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FEDERAL RESERVE BANK OF DALLAS

Fed Confronts Financial Crisis by Expanding Its Role as Lender of Last Resort

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Unprecedented measures to open financial arteries show some signs of success.

The current recession has deepened because of shrinking credit flows from banks, nonbank lenders and securities markets. This contrasts with the early 1990s, when new bonds and commercial paper cushioned a bank credit crunch, and with the high-tech investment bust of the early 2000s, when steady bank lending lessened the impact of receding bond and equity finance markets.

This time, breakdowns in key credit markets posed great risks to the financial system and the broader economy. The Federal Reserve responded with unprecedented measures, expanding its role as lender of last resort in an effort to unclog credit markets and free up the financial flows vital to a well-functioning economy.[1]

Uncertainty about asset values led to a general rise in the demand for liquidity.

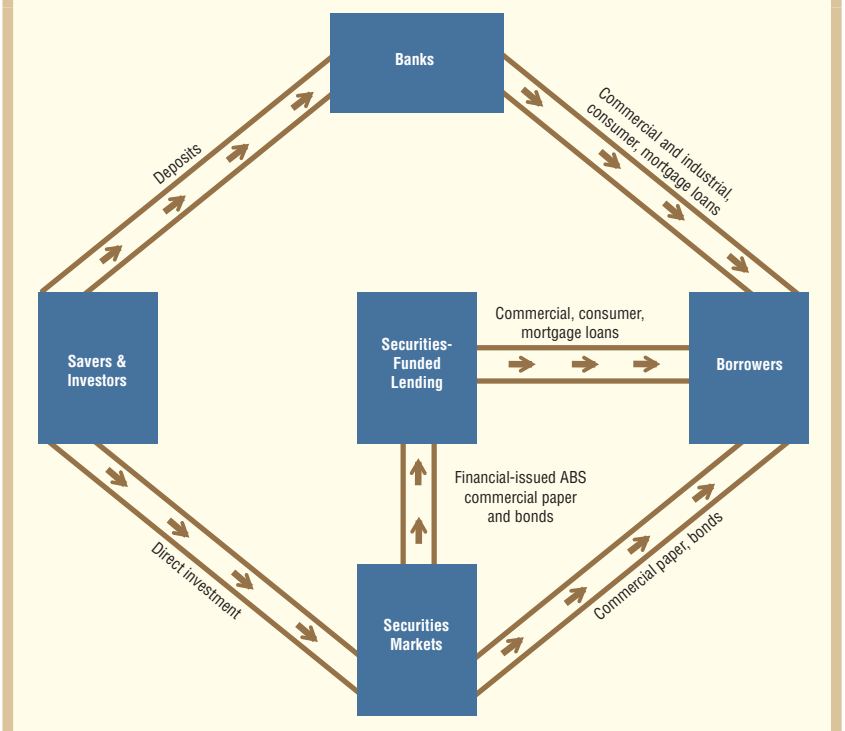
An apt metaphor is the cardiovascular system, which sustains the human body. In like fashion, financial flows provide critical sustenance to the economy, channeling funds to borrowers and payments back to lenders. In both biology and finance, blockages are unhealthy. Indeed, the financial system's seizing up in the last quarter of 2008 triggered the sharpest decline in domestic economic growth since the credit crunch of 1980.

The U.S. financial system is complex, but three channels dominate the flow of money from savers and investors to borrowers. First, the traditional banking system raises funds from depositors, then lends to borrowers (*Chart 1, top section*). Second is securities-funded lending, which can take two forms. Lenders can make loans and sell them as securities. Or they can hold the loans in portfolio and fund them by issuing debt in the securities market (*middle*). Third, well-known and highly regarded companies are able to directly finance their needs by issuing debt in the securities markets (*bottom*).

Normally, these channels efficiently move funds from savers and investors to borrowers at interest rates that reflect underlying risks and reasonable profit expectations. In the current crisis, each channel has been blocked due to many financial institutions' weak condition and investors' and lenders' extreme aversion to risk. The result has been a significant choking off of economic activity.[2]

Clearing the blockages has become critical to restoring the economy's health. A rebound will take time, but the good news is that several initiatives have helped parts of the financial system stabilize, a necessary step on the road to recovery.

Chart 1
Channeling Credit to Private Borrowers



Support for Bank Lending

The interbank loan market arose to allow banks with unfunded investment opportunities to borrow at very low interest rates from banks with excess deposits. Ready access to additional funds gave banks more confidence about making loans.

Until summer 2007, this market's benchmark London interbank offered rate, or Libor, typically ran a tenth of a percentage point above the risk-less rate expected over the life of the loan—the overnight indexed swap, or OIS, rate. The spread started widening after several European investment funds halted redemptions on Aug. 14, 2007, because they couldn't price parts of their portfolios invested in securities backed by subprime mortgages and other risky assets. This event set off a crisis of confidence among banks, and just a month later—in mid-September—Libor–OIS spreads were nearly 1 percent.

Uncertainty about asset values led to a general rise in the demand for liquidity. Institutions hung on to extra liquidity to meet their own fund-

ing needs. And they feared lending to institutions whose default risk had risen because of exposure to subprime mortgages and other suddenly suspect assets.

Because banks could no longer count on Libor borrowing to fund excess loan demand, they tightened credit standards and terms for non-bank customers. The Federal Reserve's quarterly Senior Loan Officer Opinion Survey asks roughly 60 large banks how their credit standards changed in the past three months. In April 2007, a sizable percentage of banks had begun tightening criteria on subprime and commercial mortgages, but only a small share had raised standards for non-real estate loans (*Table 1*).

