept honoring short-term liabilities, unwinding swap arrangements, and returning assets of customers in consignment within days if not hours. Long-term debts and bonds should have been be dealt with separately, and shareholders' values could have been limited to remaining values in the company, if any.

Defenders of the U.S. government action would say that there was no legal framework for the government to take over a financial institution like that. However, the fact that a majority share of AIG was acquired by the government very quickly, de facto nationalization, shows that it seems possible for the government to take over a (near-)insolvent financial institution if the government is determined to do so. More fundamentally, Section 13(3) can be invoked to create the necessary facilities, just like it was for AIG.

5.3. Should AIG Have Been Saved?

In contrast to Lehman Brothers, the AIG rescue—first with an $85 billion loan from the Federal Reserve and later with an additional capital injection—was carried out smoothly. As shown in an earlier section, the CDS premium for AIG was much higher than Lehman Brothers on the Friday before the crisis weekend. Why was AIG saved and not Lehman Brothers? The source of the AIG problem was the CDS contracts that AIG provided, and it was believed that if AIG defaulted on those CDS contracts, counterparties would suffer massive losses.

Was this much worse systemic risk than allowing Lehman Brothers to fail? CDS contracts do not carry immediate cash flow problems analogous to the overnight interbank market. CDSs are not traded in centralized markets, but over the counter. The problems that would follow CDS contract defaults were not well understood. So, on the cautious side, the $85 billion loan on September 16 may be justified.

When the loan was restructured later in November 2009, with the creation of the Maiden Lane III facility, the CDS contracts were paid in full. The so-called SIGTARP report, from the Office of the Special Inspector General for the Troubled Asset Relief Program (2009), questioned the need to pay contracts in full to protect the counterparties. There was also widespread criticism of the AIG executive bonuses in the spring of 2009.

5.4. Bank Restructuring: Conventional Wisdom and Practices

A rich literature exists on how to manage and exit a banking crisis.[24] Best practices have been learned from the experiences of the U.S. S&L crisis in the 1980s, the Nordic banking crisis in the early 1990s, the Asian financial crisis of 1997–98, and the Japanese banking crisis in 1997–2003, to name a few.

When a bank is short on liquidity, providing additional liquidity by accepting a wider range of assets as collateral is a useful first step. When counterparty risk increases, such liquidity provision by the central bank is not uncommon. In the extreme case, providing liquidity becomes a lender-of-last-resort operation. An important point here is that the central bank has to be sure that shortage is due to illiquidity, not a shortage of capital. Liquidity crises can be helped by liquidity provision, but insolvency (a negative capital position) cannot. During a crisis, it is very difficult to differentiate the two. Liquidity provision has been used many times in many countries, sometimes successfully, but more often resulting in insolvency. In the current global crisis, many "facilities" created by the Fed fall into the category of liquidity provision. The ECB, the BOE, and the BOJ also expanded asset purchases from the market and from commercial banks directly, helping to provide liquidity to banks, albeit at smaller magnitudes.

When a crisis is due to deterioration in asset quality, a different solution has to be sought. If nonperforming loans and valuation losses become excessive, the government may have to inject capital, either by purchasing subordinated debts or by purchasing new issues of bank common shares. Capital injections were tried twice for major banks during the Japanese banking crisis of 1997–98, and in the current global crisis in many countries.[25] The problem with capital injection is that governments tend to be shy about taking management control. Because the government does not take control, banks tend not to make drastic reforms. If the government offers funds tied to stringent restrictions, no bank applies for the funds.[26] So, the government tends to force several major banks—regardless of their capital positions—to accept injections. This was the case in March 1998 in Japan and in October 2008 in the United States. However, if a stringent condition is imposed (such as a cap on executive bonuses), banks will try to repay injected capital quickly, whether they still need it or not. This happened in the United States during the current crisis.

Capital injection may also have the unintended side effect that banks receiving injections may not undertake serious reform efforts, such as writing off nonperforming loans or divesting of bad assets, unless they are required to at the time of the capital injection. This was the case in Japan from 1999 to 2002, when

complacency led to the erosion of capital positions. The United States also failed to convince banks to take advantage of TARP because banks did not want to sell assets at what they considered "fire sale" prices. Without due diligence, either asset examinations or stress tests, the government is likely to end up buying bad assets at banks' offer prices, which undoubtedly are inflated. This is the fundamental problem of hasty capital injections without due diligence and the threat of nationalization.

