

Market Liquidity and Short Term Credit: The Financial Crisis of August 2007

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Those of us on the western side of the Atlantic woke up the morning of Thursday 9 August to learn that the European Central Bank had engaged in a fine-tuning operation of €94.8 billion – by far the largest in history. The following day, as these overnight repurchase agreements expired, the operation to renew them was two-thirds the size – a still very large €61.1 billion.¹ Meanwhile, the Open Market Trading Desk of the Federal Reserve Bank of New York used one-day repurchase agreements to inject \$24 billion in reserves into the U.S. banking system on Thursday; and when those expired on Friday the Desk upped the amount by \$38 billion for the weekend.²

On Friday 17 August, a week after these extraordinary open market operations, the Federal Reserve made two announcements: (1) The Federal Open Market Committee (FOMC) issued a statement. And, (2) The Federal Reserve Board announced a reduction in the primary credit discount rate from 6.25 percent to 5.75 percent.

This entire set of actions was aimed at calming what are generally called money markets. These are the short-term lending markets where banks borrow from each other and industrial companies issue commercial paper with maturities from several days to several months. The money markets had come under stress, and unless things improve there is a very real risk that these disturbances in the financial system will find their way into the real economy. Policymakers' actions were intent on keeping that transmission from occurring.

The big issue is whether central bankers can really do anything about the current crisis. I will address this question in three steps. First, I will describe the symptoms of the crisis. How is it that we can tell there is a problem? Second, I will examine the likely causes of the current problem. Where did this all come from? Third, I will look at the Federal Reserve's interventions. What exactly have American central bankers and why did they do it? Because it plays to my strength, I will focus on what has gone on in the United States and the lessons for others.

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¹ It is difficult to locate data on the ECB's operations on their website. The information is posted as it occurs, but once a set of repurchase agreements expire, it is then available either at the end of a reserve maintenance period or in the next published monthly bulletin. This can be as much as a month in the future.

² Data on Federal Reserve Bank of New York Open Market operations are posted shortly after they occur, and the entire historical data can be downloaded from www.ny.frb.org/markets/omo/dmm/temp.cfm.

Symptoms of the Crisis

Encouraged by the way in which the business press covers financial developments, the average person focuses attention on equity markets. Take a look at any news source and you will see that fixed-income markets get only a small fraction of the space that stock markets do. This makes sense once you think about it: On an average day there is much more news about stocks than there is about bonds. And a savvy bond investor will outperform his or her peers by 10 or 20 basis points, while a prize-winning equity trader can beat the market average by at least ten times that. Furthermore, most retail investors – the paying subscribers to the news sources – are only exposed to bonds through funds. Purchasing individual bonds is a complex and difficult business – there are many more bond issues than stock issues, bonds are generally not exchange traded, and the opacity of the bonds makes it difficult for non-experts to evaluate them.