By October 2007, roughly two months after the Libor-spread spike, banks were tightening on all major types of loans. A year later, net tightening rose in all loan classes following the collapse of Lehman Brothers, a major investment bank.

In effect, the mechanism that pumped funds between lending and borrowing banks had become partly blocked. The Fed looked for ways around the blockage. In early fall 2007, it extended terms and lowered costs on banks' borrowing from its primary credit facility—the discount window. However, these steps did little to restore lending because banks feared borrowing from the Fed might create the perception that they were on the verge of failing.

So the Fed acted again. In addition to further lowering costs for discount window borrowing, it created the term auction facility (TAF), which allows banks to anonymously bid on collateralized long-term loans (*Chart 2*). This can be likened to inserting a stent that partially reopened Libor's arteries.

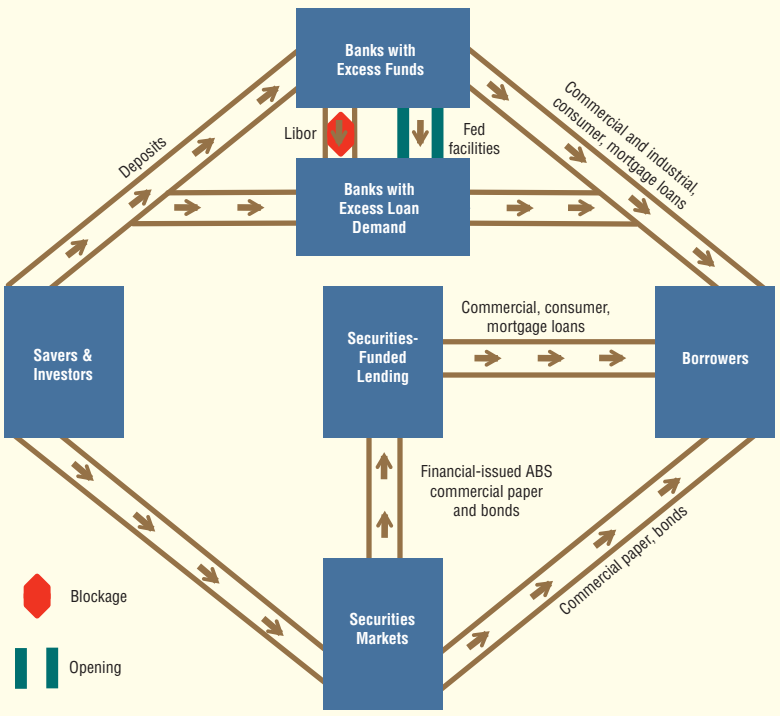
To an extent, the move succeeded in quashing the stigma of borrowing from the Fed, and Libor spreads narrowed—but not enough.[3] They remained elevated through the first eight months of 2008, a span that

Table 1
Banks Tighten Credit Standards

	Net percentage tightening credit standards over three months on:	April 2007	Oct. 2007	Oct. 2008	Jan. 2009
Real estate	Prime mortgages	15%	41%	70%	47%
	Subprime mortgages	56%	56%	100%	56%
	Commercial real estate	30%	50%	87%	79%
Business	Business loans (large/medium firms)	–4%	19%	84%	64%
	Business loans (small firms)	2%	10%	75%	69%
Consumer	Consumer loans (non-credit card)	8%	26%	64%	58%

SOURCE: Senior Loan Officer Opinion Survey, Federal Reserve Board.

Chart 2
Bypassing the Blockages in the Libor Market



included the Fed and Treasury funding that facilitated the March 2008 sale of Bear Stearns, a key Wall Street investment bank.

A major reason the TAF didn't fully unwind Libor spreads was the rise of counterparty risk—the possibility that the other party to a financial contract would be unable to keep its end of the bargain. Banks were leery of lending to each other out of fear that counterparty risk would materialize. In fall 2008, Libor spreads spiked largely because it was unclear how much counterparty risk other companies faced as a result of Lehman Brothers' collapse—or similar events that might follow (*Chart 3*).

After Lehman's failure, Libor spreads didn't start receding until two key events arguably lowered counterparty risk. The first was partial payment on Oct. 10, 2008, of credit default swap insurance the investment bank had provided on many securities. The Lehman settlement helped lower counterparty risk by clarifying many firms' exposure and reducing uncertainty about financial firms' ability to absorb losses.

These efforts partially repaired the damage that loan losses and uncertainty have done to the banking system's ability to pump credit to borrowers.

The second was the announcement the next day that the Group of Seven (G-7) nations would recapitalize their banking systems and increase liquidity facilities to back up banks. The G-7 actions gave banks additional support against systemic surges in liquidity demand.

These efforts partially repaired the damage that loan losses and uncertainty have done to the banking system's ability to pump credit to borrowers. By bolstering banks' equity cushions, the limited recapitalization has helped lower counterparty risk, providing some relief to the banking system.

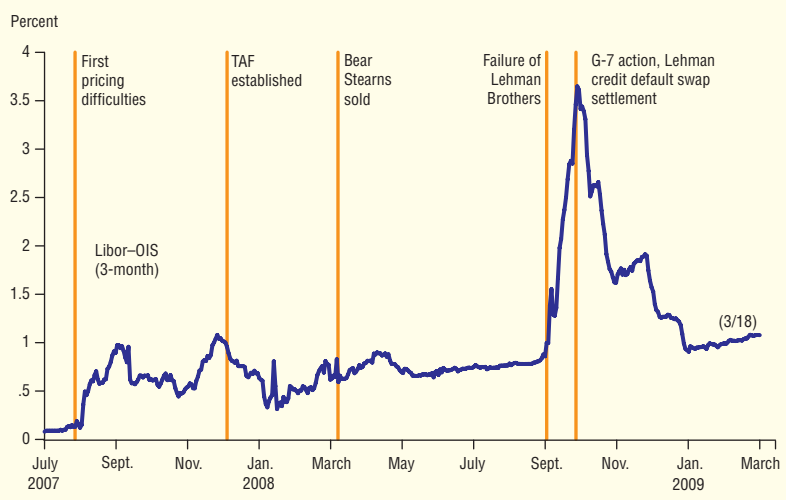
In the early months of 2009, Libor spreads have been far below their early-October highs but remain nearly a percentage point above their long-term averages. The persistent wide spread likely reflects continuing concerns about banks' current and future health and the recognition that further action will be needed to clean up the financial system.