Blanket guarantees of deposits are often necessary to avoid a bank run. Japan introduced a blanket guarantee as early as 1995, while the serious crisis did not erupt until 1997. Even during the protracted banking crisis, there was no bank run in Japan. The United Kingdom hesitated to provide a blanket guarantee when the fragility of Northern Rock became known in the fall of 2007. The existing ceiling for guarantees was low, and a bank run occurred against Northern Rock, resulting in nationalization in February 2008. This was a costly episode since it eroded confidence in Britain's financial regulators. During the Asian crisis, Indonesia closed 16 banks without full guarantees of deposits, which caused bank runs and capital flight.[27] During the current crisis, Sweden increased the ceiling of deposit guarantees to SEK500,000 on October 6, 2008, and Switzerland did the same up to CHF100,000 on November 5. On October 5, the German government guaranteed all private bank deposits. On September 30, deposits in six large banks in Ireland were guaranteed by the government. This was an enhancement from an increase in the deposit insurance ceiling to €100,000 only 10 days earlier.

In addition to deposits, other liabilities of banks can be guaranteed by the government if and when counterparty risk becomes unreasonably high. In order to maintain the interbank market and to avoid systemic risk, the government may choose to guarantee these liabilities. In the current crisis, the German government and SoFFin (the financial stabilization fund) extended guarantees to several large institutions.

When a financial institution is insolvent or near insolvency, in many cases the government will prefer to take it over and restructure it, rather than allowing it to be liquidated. Suddenly shutting down large financial institutions (or entering into bankruptcy proceedings) increases the risk of systemic risk and a financial meltdown. This was what happened in the case of Lehman's filing for Chapter 11. Temporary nationalization (or a publicly arranged orderly resolution) makes it possible to resolve an institution without causing stress to short-term creditors and derivative counterparties, and while shareholders and management can still be held responsible. Hesitation on the part of the government is understandable, because nationalization may be widely criticized.

Critics might argue that nationalization, even if it is temporary, would destroy confidence in the free market. They may also argue that the government is not competent to run a large complex bank. There may also be conflicts of interest if the government or public corporations are borrowers from the bank. However, nationalization brings opportunities to pursue drastic reforms, engage in quick sales of noncore assets, reduce wages and legacy costs, and separate distressed assets to a bad bank. Nationalization and separating bad assets worked during the S&L crisis of the United States, the Japanese banking crisis from 1997 to 2003, and the Asian financial crisis (Korea, Indonesia, and Thailand).

It is well recognized that separating distressed assets—nonperforming loans in the Japanese context and toxic assets in the U.S. context—is key in reviving the health of troubled banks. However, it is difficult to convince banks to sell their distressed assets against their will unless the government has the power to threaten nationalization. Sometimes, not just the threat, but actual nationalization is needed to arrive at a good bank–bad bank solution.[28] This was shown to be true during the S&L crisis in the 1980s, the Nordic crisis of the early 1990s, and in the Indonesian, Thai, and Korean crisis in 1997–98.[29]

The failure to use TARP money in the United States for its original purpose was attributable to the government's inability to force banks to sell toxic assets. Valuation is inherently difficult when markets have dried up. The gap between sellers' desired prices and those that would have met the buyers' responsibilities to the taxpayers could not have been bridged. If banking fragility arises again in the United States, the perceived hesitation of its government to nationalize banks makes it difficult to force the separation of banks and their toxic assets.

5.5. Summary

My major assessments of the policy responses are as follows:

- Credit easing, as well as conventional policy, by the Fed has been very successful in avoiding the worst possible situation—a meltdown of the financial markets—in the wake of Lehman Brothers' failure.
- Various unconventional measures employed by European financial authorities were effective in providing liquidity and averting large-scale financial problems. Some of the early nationalization and liability guarantees maintained systemic stability.
- Although unconventional policies had high costs, during the crisis they played a large role in avoiding financial disaster.
- Letting Lehman Brothers file for Chapter 11 was a mistake. Instead, the six months between March 2008 and September 2008 should have been

used not only for "firefighting," but also for institutional overhaul in anticipation of the insolvency of some large, complex financial institutions.
- The terms of the resolution of AIG, paying full value of CDSs to counterparties, has been questioned.
- Inflation targeting is an effective tool for expectations management and communication, even during the phase of ZIRP.