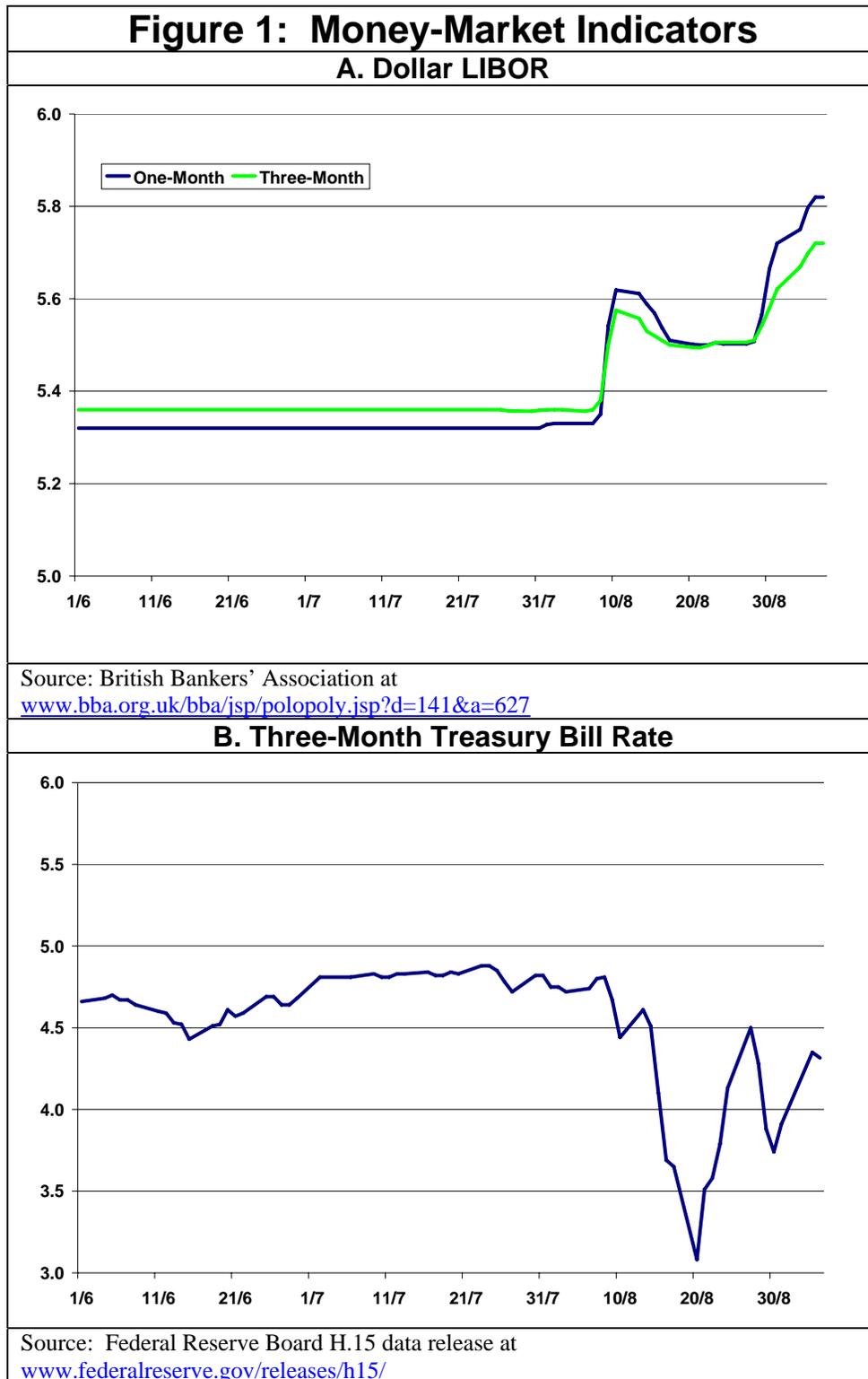
But all of this presumes that bond and money markets are functioning smoothly. Unfortunately, there are times when they are not. The last big event in the fixed-income markets was in the fall of 1998. Following the Russian default on 17 August 1998 and the collapse of Long-Term Capital Management over the following month, bond market simply ceased to function. This prompted William McDonough, then President of the Federal Reserve Bank of New York, to declare on October 5, 1998, “I believe that we are in the most serious financial crisis since World War II.”³

The primary symptom of the 1998 crisis was that risk spreads increased to the point where many bonds simply could not be traded. Things were so bad that it was difficult to trade U.S. Treasury bonds. This was worse than a textbook flight to quality, as investors were fleeing everything but the most recently issued, “on-the-run,” U.S. Treasury bonds. An indication of how bad things were is that the spread between the 29 and 30 year Treasury bond was in the range of 30 basis points, and the bid ask spread for the off-the-run issues rose as high as 5/32nds.

Today, the problem is different, at least for now. While various markets are facing dislocations – the market for so-called “nonconforming” mortgages, for example, the focus of the August 2007 crisis is on the short-term markets.⁴ Figure 1 reports a number of indicators that can help understand the problem. Panel A plots the one- and three-month dollar LIBOR (London Interbank Offer Rate). This is the interest rate at which large banks offer to lend unsecured funds to other banks. Over the last three weeks has risen by roughly 30 basis points. But more importantly, the normal spread between the one- and three-month lending has been reversed: It is more expensive to borrow short than it is to borrow long. We can speculate on the reasons for this. It could be that no one is able to borrow for three months, so while we see posted prices, there are no loans. (There are no quantity data that I know of.) Alternatively, it could be that banks are being divided into two quality classes and the “good” banks can borrow for three months at a favorable rate, while the “bad” banks can only borrow short-term at the higher rate. This brings up to our first symptom: Banks are having a difficult time obtaining funding in the interbank market.