As Libor spreads narrowed, the Fed's loan officer survey began showing a parallel development—an ebb in tightening of credit standards. (*See Table 1 on p. 3.*) It was slight, to be sure. The months leading up to January still showed considerable caution among lenders. It probably reflected the combination of a poor economic outlook, the compromised condition of many banks and new write-downs of bad loans and investments. Because of banks' critical role in the overall credit markets, the Treasury is developing additional plans to reduce stress on the system.

Credit Funded by Securities

The Federal Reserve Act empowers the central bank to make collateralized loans to banks as a way to prevent solvent institutions from failing due to a lack of liquidity. In 1932, Congress expanded the Fed's authority to act under extreme circumstances, allowing collateralized lending to nonbanks to help support financial markets.

Chart 3
Interbank Loan Costs Retreat After Rescue Efforts



SOURCES: *Financial Times*; *Reuters*.

Until recently, the Fed had used this power only during the Great Depression. It didn't invoke this authority in the wake of the 1987 stock market crash or the terrorist attacks of September 11, 2001. Instead, the Fed did what it usually did: provided banks with discount loans to support their lending to securities dealers and other borrowers.

Neither event halted a financial boom that was closely linked to strength in a few sectors of the economy. This time, a financial boom did come to an end, and it was directly related to the financing of homebuilding and housing-backed consumer borrowing—major drivers of the recovery from the 2001 recession.

It's against this backdrop that the Fed has extended its role as lender of last resort beyond banks. Since late 2007, the central bank has supported key credit flows funded by securities, extending loans on nonfinancial corporations' commercial paper, residential mortgage-backed securities and nonbank financial companies' loans to consumers and businesses.[4]

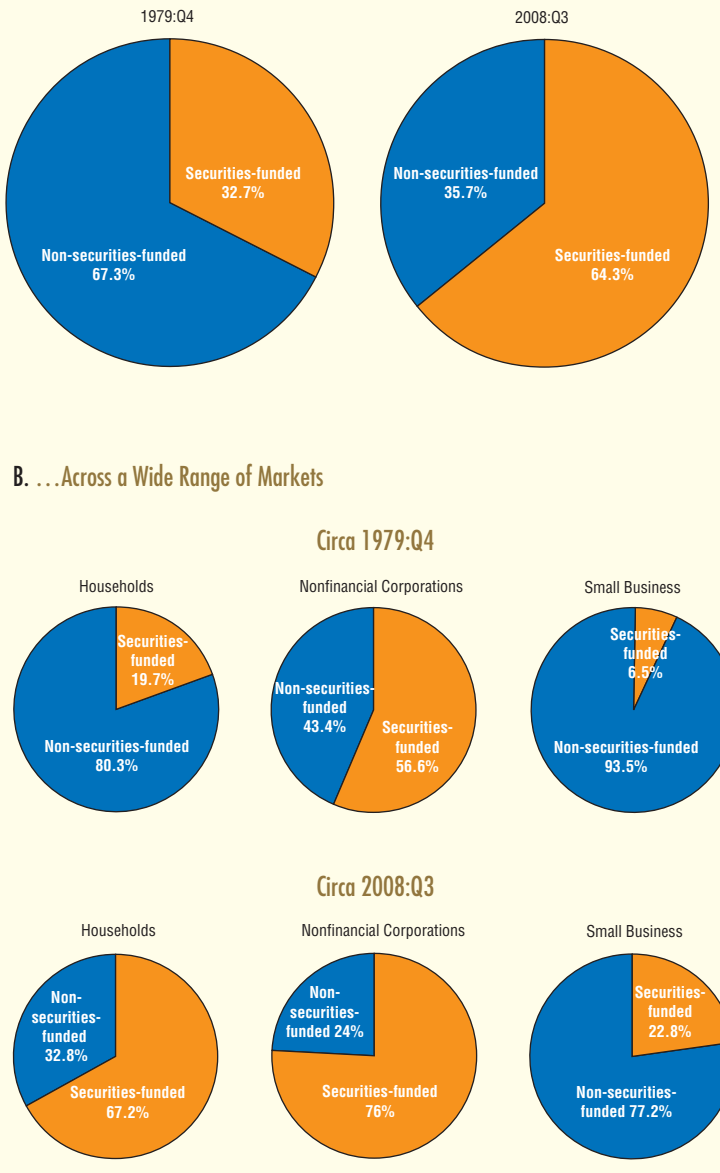
The Fed actions recognize the dramatic shift toward debt funded through securities markets. At the end of 1979, securities funded about 33 percent of household, nonfinancial corporate and nonfarm business debt. By the third quarter of 2008, that figure had risen to around 64 percent (*Chart 4A*).

A closer look reveals that household debt became significantly more dependent on market funding, largely reflecting the increased importance of asset-backed securities (ABS) in funding mortgages and consumer loans. Even the share of nonfinancial corporate debt funded by securities rose considerably over the same period—from 57 percent to 76 percent (*Chart 4B*).[5]

Much of this increase reflects the growing importance of corporate bonds, securities-funded lending and commercial mortgage-backed securities. Securities-funded lending became more important even for small businesses, rising from 6.5 percent of credit at year-end 1979 to nearly 23 percent by third quarter 2008.