6. Remaining Challenges

As argued in the end of Section 2, the financial markets and institutions regained normalcy in terms of risk spreads and CDS premia. However, this may still be dependent on continuing conventional and unconventional monetary policies. How to exit from ZIRP, CE/QE, and all other guarantees and injected capital is obviously a difficult challenge that will be faced in the coming months. However, it would be prudent to err on the side of late exit given what the market has experienced since September 2008. Moreover, deflation may be more of a risk than inflation. Critics may point out that the last episode of keeping the interest rate low in the aftermath of the bursting of the tech bubble might have sown the seeds for the housing bubble (e.g., Taylor 2009). And they conclude that exit must not be delayed. However, at this moment there is no sign of the formation of another bubble due to ZIRP. The worry is misguided. Of course, as a long-run issue, it is important to examine whether and how monetary policy should respond to asset prices.

One of the main reasons for the subprime crisis in the United States was its antiquated regulatory framework—fragmented, duplicated, and with cracks. Investment banks were not effectively regulated by the Securities and Exchange Commission, and multiple regulators invited regulatory arbitrage. Currently, there is a proposal to give more power to the Federal Reserve to supervise systemically important financial institutions. The issue of whether an independent supervisor, such as the Financial Services Authority (FSA), is most effective in regulation and supervision, or whether responsibility is best held by the central bank has been debated in policy circles. The United Kingdom, Japan, Australia, and Korea, among others, chose a model of an independent FSA, while several continental European countries have a hybrid of federal regulator and national central bank.

When normalcy in the financial market is restored and the supervision framework is straightened out, the fundamental question of how to avoid "too-big-to-fail" policy while maintaining systemic stability has to be debated. In order to avoid too big to fail, the government must be able to nationalize large, complex, internationally active financial institutions for orderly resolution.

However, if the government-led resolution frameworks for Europe, the United States, and Asia are not coordinated, resolution becomes difficult.

Now that the G-20 is a permanent forum for discussing financial architecture, leadership in G-20 is needed to steer discussions into a direction of relevance. Engaging important emerging market economies is important, but 20 may be too large a number for effective discussions.

The IMF is again being criticized that it may be overlooking signs of vulnerability among emerging markets that are now under its programs—Iceland, Hungary, Belarus, and Latvia, to name a few. Could it ever be possible to create an effective early warning model? The call for early warning was heard in the aftermath of the Mexican crisis of 1994, again after the Asian crisis, and this time. If every crisis is different, it is almost impossible to predict a crisis. On the other hand, too much short-term debt in comparison to foreign reserves seems to be a robust indicator for vulnerability. This was recognized by Asian countries, and they have piled up foreign reserves since 2000. It seems their accumulating foreign reserves, however costly in terms of fiscal operations, has proven worthwhile in the avoidance of crisis in East Asia during the current global crisis.

The G-20 and the IMF should shift their focus to establishing a global resolution mechanism for large, complex, internationally active financial institutions, in order to avoid moral hazard while maintaining systemic stability. This is the most important lesson from Lehman's filing for Chapter 11, and the most important lesson for global financial supervision and regulation in the future.

REFERENCES

Ahearne, Alan, Joseph Gagnon, Jane Haltmaier, Steve Kamin, and others. 2002. "Preventing Deflation: Lessons from Japan's Experiences in the 1990s." Federal Reserve Board of Governors, International Finance Discussion Paper 729 (June).

Bank of England. 2009. *Inflation Report*. February.

Bernanke, Ben.S. 1983. "Nonmonetary Effects of the Financial Crisis in the Propagation of the Great Depression." *American Economic Review* 73, pp. 257–276.

Bernanke, Ben. S. 2002. "Deflation: Making Sure 'It' Doesn't Happen Here." Remarks before the National Economists Club, Washington, DC, November 21.