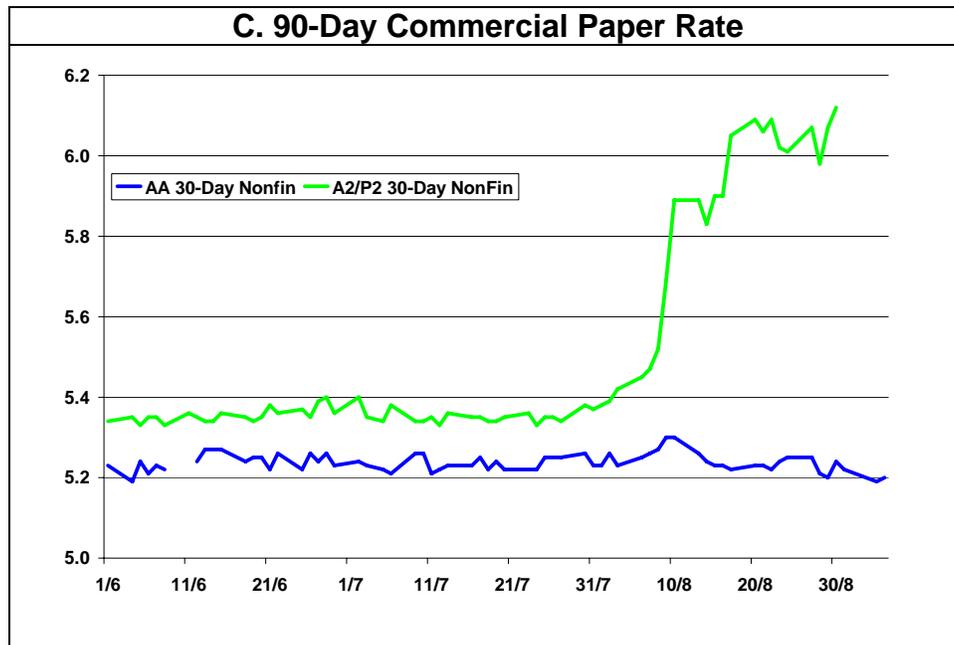
³ See Jacob M. Schlesinger, “Global Fragility Prompted the Fed to Cut Rates,” *Wall Street Journal*, 6 October 1998, pg. 1.

⁴ A nonconforming mortgage is one that does not meet the requirements for Federal Housing Authority insurance. The most important limit is on the size of the loan. “Jumbo” mortgages, those in excess of \$417,000, are nonconforming.

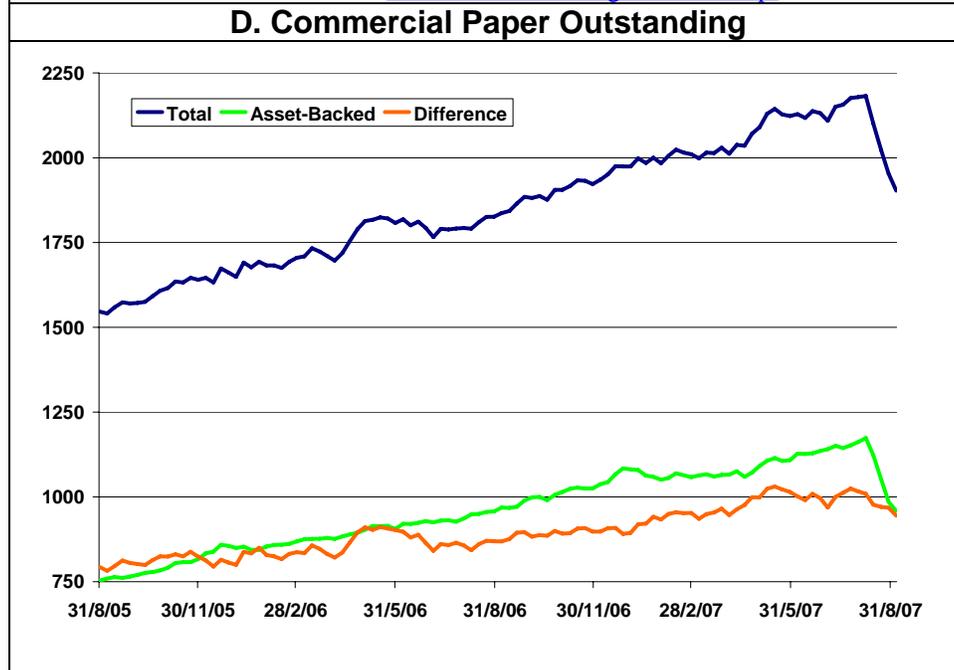


Next take a look at the 3-month Treasury Bill rate plotted in panel B. Notice how this fell suddenly from about 4.9 percent to 3.1 percent. That huge move was the result of individuals' strong desire to hold something they were certain had no default risk. The extreme drop in the

T-Bill rate only last a few days before things started to stabilize, but this sort of thing is a clear indication that people are fleeing any real or perceived risks



Source: Federal Reserve Board at www.federalreserve.gov/releases/cp/



Source: Federal Reserve Board at www.federalreserve.gov/releases/cp/outstandings.htm

Third, there is the commercial paper. This has been a focal point for the market disruptions. The commercial paper market in the United States is enormous. Before the crisis started, the

Federal Reserve Board's reported that there were roughly \$2.2 trillion in commercial paper outstanding. Most commercial paper is short-term borrowing that is backed by either a bank line of credit or a security or some sort. And the term tends to be very short. For example, half of what is outstanding today will mature in the next four weeks. That means that something like \$1 trillion in borrowing will have to be refinanced some time in September – that's about \$50 billion every business day.