The increased importance of nonbank credit makes maintaining liquidity in these markets critical for financing overall economic activity. Recognizing this reality, the Fed has provided liquidity beyond the traditional commercial banking sector.

Chart 4
Funding of Nonfinancial Sector Debt



NOTE: Small business represents nonfarm, noncorporate business.

SOURCE: Federal Reserve Board (flow of funds data).

Are Expanded Lender of Last Resort Actions Inflationary?

Recent actions to add liquidity in key credit markets have meant rapid growth in the Federal Reserve System's balance sheet. On March 18, 2009, the Fed held $236 billion in residential mortgage-backed securities and $241 billion in commercial paper. In addition, the central bank has the option to expand holdings in mortgage-backed securities to $1.25 trillion and invest up to $1 trillion in the newly created term asset-backed securities loan facility, or TALF.

Viewed as a conventional monetary policy action, this large potential increase in reserves might raise concerns over future inflation. But the Fed's extraordinary lending facilities were created to address a temporary liquidity crisis, with the intention of undoing asset purchases and excess reserve creation as the financial crisis and the need for extra liquidity abate.

In a financial crisis, investors flee riskier investments, bringing a sharp rise in the demand for safe, liquid assets—most broadly, money.

At the micro level, depositors' withdrawing funds from solvent banks creates liquidity pressures that might force the banks to call-in loans or even shut down. The classic role for a central bank in a financial crisis focuses on this problem by providing liquidity to solvent banks against good collateral at an interest rate above some benchmark safe asset. Such lending enables solvent but illiquid institutions to survive until the panic fades and the discount loans are unwound.

At a macro level, a surge in safe-harbor demand for money would push up short-term interest rates—unless it's offset by a large enough increase in the money supply. Temporary creation of reserves can enable the money supply to expand in line with demand during the panic, helping avoid interest rate increases that could damage the economy.

As the crisis ebbs, fewer discount loans are needed, and the supply of reserves can be shrunk to match the falling demand for money as a safe harbor. In this way, solvent institutions, the financial system and the overall economy can be cushioned without fueling inflationary pressures, while enabling the market system to shutter insolvent firms.

In a modern financial system, securities-funded lending has replaced the banking system as the predominant credit source for households and nonfinancial firms. Because of this development, it can be appropriate to extend the lender of last resort role to temporarily support some nonbank credit sources.

During a crisis, for example, the Fed could make collateralized loans against top-quality residential mortgage-backed securities and commercial paper to facilitate the financial flows to creditworthy borrowers. For two reasons, such actions needn't be inflationary.

First, if banks are too reluctant to lend, the reserves created during the crisis could induce a surge in excess reserves. This would largely fund central bank asset purchases and not spur the multiple deposit creation that would fuel rapid growth in the broad money supply. In addition, excess reserves created in this process largely prevent a spike in liquidity demand from pushing up short-term interest rates to highly rated borrowers. So far, both of these patterns hold in the current crisis.

Second and more important, when the financial crisis recedes, purchased assets could be sold and the temporary reserves could be withdrawn in the interest of long-run price and financial stability.

Note

The classic case for central banks as lender of last resort can be found in Henry Thornton's *An Enquiry into the Nature and Effects of Paper Credit of Great Britain* (1802) and Walter Bagehot's *Lombard Street: A Description of the Money Market* (1873).

Support for commercial paper. Commercial paper serves as an important source of funding for large nonfinancial corporations and securities-funded lenders. Money market mutual funds purchase much of this short-term debt, raising funds by issuing shares to investors. These funds are invested in Treasury bills and highly rated commercial paper, so investors generally think of them as free of risk from default or fluctuating interest rates. As a result, ample funds were available to borrowers at relatively low cost.

In August 2007, the spread between interest rates on commercial paper and Treasury bills widened because of the demand for liquidity and concerns about risk. The spreads stayed relatively high through the next year and spiked following Lehman Brothers' failure. Compounding the situation was an unusual event at a money market fund facing defaults on its Lehman Brothers commercial paper investments. Those losses were so large that the fund closed and paid its investors below the $1 a share par value—breaking the buck, as it's called.

This event prompted many institutional investors to redeem shares at money market funds invested in commercial paper. To raise cash to meet the withdrawals, the funds sold their holdings of paper into a thin market, pushing commercial paper rate spreads to extremely high levels. The run could have accelerated had many households also fled the market.

To prevent a commercial paper breakdown, initial policy efforts focused on supporting liquidity in money market mutual funds. For example, the Fed encouraged bank use of the discount window to finance loans to money funds facing redemptions. In addition, the Treasury extended deposit insurance to the funds to allay investor concern about possible losses if other funds broke the buck. These actions were designed to act like stents in opening the arteries into and out of money market funds (*Chart 5A*).

Unfortunately, risk aversion among investors—including many company treasurers who deposit assets in money funds—surged following Lehman Brothers' collapse. As a result, liquidity premiums jumped, leading to a sharp widening of the spread between commercial paper and Treasury bill interest rates. Investors' extreme risk aversion made it almost impossible for even many highly regarded companies to continue issuing new commercial paper, and the amount of commercial paper outstanding fell sharply.