Bernanke, Ben S. 2003. "Some Thoughts on Monetary Policy in Japan." Speech before the Japan Society of Monetary Economics, Tokyo, Japan, May 31.

Bernanke, Ben S. 2009. "The Crisis and the Policy Response." Speech at the Stamp Lecture, London School of Economics, London, England, January 13.

Bernanke, Ben, Mark Gertler, and Simon Gilchrist. 1999. "The Financial Accelerator in a Quantitative Business Cycle Framework." In *Handbook of Macroeconomics, Volume 1*, eds. John B. Taylor and Michael Woodford. Amsterdam: Elsevier North-Holland. pp. 1341–1393.

Board of Governors of the Federal Reserve System. 2009. *Monetary Policy Report to the Congress*. February 24.

Caprio, Gerard, Jr., William C. Hunter, George G. Kaufman, and Danny M. Leipzinger, eds. 1998. *Crises: Lessons from Recent Global Bank Failures.* Federal Reserve Bank of Chicago and Economic Development Institute of the World Bank, Washington, DC: World Bank.

Cargill, Thomas F., Michael M. Hutchison, and Takatoshi Ito. 2000. *Financial Policy and Central Banking in Japan.* Cambridge, MA: MIT Press.

Čihák, Martin; Thomas Harjes, and Emil Stavrev. 2009. "Euro Area Monetary Policy in Uncharted Waters." International Monetary Fund Working Paper WP/09/185 (August).

Clouse, James, Dale Henderson, Athanasios Orphanides, David Small, and Peter Tinsley. 2000. "Monetary Policy When the Nominal Short-Term Interest Rate is Zero." Federal Reserve Board of Governors, International Finance Discussion Papers 729.

Cúrdia, Vasco, and Michael Woodford. 2009. "Credit Frictions and Optimal Monetary Policy." Manuscript, August.

Eggertsson, Gauti, and Michael Woodford. 2003. "The Zero Bound on Interest Rates and Optimal Monetary Policy." *Brookings Papers on Economic Activity* 2003-1, pp. 139–211.

Elliott, Larry, and Jill Treanor. 2009. "Lehman's Fall to Earth: The Last Hours of a Wall Street Giant." Guardian.co.uk, September 3, 2009. http://www.guardian.co.uk/business/2009/sep/03/lehman-brothers-rescue-bid

Hausmann, Ricardo, and Liliana Rojas-Suárez. 1996. *Banking Crises in Latin America.* Washington, DC: Inter-American Development Bank.

Ito, Takatoshi. 2004. "Inflation Targeting and Japan: Why Has the Bank of Japan Not Adopted Inflation Targeting?" In *The Future of Inflation Targeting*, eds. Christopher Kent and Simon Guttmann. Sydney: Reserve Bank of Australia, pp. 220–267.

Ito, Takatoshi. 2007. "Asian Currency Crisis and the International Monetary Fund, 10 Years Later: Overview." *Asian Economic Policy Review* 2(1), pp. 16–49.

Ito, Takatoshi, and Kimie Harada. 2004. "Credit Derivatives Premium as a New Japan Premium." *Journal of Money, Credit, and Banking* 36(5, October), pp. 965–968.

Ito, Takatoshi, and Kimie Harada. 2005. "Japan Premium and Stock Prices: Two Mirrors of Japanese Banking Crises." *International Journal of Finance and Economics* 10(3, July), pp. 195–211.

Ito, Takatoshi, and Yuko Hashimoto. 2007. "Bank Restructuring in Asia: Crisis Management in the Aftermath of the Asian Financial Crisis and Prospects for Crisis Prevention—Malaysia." RIETI Discussion Paper Series 07-E-039.

Krugman, Paul. 1998. "It's Baaack: Japan's Slump and the Return of the Liquidity Trap." *Brookings Papers on Economic Activity* 29(1998-2), pp. 137–187.

McDonald, Lawrence G., and Patrick Robinson. 2009. *A Colossal Failure of Common Sense: The Insider Story of the Collapse of Lehman Brothers.* New York: Random House.