Panel C of Figure 1 shows the interest rate on 30-day commercial paper for both high- and low-grade nonfinancial borrowers. The interesting thing about this chart is that the AA borrowers are doing fine, while the low grade credits face increase of 60 to 70 basis points in the borrowing costs.

The quantities of commercial paper outstanding are plotted in Panel D of Figure 1. Included are the total (that's the top line), the quantity that is asset-backed, and the difference. The decline has been incredible. Over the three weeks from 9 to 22 August the outstanding amount has fallen by \$229 billion, or 11 percent. It is important to note that over 80 percent of this decline – \$188 billion – has been in the asset-backed portion of the market. That is, people who were issuing commercial paper backed by assets (one has to suspect that many of these are related to mortgages) have not been able to roll over their maturing issues.⁵

To summarize, the crisis is in the short-term lending markets. Both financial and nonfinancial firms have been unable to use standard mechanisms to borrow cash to conduct their normal daily business. We can see this both because interest rates have spiked and quantities have declined.

Before going on, it is important to note there are indications that some of the decline in commercial paper issuance has been made up with bank lending. That is, unable to borrow directly in financial markets, people have turned to back-up lines of credit they had with their banks. We can see this in the consolidated balance sheet of the all U.S commercial banks, which shows an increase in total lending of roughly half of the dollar fall in commercial paper.⁶

Changes in the Financial System and the Causes of the Crisis

To examine the causes of the crisis, I will start by digressing a bit into a discussion of the financial system. Over the past several decades, the financial system has evolved in a way that improves the efficient operation of the economy. In the past, payment streams and risks tended to come bundled together. Bonds were sequences of coupons with principal payment at maturity, and the issuer could default on some fraction of these promises. Today, bonds are stripped so that coupons and principal can be purchased separately and the risk of default insured. More generally, you can purchase or sell virtually any payment stream with any risk characteristics that you want – that's what financial engineering is all about.

This ability to separate finance into its most fundamental pieces – the financial analog to the particle physicist's quarks – has had profound implications for the way in which risk is bought and sold. Today, risk really does go to those who are most able to bear it. Markets allocate the

⁵ In addition, there are recent reports that high-yield bond issuance fell to \$245 million in August 2007, roughly one-tenth the rate in average monthly rate in 2000, the lowest year reported by the Securities Industry and Financial Markets Association at www.sifma.org/research/pdf/Corporate_HY_IG.pdf. See also Koons (2007).

⁶ You can see this in the Federal Reserve Board's weekly publication of the consolidated balance sheet of the U.S. commercial banking system in the H.8 release, available at www.federalreserve.gov/releases/h8/.

risk to those who are willing to take it on for the lowest price. The result is that we can insure virtually anything and engage in many activities we wouldn't have undertaken in the past.

On the plus side, I am convinced that the development of the financial system is an important source of the Great Moderation – the reduced volatility of real growth in the developed world over the past 20 years. Faced with income volatility, individuals today can use the financial system to insure that their consumption remains smooth. Amazingly, this adds up to macroeconomic stability.⁷

The fact that we can now cut up and repackage risk, and then sell it easily and cheaply, has created a new set of risks. In May 2007 Chairman Bernanke noted that in the case of the sub-prime mortgage market it has created what is known as a “principal-agent” problem. Sub-prime mortgage originators act as the agents for the investors, who are the principals. And the principals failed to impose sufficient discipline on their agents. The result has been a myriad of increasingly complex and insufficiently transparent securities that virtually no one understands how to value. Unsophisticated investors purchased these assets without even realizing what questions they should be asking of the sellers. The result of this lack of discipline is that the securities are of extremely low quality.⁸

Federal Reserve Vice Chairman Donald Kohn summarized the risks in comments on 16 May 2007:

“[T]he growth of tranching CDOs and other structured credit products with substantial embedded leverage has made it more difficult to assess the degree of leverage of individual institutions or of the financial system as a whole.”

The fact that most people have no idea what a “tranching CDO” is emphasizes the point.

This brings us to the causes of the current distress. Why did the money market dislocation occur when it did? While we can see something that has happened, as I suggested earlier there has been no fundamental deterioration in economic conditions. In fact, in the United States there was no economic data released on Thursday 9 August 2007. So, it isn't that people suddenly changed their view of the future.