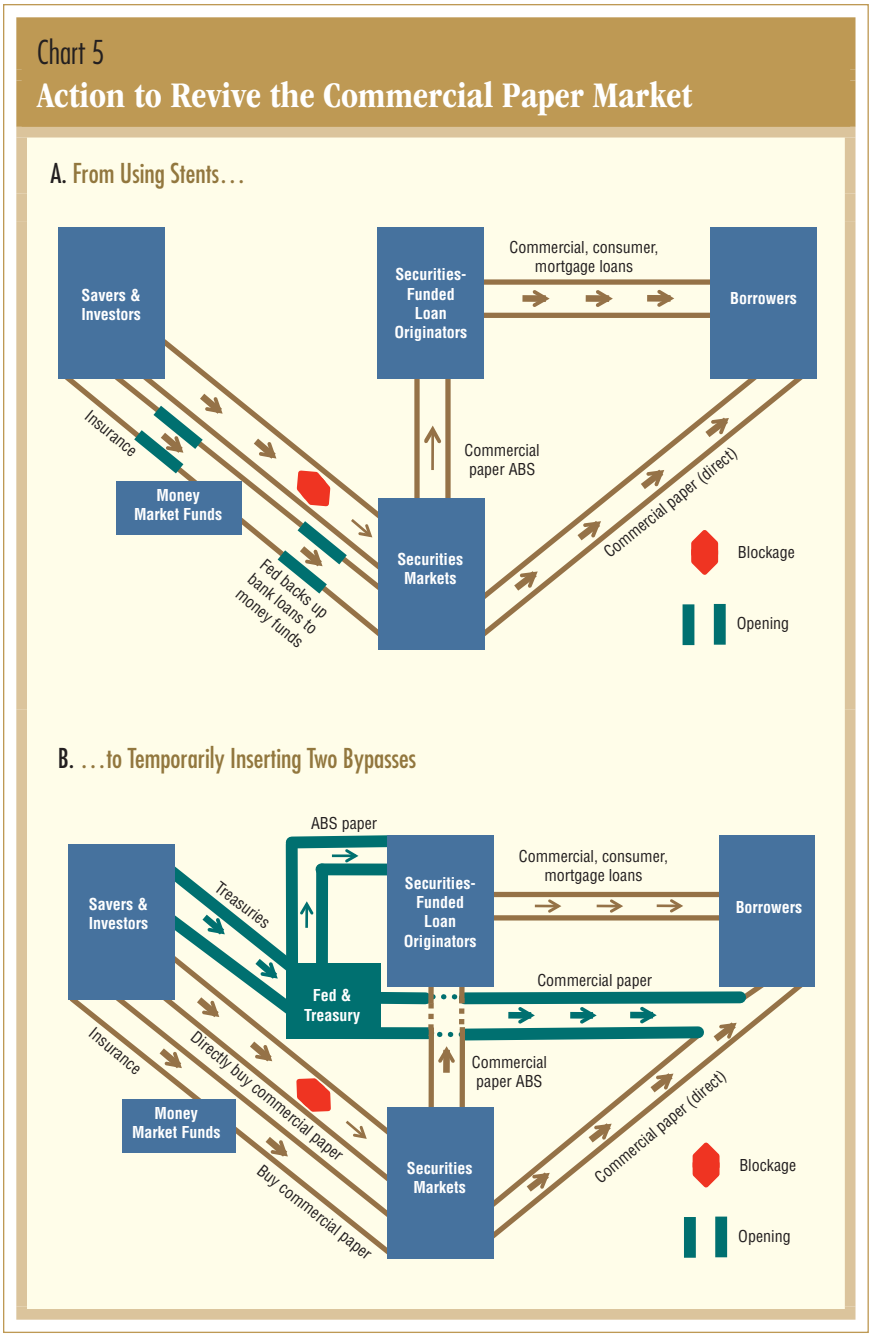
More action was needed. The Fed's next step was to allow money market mutual funds to directly borrow collateralized discount loans from a new money market investor funding facility. This helped prevent a flood of money-fund redemptions that would have set off a disorderly sale of commercial paper in an already unsettled market.

Investors were still uncertain whether companies would be able to issue new paper to repay maturing debt, especially if other investors should become too risk averse. To address this, the Fed announced it would fund purchases of top-rated commercial paper via a new facility capitalized by the Treasury—the commercial paper funding facility (CPFF). The Treasury raises funds by issuing new bonds, and the Fed uses the Treasury's deposits and some excess bank reserves to help meet the commercial paper needs of solid companies (*Chart 5B*).

This facility has acted as a partial, temporary bypass, relieving blockage in the securities markets. Since October 2008, commercial paper lending has revived, and spreads between commercial paper and comparable-maturity Treasury bills have narrowed (*Chart 6*). Steps to bolster liquidity in related markets also contributed to the improved functioning of the commercial paper market.

It's been less daunting to restore more normal conditions in top-grade commercial paper than in the Libor market. Investors perceive that top-rated issuing companies have a lower, more transparent default risk than many financial institutions.

Chart 5
Action to Revive the Commercial Paper Market



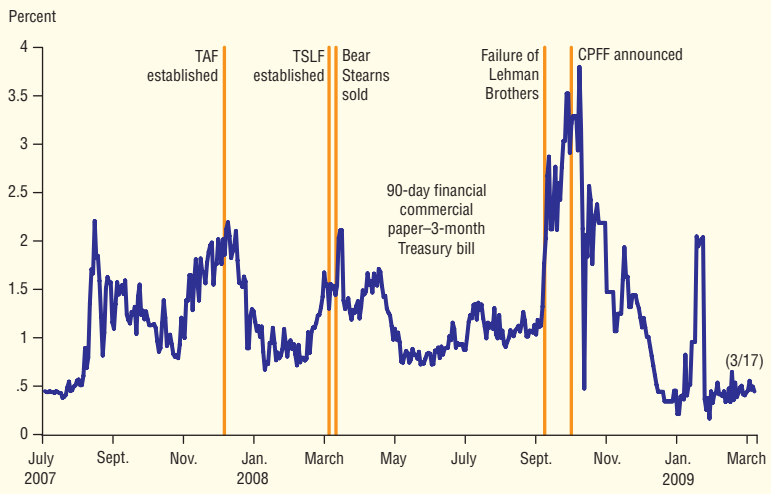
Support for prime-mortgage lending. At one time, banks and thrifts originated and held most home mortgages, funding the loans with deposits. The development of mortgage securitization in recent decades launched a new era, and the market grew rapidly.