Oda, Nobuyuki, and Kazuo Ueda. 2007. "The Effects of the Bank of Japan's Zero Interest Rate Commitment and Quantitative Monetary Easing on the Yield Curve: A Macro-Finance Approach." *Japanese Economic Review* 58(3), pp. 303–328.

Office of the Special Inspector General for the Troubled Asset Relief Program (SIGTARP). 2009. "Factors Affecting Efforts to Limit Payments to AIG Counterparties." November 17.

Okina, Kunio, and Shigenori Shiratsuka. 2004. "Policy Commitment and Expectation Formation: Japan's Experience under Zero Interest Rates." *North American Journal of Economics and Finance* 15(1), pp. 75–101.

Panetta, Fabio, Thomas Faeh, Giuseppe Grande, Corrinne Ho, Michael King, Aviram Levy, Federico M. Signoretti, Marco Taboga, and Andrea Zaghini. 2009. "An Assessment of Financial Sector Rescue Programs." Bank for International Settlements Papers 48 (July).

Reinhart, Carmen M., and Kenneth S. Rogoff. 2008. "Banking Crises: An Equal Opportunity Menace." NBER Working Paper 14587 (December).

Schäfer, Dorothea, and Klaus Zimmermann. 2009. "Bad Bank(s) and Recapitalization of the Banking Sector." DIW Berlin Discussion Paper 897.

Shiratsuka, Shigenori. 2009. "Size and Composition of the Central Bank Balance Sheet: Revisiting Japan's Experience of the Quantitative Easing Policy." Bank of Japan, IMES Discussion Paper 2009-E-25 (November).

Sorkin, Andrew Ross. 2009. *Too Big to Fail, The Inside Story of How Wall Street and Washington Fought to Save the Financial System.* London and New York: Penguin.

Sudo, Nao, and Yuki Teranishi. 2008. "Optimal Monetary Policy under Imperfect Financial Integration." Bank of Japan, IMES Discussion Paper 2008-E-25.

Svensson, Lars E.O. 2001. "The Zero Bound in an Open Economy: A Foolproof Way of Escaping from a Liquidity Trap." *Monetary and Economic Studies* 19(S-1, February), pp. 277–312.

Taylor, John B. 2008. "Monetary Policy and the State of the Economy." Testimony before the Committee on Financial Services, U.S. House of Representatives.

Taylor, John. 2009. *Getting off Track: How Government Actions and Interventions Caused, Prolonged, and Worsened the Financial Crisis.* Stanford, CA: Hoover Press.

Teranishi, Yuki. 2009. "Credit Spread and Monetary Policy." Bank of Japan, IMES Discussion Paper 2009-E-14 (June).

Ueda, Kazuo. 2005. "The Bank of Japan's Struggle with the Zero Lower Bound on Nominal Interest Rates: Exercises in Expectations Management." *International Finance* 8(2), pp. 329–350.

NOTES

1 Taylor (2009) argues that the financial market turbulence was primarily attributable to counterparty risk, rather than illiquidity, since the Libor-OIS spread highly correlates with the Libor-repo spread, which measures counterparty risk more directly. Here, the TED spread is used to make the same argument.

2 In the aftermath of the banking crisis of November 1997 in Japan, the so-called Japan premium increased sharply. Western banks demanded higher interest rates on Japanese banks who wanted to borrow U.S. dollars. See Ito and Harada (2004, 2005) for the Japanese experiences of the banking crisis from 1997-2003.

3 Both Libor and the OIS rates are influenced by expectations about future interest rate movements but spreads difference out movements in interest rate expectations.

4 Many conversations with market participants confirm that few expected a Lehman failure on the Friday before the negotiation weekend. McDonald and Robinson (2009) also describe similar sentiments inside the company.

5 Accounts of the last hours of the negotiation have been reported by well-informed journalists. See Elliott and Treanor (2009) and Sorkin (2009).

6 For the decision under Section 13(3), only five governors of the Federal Reserve Board are needed to make decisions. Presidents of regional Federal Reserve Banks do not participate in the discussion or voting.

7 This may be a reaction to the fact that maintaining the (average) policy rate at the target level had become increasingly difficult due to the heterogeneity of market participants.