Instead, what happened was analogous to a bank run. Bank runs result from the fact that depositors (bank liability holders) delegate the monitoring of the quality of bank assets to the bank's managers. We do this because even the more sophisticated among us are not in a position to assess the quality of the assets on a financial institution's balance sheet. In fact, most of us don't even know what those assets are. (Do you know what your bank's assets are?)

⁷ See for Dynan, Elmendorf, and Sichel (2006) and Cecchetti, Flores-Lagunes, and Krause (2005).

⁸ A second problem that arises from the ability to buy and sell risk easily and cheaply is that individuals can accumulate risk in almost arbitrarily large amounts. Combined with compensation schemes in which money managers share the gains but not the losses of their investment strategies, this creates incentives to take on huge amounts of risk. Without risk, there is no reward; and without big risks there are never big rewards. The result is that small numbers of individuals have the potential to jeopardize the stability of the entire financial system. They do this not because they fail – the right to succeed in the capitalist system is the right to fail – but because of the knock-on effects they will have when they fail. In this case, which is a description of the 1998 Long-Term Capital Management episode, it is the interconnectedness of the system's the biggest challenge. And the more complex the system becomes, the bigger this risk becomes.

So when we learn that one bank is in trouble, that the trust its depositors placed in their banks managers had been misplaced, we all begin to worry. Should we really trust the managers of our banks? When you lose trust, you want to get out, and getting out safely means being first in line to redeem your deposits. The result is a run. More generally, the inability to accurately value assets leads to a strong shift toward high-quality securities like Treasury bonds.

Thinking about it this way, there are two events that may have precipitated the crisis. The first was the announcement on 2 August that the German bank, IKB Deutsche Industriebank AG, was in trouble because of investment in U.S. subprime loans. And then, on Wednesday that one of Europe's largest banks, BNP Paribas had three funds with similar problems.

As it became apparent that subprime mortgage losses were much worse than even the most pessimistic observers had feared, financial market participants' response was to reduce their exposure to risky investments under the assumption that they could not properly assess the risks. That's exactly analogous to a bank run. It is impossible to predict the exact timing of something like that.

Central Banks: Objectives and Instruments

This brings us to central banks, their objectives and their instruments. We have reached a broad consensus over the principles under which a central bank should operate. This agreement over best practices states that central banks should focus on three objectives:

1. Low, stable inflation
2. High, stable real growth
3. A stable financial system

Stabilizing the financial system is a tricky business. Given the actions that policymakers have taken over the past several decades, my interpretation of this is as follows. In the very short term, the central bank must ensure that financial markets remain liquid so that individuals can trade, and that there isn't an excess of price volatility. Regulators and supervisors are in charge of ensuring that there is minimal contagion associated with the failure of any individual institutions. (It so happens that in the United States, the Federal Reserve has this later function as well, but that is not universally the case.)

It should not, however, bail out people who make bad investments. Federal Reserve Chairman Ben Bernanke said it best:

"It is not the responsibility of the Federal Reserve – nor would it be appropriate – to protect lenders and investors from the consequences of their financial decisions."
31 August 2007

Achieving these goals means reducing systematic risk in the economy. That is, lowering the undiversifiable risk that we all necessarily face; and with a reduction in economy-wide risk comes an increase in the level of real growth and a fall in risk premia.

Central bankers have a very limited set of tools they can bring to bear on their stability objectives. In fact, there are really only two: (1) the size of their balance sheet, and (2) the composition of the assets they hold. Remember that central bank liabilities are not a tool as they are almost entirely composed of currency and commercial bank reserves.

The first tool, balance sheet size, is used to control the overnight interest rate – really to have an impact on the short-term real interest rate. There are two operational methods by which the size of the balance sheet changes, open market operations and discount lending. Importantly, the first of these is at the discretion of policymakers while the second is the result of decisions by commercial bank borrowers.

In deciding on the size of their balance sheet, and setting the short-term interest rate target, policymakers will normally be trying to answer the following question:

“Are current financial conditions appropriate to attain medium-term macroeconomic stabilization objectives?”

Decisions about the composition of assets on the central bank’s balance sheet are quite complex. The example we are all familiar with is sterilized foreign exchange intervention. The best way to think about this is as the sale of a bond issued in one currency and the immediate purchase of a bond issued in another currency. That’s a change in the composition of central bank assets.⁹

It is also possible for central banks to change the composition of the purely domestic assets held on their balance sheets.¹⁰ This can be done through a change in what is directly purchased and held; by decisions about what to take as collateral in repurchase agreements; or by adjustments to what can be pledged in exchange for a discount loan.