Lenders could originate mortgages that met certain credit and underwriting standards and sell them to Fannie Mae or Freddie Mac. The two government-sponsored enterprises (GSEs) would then package the mortgages into mortgage-backed securities. In exchange for a fee, Fannie Mae and Freddie Mac passed through payments

Since October 2008, commercial paper lending has revived, and spreads between commercial paper and comparable-maturity Treasury bills have narrowed.

Chart 6

Commercial Paper Spreads Narrow After Fed Actions



SOURCES: Federal Reserve Board; authors' calculations.

from mortgage borrowers to investors and guaranteed the underlying mortgages against default.

Because the two GSEs were perceived as implicitly backed by the federal government, investors viewed the mortgage-backed securities as largely free from default risk and even good substitutes for Treasury bonds. By 2000, this securitization channel funded a majority of household mortgages.

In late 2006, mounting loan losses stemming from the housing crisis were depleting capital reserves at Fannie Mae and Freddie Mac. At the time, the two agencies guaranteed $4.5 trillion in mortgage-backed securities, only a small fraction of which involved nonprime mortgages. However, their federal charters and oversight also led the two GSEs to invest in privately issued nonprime mortgage-backed securities, primarily to meet the public policy goal of expanding homeownership.

Growing mortgage problems hurt Fannie Mae and Freddie Mac by lowering the value of these nonprime mortgage-backed securities investments. The two GSEs sustained further damage from defaults on the prime, or conforming, mortgages for which they had indemnified investors.

These prime-mortgage losses demonstrate the impact of the boom and bust of nonprime lending on home prices.[6] By 2006, nearly 40 percent of home purchases financed with securitized mortgages involved the use of subprime or other nonprime loans.[7] By increasing the homeownership rate, this lending boom helped push up housing prices—at least for a while.

Inevitably, the poor underwriting standards for many nonprime mortgages gave way to staggering losses. A confluence of factors began pushing housing prices down in late 2006:

- Easy lending practices had concentrated purchases in the early part of the decade, accelerating the timing of demand from buyers who would have otherwise waited a few years;
- the 2007 pullback in nonprime lending reduced the demand from potential buyers who no longer qualified for mortgages; and
- rising foreclosures flooded an already oversupplied housing market.

Declining home prices and excess supply increased the likelihood of prime-mortgage borrowers defaulting. Falling collateral values, in turn, added to losses on loans guaranteed by Fannie Mae and Freddie Mac. As mortgage troubles rose, the two GSEs found it difficult to raise new money to meet minimum capital requirements.

Growing concerns about their viability led investors to demand higher interest rates on GSE-guaranteed mortgage-backed securities relative to Treasury rates, which remained low because of investors' strong preference for holding Treasuries, the most liquid securities.

Typically, Fannie Mae and Freddie Mac can pass higher risk spreads to loan originators. For this reason, mortgage interest rates didn't drop in early 2008 despite large declines in Treasury interest rates and the Fed's federal funds rate target. This widening of liquidity spreads had important implications beyond mortgage markets because GSE securities had been used as collateral in repurchase, or repo, agreements and other financial arrangements.

Among the critical financial system arteries are primary dealers, which buy initial public offerings of mortgage-backed securities and later sell these securities from their portfolios. Dealers must be confident they can access liquidity from their mortgage-backed securities holdings through repo agreements. Otherwise, they'd have little incentive to make a market in newly issued mortgage-backed securities, and much mortgage financing would evaporate as a result.

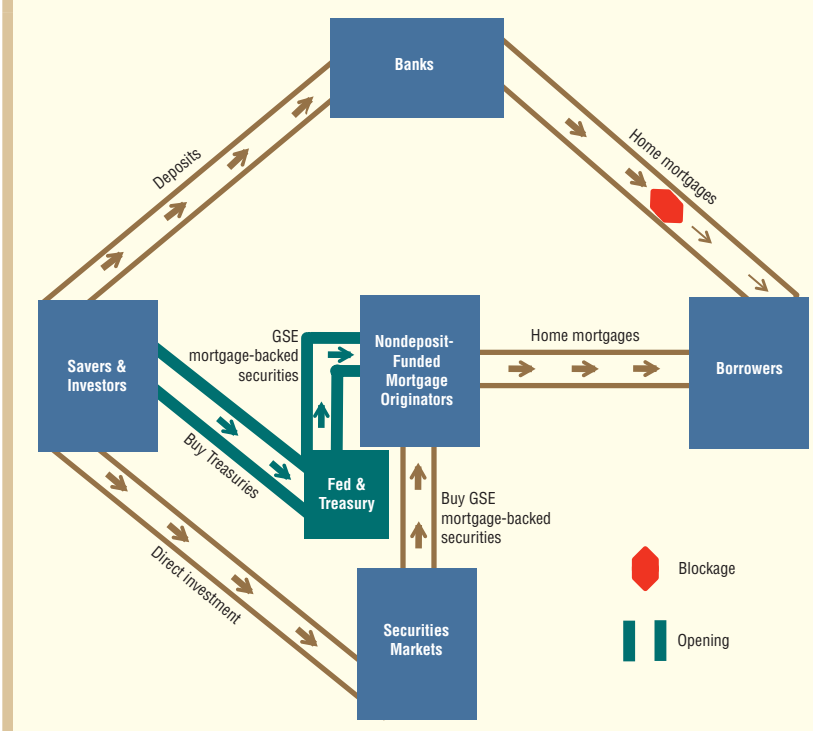
To keep this artery open, the Fed created the term securities lending facility in March 2008. It allows primary dealers to temporarily borrow Treasury securities from the central bank, putting up GSE debt as collateral. Making mortgage-backed securities more liquid helped Fannie Mae and Freddie Mac to continue issuing debt in the primary security markets, which supported the continued funding of prime mortgages (*Chart 7*).