8 Of course, the correct inflation rate may be the forward-looking expected inflation rate. However, timely comparable observations of the expected inflation rate are difficult to obtain. The exact price index for policy purposes may also be different from the headline CPI inflation rate. For example, the United States uses the personal consumption expenditures (PCE) inflation rate, and Japan uses the CPI excluding fresh food (but including energy prices). However, again for comparability, I use headline CPI inflation for the four countries.

9 The BOJ briefly moved into positive interest rate territory between August 2000 and March 2001.

10 In March 2006, the policy target was switched from the current account balance at the BOJ to the call rate, which was set at 0 percent. The 0 percent call rate target was maintained until July 2006.

11 See Bernanke (1983) on the Great Depression.

12 See Oda and Ueda (2007), Okina and Shiratsuka (2004), and Ueda (2005) for descriptions and examinations of the policy duration effect.

13 The BOE increased its ceiling of purchase from £75 billion in March 2009 to £125 in May, to £175 in August, and to £200 in November. The balance stood at £158.4 billion on October 1, 2009.

14 Chairman Bernanke once referred to this range as a "comfort zone."

15 From a footnote of the table of the projection, with emphasis added by the author; see Board of Governors (2009), p. 43.

16 There were only two Japanese financial institutions that reported any sizable exposures to these problematic assets, and the size of their holdings was small compared to their total size of the assets. There were a few incidents, such as the case of "Lehman mini-bonds" marketed to retail customers in Hong Kong and Singapore.

17 "Our approach—which could be described as 'credit easing'—resembles quantitative easing in one respect: It involves an expansion of the central bank's balance sheet. However, in a pure QE regime, the focus of policy is the quantity of bank reserves, which are liabilities of the central bank; the composition of loans and securities on the asset side of the central bank's balance sheet is incidental. Indeed, although the Bank of Japan's policy approach during the QE period was quite multifaceted, the overall stance of its policy was gauged primarily in terms of its target for bank reserves. In contrast, the Federal Reserve's credit easing approach focuses on the mix of loans and securities that it holds and on how this composition of assets affects credit conditions for households and businesses." Bernanke (2009).

18 See Ito (2004) for controversies in Japan over the adoption of QE, the non-adoption of inflation targeting, and the effectiveness of QE. See Oda and Ueda (2007) for policy duration effects.

19 The core capital of major banks was steadily eroded from 1999, when capital injection took place, to 2002, and they found that a large proportion of their Tier I capital was replaced by "tax deferred assets." The new FSA minister Takenaka in October 2002 threatened banks with nationalization and forced them to raise capital. He was reported to have said that "no bank is too big to fail."

20 Taylor (2008) and Cúrdia and Woodford (2009) investigated whether a central bank should respond to the market credit spreads. By modifying the conventional Taylor rule to include the credit spread, Taylor showed that the Fed action of rapid easing in the current crisis can be better explained. This was named the spread-adjusted Taylor rule. Sudo and Teranishi (2008) and Teranishi (2009) showed that under some circumstances, the spread-adjusted Taylor rule is an optimal monetary policy rule. In particular, Teranishi (2009) showed that the spread-adjusted Taylor rule is consistent with optimal monetary policy under heterogeneous loan interest rate contracts in both discretionary and commitment strategies, and that a commitment policy is effective in narrowing the credit spread when the central bank hits the zero lower bound constraint.

21 See Ito (2004, p. 239) for detailed accounts of the Bank of Japan policy.

22 Federal Reserve Act, Section 13(3).

23 The ECB does not issue minutes of monetary policy discussions or discussions about unconventional measures.

24 For example, see Caprio, et al. (1998), Hausmann and Rojas-Suárez (1996), Ito and Hashimoto (2007), and Reinhart and Rogoff (2008).

25 See Cargill, Hutchison, and Ito (2000) for the experiences of the Japanese banks.

26 Banks also shy away from acquiring funds with stringent restrictions because of a "stigma issue." They fear the market will think the banks that accepted the funds were in worse financial shape.

27 See Ito (2007) for a critical review of the "prior condition" for the IMF program for Indonesia on October 31, 1997.

28 Schäfer and Zimmermann (2009) argue that "bad banks and nationalization are not alternatives but rather two sides of the same coin."

29 See Ito and Hashimoto (2007).