While changes in the size of the balance sheet are aimed at keeping the level of the overnight interest rate close its target, adjustments in the composition of central bank assets can be used (at least in principle) to influence risk premia and interest rate spreads. So, in formulating policies related to this, policymakers will try to answer questions like:

“Do financial institutions and markets have sufficient funds to carry out their daily business?”

and

“Do market determined risk spreads accurately reflect current uncertainties in economic fundamentals?”

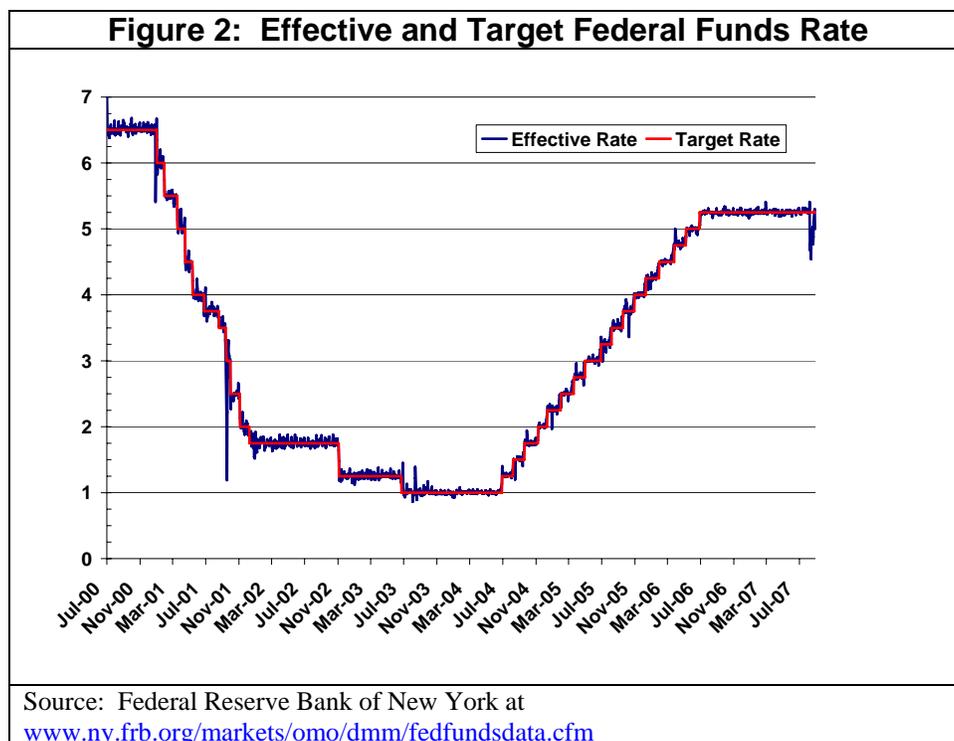
⁹ For a discussion of central bank balance sheet management see Chapter 17 of Cecchetti (2009).

¹⁰ The most prominent historical example of this is the failed “operation” twist in the early 1960s when the Federal Reserve attempted to change the slope of the yield curve, without changing the level of short-term interest rates.

Recent Federal Reserve Interventions

Over the past 3 weeks, the Federal Reserve has done acted in ways that affect both the size and composition of its balance sheet. Here's the list:

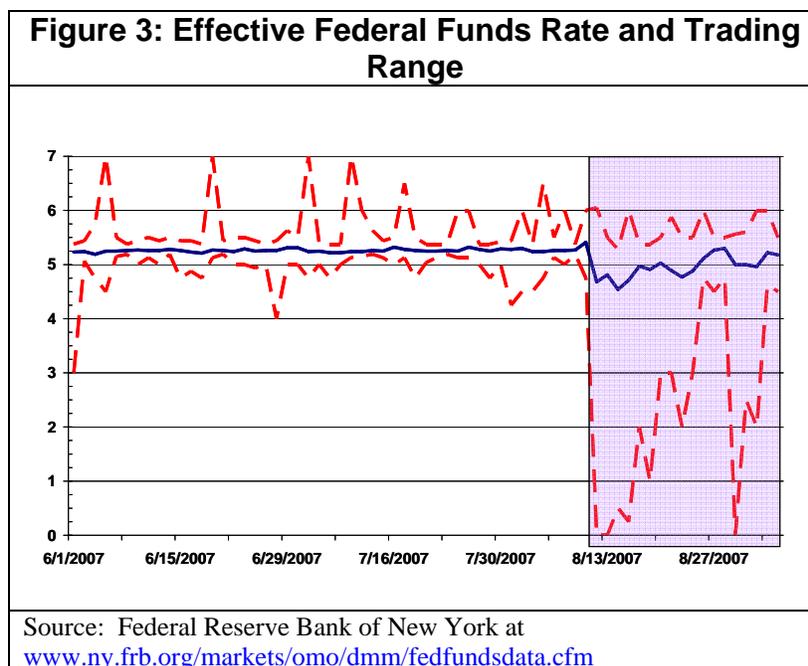
1. 9 August Open Market Operations
 - a. Balance sheet increase that drove the federal funds rate down 50 basis points
 - b. Change the composition of what they took in repo to focus on mortgage-backed securities
2. 17 August Statement by the FOMC noting the risks to growth
 - a. Given the committee's communication policy (what might be called *ex ante* transparency) this was necessary in advance of a cut in the federal funds rat target.
3. 17 August Discount Rate Cut aimed at composition:
 - a. Reduced the primary lending rate 50 basis points to encourage borrowing
 - b. Allowed loans for a term up to 30 days
 - c. Emphasized the acceptance of a wide-range of collateral