Unfortunately, the housing market continued to worsen, dragging down home values and pushing up mortgage losses. Doubts about the liquidity of prime-mortgage securities intensified, and the benchmark interest rate on 30-year, conforming, fixed-rate mortgages rose in mid-2008. Treasury interest rates were falling at the time due to Fed monetary policy actions and a faltering economy's weakening credit demand.

With more losses looming for Fannie Mae and Freddie Mac and disruptions to the prime-mortgage market mounting, the Treasury responded in July by announcing plans to put the two GSEs into conservatorship and giving explicit assurances to back

Making mortgage-backed securities more liquid supported the continued funding of prime mortgages.

Chart 7
Fed Actions Help Reopen Arteries Funding Home Mortgages



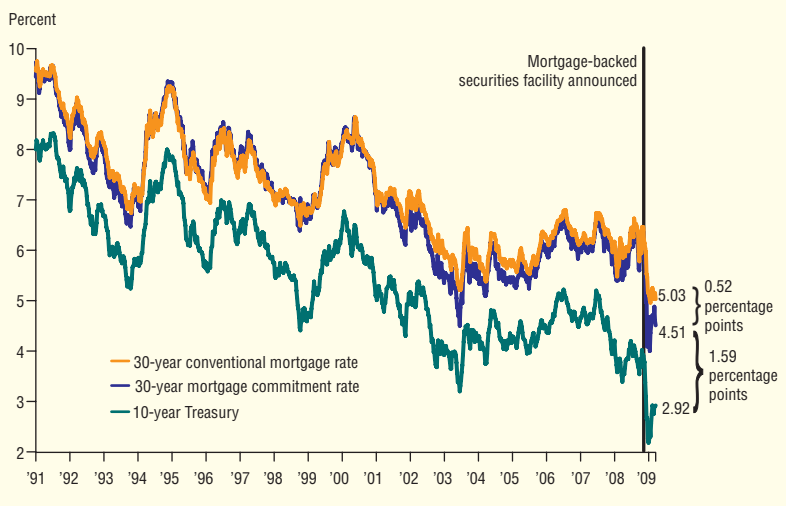
The decline in interest rates on mortgage-backed securities was largely, but not completely, transmitted into lower interest rates on traditional 30-year fixed-rate mortgages.

their guarantees on mortgage-backed securities. These actions helped stabilize spreads between mortgage-backed securities and Treasury bond interest rates at high levels, but they didn't trigger a return to more normal spreads.

With very ill patients, alleviating one ailment sometimes doesn't ensure a full recovery. When the demand for liquidity spiked after Lehman Brothers' collapse, spreads between mortgage-backed securities and Treasury yields widened, preventing mortgage rates from falling despite sharp declines in the 10-year Treasury yield (*Chart 8*). Stubborn mortgage rates undermined conventional monetary policy's ability to cushion the economic downturn by influencing interest rates on private debt.

To counteract this, the Fed initially committed to purchasing up to $500 billion in GSE mortgage-backed securities and up to $100 billion in GSE debt, which provide the organizations with funding to package the securities and hold them. This announcement led to a sharp narrowing in mortgage-backed securities–Treasury spreads.

Chart 8
Mortgage Rates and Some Spreads Have Fallen Recently



SOURCES: Federal Reserve Board; Freddie Mac.

The decline in interest rates on mortgage-backed securities was largely, but not completely, transmitted into lower interest rates on traditional 30-year, fixed-rate mortgages. The gap between these two rates is normally about 0.1 percentage point, reflecting securitization and servicing fees from borrowers to mortgage-backed securities investors.

In early 2009, that gap widened to about 0.5 percentage point, perhaps partly due to increased fees. Nevertheless, the average rate on 30-year, fixed-rate conforming mortgages has fallen by nearly 1 full percentage point since the Fed announced its program.

To provide even more support to mortgage markets, the Fed announced plans in mid-March to buy as much as another $750 billion in GSE mortgage-backed securities, bringing potential holdings up to $1.25 trillion this year. The central bank also said it would double its purchase of GSE debt, bringing that total to up to $200 billion.

Support for consumer and small business lending. Many consumer and business loans are bundled and issued as asset-backed securities. After the surge in liquidity premiums across a wide spectrum of financial instruments, market conditions turned extremely inhospitable to new ABS issues.

Finding it difficult to obtain funds, many lenders severely tightened credit standards. This lack of funding, coupled with the inability of many capital-constrained banks to hold loans, has led to a broad credit crunch for small businesses and consumers. For example, the freezing up of funding reduced the number of potential car buyers, exacerbating the decline in vehicle sales.

To help these borrowers, the Fed announced it would make heavily collateralized loans to certain holders of Aaa-rated consumer and government-guaranteed small business loans. By promoting liquidity in this market, the

term asset-backed securities loan facility, or TALF, is intended to facilitate more normal interest rate spreads for consumer- and business-loan-backed securities and thereby help alleviate the credit crunch.