We can go through these quickly, starting with the open market operations. The Federal Reserve Bank of New York's Open Market Trading Desk has the job of keeping the market-determined federal funds rate close to the target set by the Federal Open Market Committee. They are very good at this. Figure 2 plots and you can see that, with only a few exceptions, they keep the market rate (the jumpy line) very close to the target.¹¹

¹¹ For a description of the mechanics of how the Fed does this, see Cecchetti (2007a).

Now take a look at Figure 3, which plots the effective federal funds rate along with the daily high and low that are recorded. Throughout this period the official target has been 5.25 percent. Focusing on the last 3 weeks (the shaded area in the Figure), we can see that the market rate has been allowed fall well below the target, staying between 4.75 and 5.00 percent most of the time. In addition, the trading range has been extremely wide, falling to zero on a few occasions. In effect, the Fed cut the federal funds rate for a while. They did this unofficially, in the hope (one suspects) that they will not have to lower the official target.



On Friday 10 August the Fed accepted mortgage-backed securities as collateral for the entirety of the \$35 billion in repos it engaged in that day. Importantly, though, they did not accept just any mortgage-backed securities. They only allowed dealers to pledge mortgage-backed securities issued or fully guaranteed by federal agencies.

Two observations are relevant here. First, this is not new. The willingness to accept mortgage-backed securities as collateral in repo goes back to changes made in advance of Y2K. At the time there were concerns about being able to get funds into the financial system quickly, and this is one of the changes made to ensure the Open Market Desk could do that. Since then, the Fed has taken mortgage-backed securities as collateral in repo at nearly the same rate they have taken agency securities.

Nevertheless, the way in which the Fed chose to do this on Friday 10 August is notable. Normally, when the Fed sends out a message they tell dealers exactly what they want in collateral. Each of the three categories is treated separately. So, it is common for the Desk to send out a message that they are willing to accept only Treasury securities. Alternatively they might send out a message that they will accept all three types – Treasury, agency and mortgage-backed – in three separate operations. What the Desk did on Friday is send out a message that said they would take whatever the dealers wanted to deliver. Since mortgage-

backed securities are the cheapest to deliver (they have the lowest price in the market), that's what came in.

My speculation is that the Fed did this to demonstrate to the markets that they believe mortgage-backed securities are good as collateral. They were trying to encourage financial market participants to value mortgage pools sensibly.

Next, we can turn to changes in discount lending. Historically, banks have been extremely reluctant to borrow. Over the past year, borrowings have averaged less than \$200 million per day (that's with an "m"). On a normal day, bank's hold a total of around \$12 billion in their reserve accounts at the Fed, so \$200 million is a very small number.

Once-upon-a-time (over a decade ago) discount borrowing had a stigma attached to it. If a bank borrowed too frequently, the people running the bank must not be very good at managing their balance sheet; or, so the logic goes. Frequent borrowers would be admonished by the Federal Reserve.

When the discount rate was one-half of one percentage point below the target federal funds rate, discouraging borrowing may have made some amount of sense. But that's no longer the case. So why don't banks do it?

There are two reasons that banks have not utilized discount borrowing with any frequency. First and foremost, is the cost; it is more expensive to borrow from the Fed than it is to borrow from other banks. Over the past two weeks, the federal funds rate in the market has been regularly below not just the primary discount rate (which was 6.25 percent until 10 August) but below the target of 5.25 percent. The following table reports the effective (quantity-weighted) federal funds rate along with the reported high and low levels for the past 15 business days.

But there is another very good reason that banks are unlikely to borrow. Here's the problem. When I attended meetings of the Board of Directors of the Federal Reserve Bank of New York I would receive a copy of the notebook the Directors had. Inside this book was a listing of all of the discount loans the Bank had made since the last meeting – the size of the loan and to whom it went. Since the Reserve Banks are private nonprofit corporations and chartered banks, this made sense. The Directors had a fiduciary responsibility for the management of the bank.

That's all well and good, but by statute three of the each Reserve Bank's directors are bankers. That meant that they were able to see who was borrowing. Since the directors rotate every few years, and bankers surely talk to each other, I strongly suspect that everyone knows some of their competitors will find out they have borrowed from the Fed. Would you borrow under those circumstances?

Some observers have suggested that the Fed's actions of the last three weeks – largesse in open market operations and discount lending without changing the federal funds rate target – are an attempt to separate policies aimed at stabilizing the financial system from those directed at conventional macroeconomic stabilization.¹² I doubt that this is the case. As I noted earlier, when setting short-term interest rate targets, policymakers ask whether the level is consistent with financial conditions appropriate for meeting medium-term objectives of low, stable inflation and high, stable growth. But financial conditions can change for many reasons

¹² See, for example,

unrelated to the current policy stance. When that happens, it may be necessary for central bankers' to adjust their interest rate target.

So far (on 3 September) the FOMC has not adjusted its federal funds rate target. The reason is not that financial conditions are unchanged since the target was set at 5.25 percent on 29 June 2006. Clearly, over the last three weeks the willingness of lenders to lend and the ability of borrowers to borrow have changed. And the actions of the Fed have been directed – correctly in my view – returning the system to some semblance of normalcy.

The distinction, I believe, is between policies aimed at short-term financial stabilization and those directed at medium term macroeconomic performance. Chairman Bernanke and his colleagues clearly hope that their recent actions will address the short-term turmoil without affecting the outlook for inflation and growth.

Remaining Questions

The biggest question is whether this is all going to work. So far it has calmed things down a bit, but stresses are clearly still there. Interbank term lending is expensive when you can get it, and commercial paper is difficult to issue. There are two big questions that we face:

1. Do central bankers have the right tools to handle the crisis?
2. Do we have the tools to mitigate the information problems that plague financial arrangements?

On the first, it seems clear that the federal funds rate is not the first-line of defense against short-term financial market disrupts. Instead, it is the ability of policymakers to lend. Here the problem turns on central bankers' capacity to accurately value securities that are used as collateral. Collateral valuation and proposals that the central bank become a market-maker of last resort¹³ are related to the general issue that faces central banks when acting as a lender of last resort. The original Walter Bagehot rule was to lend freely on good collateral at penalty rates. But there is a potential flaw. For the system to work, central bank officials who approve the loan applications must be able to distinguish an illiquid from an insolvent institution. But during a crisis, computing the value of a bank's assets is almost impossible, since there are no market prices. (If a bank could readily sell its marketable assets, it wouldn't need a loan from the central bank.) Because a bank will go to the central bank for a direct loan only after having exhausted all opportunities to sell its assets and borrow from other banks without collateral, its illiquidity and its need to seek a loan from the government raise the question of its solvency.

When it comes to making markets, the problem is even worse. The idea, as I understand it, is that when financial markets seize up, central bankers should start to offer to buy and sell the securities that investors and traders refuse to trade. But I would assume that the reason for market disruptions is that the high-paid mathematical financial whizzes inside the investment banks can't figure out how to price the securities. For the central bankers to make a market, their staff will need to determine the prices at which the illiquid assets should be trading. My guess is that the people inside the Federal Reserve System who are better at this than the employees of Goldman Sachs have already left the public sector.

Turning to the more general problems created by information asymmetries, we have traditionally used three mechanisms for addressing these: (1) Collateral and net worth, (2) information

¹³ See Buiter and Sibert 2007.

disclosure, and (3) ratings agencies. In the context of financial intermediaries, capital plays the role of collateral. Here, there is a consensus building that we need to improve capital regulation to insure the accurate treatment of the risks posed by what are now off-balance-sheet exposures. It seems unlikely that increased information disclosure will help in the determination of the risk embodied in new, complex, financial instruments.¹⁴ Instead, we will probably have to focus on ratings agencies; and here there is some reason for optimism. While financial geniuses will continue to create new structures that they try to make opaque, we will be able to force transparency through both pricing and ratings agencies. The newest securities that are not universally understood will command lower prices, discouraging certain behavior. And the ratings agencies will step back and regain the conservatism they have always had, and produce information that we will once again be able to trust.

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¹⁴ As Federal Reserve Governor Frederic Mishkin (2007) noted recently, during times of rapid financial innovation "lending booms can sometimes outstrip the available information resources in the financial system."

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