An important goal is to improve market funding for these loans, much as the Fed's mortgage-backed securities purchases sought to enhance mortgage market conditions. Since the November announcement, the potential size of this facility—which launched in March—has been increased from $200 billion to $1 trillion.

Restoring Financial Health

Because a financial boom had a major role in the run-up in home prices and growth in consumption since 2000, the ensuing financial bust and crisis has hit the U.S. economy especially hard. Indeed, the current recession has deepened as the financial crisis has curtailed the critical flow of credit to households and businesses.

Faced with the worst financial crisis since the Great Depression, the Fed hasn't restricted itself to the conventional monetary policy response of lowering the overnight federal funds rate. Rather, it has extended its role as a lender of last resort to stabilize both the financial system and the overall economy. Providing unconventional liquidity has helped the central bank engineer policy for a modern credit market that has been transformed from a bank-dominated system funded by deposits to one predominantly funded by securities markets.

What's made policy challenges even more daunting has been severe blockages in all three main arteries through which credit flows to households and businesses. To support the needed flow of finance until the banking system returns to normal and the rhythm of the securities markets becomes more regular, the Fed is providing stents and bypasses to open some bank and nonbank financial arteries.

The central bank is also acting as a temporary heart and lung machine while the main valves of the financial system undergo major surgery to excise the bad assets from the balance sheets of many banks and financial institutions. The partial resumption of financial flows in the commercial paper and mortgage-backed securities markets indicates these efforts are having some success. And by helping sustain credit flows financed by securities, the Fed is indirectly providing fiscal authorities with time to restore the banking system's health.

At some point, a further pickup of financial flows, coupled with stimulus from monetary and fiscal policy, will spur economic recovery. When financial markets require less help, the Fed's unusual discount lending will be unwound to prevent inflationary pressures from building.

Because economic swings often lag financial developments and policy actions, the U.S. economy will likely continue to contract well into 2009. Nevertheless, one key to bringing about an eventual economic recovery has been the modernization of the central bank's role as a lender of last resort to meet the needs of today's global and immensely complex financial system.

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Faced with the worst financial crisis since the Great Depression, the Fed has extended its role as a lender of last resort to stabilize both the financial system and the overall economy.

Notes

The authors thank Niki Maas for research support.

[1] More information on the Fed's credit and liquidity programs is available at www.federalreserve.gov/monetarypolicy/bst.htm. The Federal Reserve Bank of New York has posted a table summarizing the central bank's actions at www.newyorkfed.org/markets/Forms_of_Fed_Lending.pdf and provides details on these steps at www.federalreserve.gov/newsevents/recentactions.htm.

[2] "From Complacency to Crisis: Financial Risk Taking in the Early 21st Century," by Danielle

DiMartino, John V. Duca and Harvey Rosenblum, Federal Reserve Bank of Dallas *Economic Letter*, no. 12, December 2007.

[3] See "The Federal Reserve's Term Auction Facility," by Olivier Armantier, Sandra Krieger and James McAndrews, Federal Reserve Bank of New York *Current Issues in Economics and Finance*, vol. 14, no. 5, July 2008; "On the Effectiveness of the Federal Reserve's New Liquidity Facilities," by Tao Wu, Federal Reserve Bank of Dallas, Working Paper no. 0808, May 2008; and "A Black Swan in the Money Market," by John B. Taylor and John C. Williams, *American Economic Journal: Macroeconomics*, vol. 1, no. 1, January 2009, pp. 58–83.

[4] With the federal funds rate at about zero, Federal Reserve Chairman Ben Bernanke described the general approach of providing liquidity support to banks and nonbanks as "credit easing" in a Jan. 13, 2009, speech, "The Crisis and the Policy Response," www.federalreserve.gov/newsevents/speech/bernanke20090113a.htm. For why the Bank of England has supported credit from nonbank sources, see Governor Mervyn King's Jan. 20, 2009, speech at www.bankofengland.co.uk/publications/speeches/2009/speech372.pdf. The general case for acting in nonbank markets is discussed in "The World's Central Banks Must Buy Assets," by John Muellbauer, *Financial Times*, Nov. 24, 2008, www.ft.com/cms/s/0/28f8faac-ba3e-11dd-92c9-0000779fd18c.html.

[5] Figures are based on flow of funds data on the consumer credit and mortgage debt of households and nonprofits and the credit market debt of nonfinancial corporations and nonfarm, noncorporate business. Non-securities-funded debt includes credit extended by banks (plus savings and loans) and by some nonbank intermediaries that use contractual obligations to fund investments (for example, insurance companies using accumulated premiums to directly make commercial mortgages—exclusive of purchasing commercial mortgage-backed securities, which is a form of securities-funded credit). Securities-funded debt includes securitized mortgages and other asset-backed instruments, corporate bonds, commercial paper, finance company loans and securities-funded commercial mortgages. The last item equals commercial mortgages financed by commercial mortgage-backed securities, asset-backed securities, finance companies, government agencies and real estate investment trusts.

The authors apportioned commercial mortgage debt using the total non-securities-funded share of commercial mortgages multiplied by commercial mortgages in each sector. Details on business "other loans" are used to apportion funding from securities markets and nonsecurity intermediaries. These figures understate the market sensitivity of debt as banks have become more dependent on nondeposit funding and derivatives to reduce risk.

[6] For more information, see "The Rise and Fall of Subprime Mortgages," by Danielle DiMartino and John V. Duca, Federal Reserve Bank of Dallas *Economic Letter*, no. 11, November 2007.

[7] "Mortgage Quality du Jour: Underestimated No More," Credit Suisse, March 13, 2007.

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