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RESPONDING to the GLOBAL FINANCIAL CRISIS What We Did and Why We Did It

Novel Lender of Last Resort Programs

Lorie Logan, William Nelson, Patrick Parkinson¹

Note: The views expressed in this draft are strictly those of the author(s).

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Introduction

Despite the Federal Reserve’s innovative use of its conventional toolkit, described in the last chapter, the severity of the financial crisis called for further action. The Fed introduced a number of novel lending facilities based on emergency powers granted in the Federal Reserve Act. This chapter discusses considerations around the development of the most important of those new facilities, assesses their usefulness, and draws some lessons for future policymakers.

The need for these novel lending facilities stemmed from the changes to the financial system described in Chapter XXXX. In the decades leading up to the financial crisis, nonbank financial firms became an increasingly important source of credit to the U.S. economy. Much of the credit provided by nonbank firms was funded in stable ways (for example, through issuance of long-term debt, reserves of pension funds or life insurance companies, or securitization). But a significant portion was funded by short-term debt instruments such as asset-backed commercial paper (ABCP) or repos. Beginning in the late summer of 2007, investors became concerned about the quality of collateral backing such instruments and reluctant to roll them over as they matured. These runs placed substantial liquidity pressures on the dealers and banks that issued and sponsored those instruments. This pressure reached a peak following the failure of Lehman Brothers in September 2008, when a run on prime money market funds (MMFs) resulted in a freezing of many money and securitization markets.

In 2007 and 2008, the Fed responded to the runs on nonbank firms using its conventional tools, the discount window and open market operations, albeit in some unconventional ways. But in March 2008, following the implosion of Bear Stearns, liquidity conditions deteriorated in the short-term markets where nonbank intermediaries were financed, risking a sharp further reduction in the supply of credit to businesses and households. In response, the Fed turned to emergency lending authority that it had not used since the Great Depression. That authority, granted under Section 13(3) of the Federal Reserve Act, allowed the Federal Reserve Banks, with the authorization of the Board of Governors, to lend to nonbanks in “unusual and exigent” circumstances. The Fed used these powers to alleviate liquidity pressures on primary dealers and protect the repo markets and U.S. government securities and mortgage-backed securities markets, whose functioning was tied tightly to the functioning of the repo markets. Following Lehman Brothers’ failure in September 2008, the Fed introduced a variety of other innovative programs under Section 13(3). These programs provided liquidity to prime MMFs and to the commercial paper and ABCP markets and helped to revive issuance of asset-backed securities (ABS).

We start this chapter with the development of the most important of these Section 13(3) facilities in the order in which they were introduced: the Term Securities Lending Facility (TSLF), Primary Dealer Credit Facility (PDCF), Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility (AMLF), Commercial Paper Funding Facility (CPFF), and the Term Asset-backed Securities Loan Facility (TALF).² As was the case with the conventional liquidity tools before them, the novel facilities

² The table in Appendix A gives some high-level information about each of the programs, including the dates of operation, and the peak amounts lent.

were introduced on a piecemeal basis, in short time frames, adapted to work within operational and legal constraints, and based upon limited information. As a result, they were refined repeatedly. The consensus view of those involved in the implementation of the programs and the literature produced to date indicates that the programs did ease liquidity and helped avoid an even more severe contraction of credit to businesses and households.

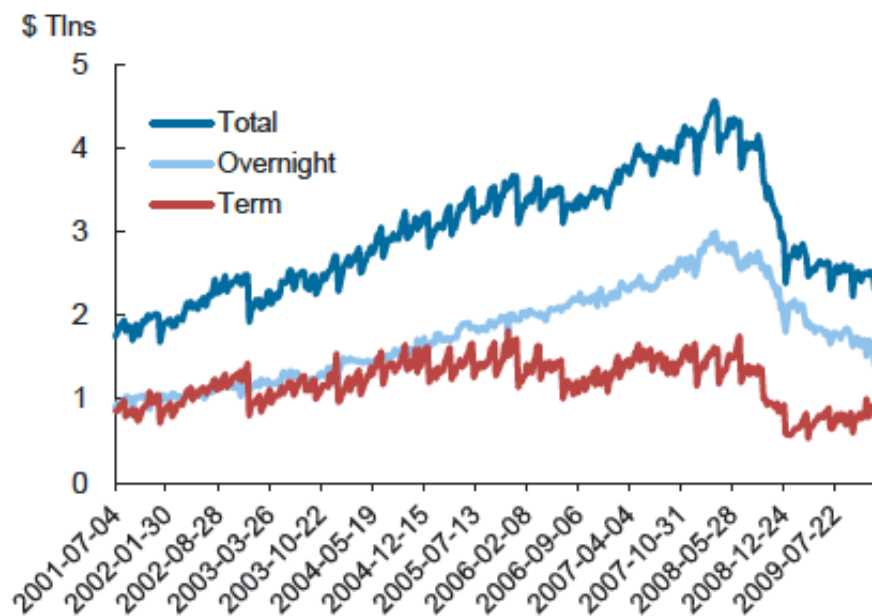
I. Policy Response: Design, Evolution and Innovation

Providing a Backstop to Secured Financing Markets: The TSLF and PDCF

From late 2007 through the failure of Bear Stearns in March 2008, stresses built in secured financing markets. Dealers were particularly dependent on these markets, in which they raised short-term loans from other financial institutions by posting securities in their inventory as collateral. However, many of the firms that were integral to the provision of such loans, such as money market mutual funds and securities lenders, became increasingly risk averse as they focused on maintaining their own liquidity.

Importantly, dealers' access to secured financing turned not only on the willingness of lenders to advance funds to that dealer, but also on the willingness of the dealer's clearing bank—either JPMorgan Chase or Bank of New York—to continue providing clearing services. This included the facilitation of dealers' repo financing from money funds and other nonbank suppliers of funds (so-called “tri-party repos”). At the time, the clearing banks provided substantial intraday funding, and took on substantial intraday exposure to the dealers, leaving the clearing bank at considerable financial risk if a dealer was unable to roll over its financing at the close of business. If the clearing bank were to elect to not provide this funding to a dealer, that dealer would have great difficulty avoiding bankruptcy. This choice by the clearing bank was entirely discretionary and, if either of them had pulled the plug on one or more dealers as a result of a loss of confidence, this would have immediately and rapidly escalated the crisis.

Even in the absence of dealer bankruptcies, the loss of secured financing as reflected by the decline of primary dealer repo outstanding shown in Figure 1 would likely have markedly accelerated the fire sale in securities markets. If dealers cannot readily obtain appropriately priced secured financing for a given asset, or even if they are uncertain about their ability to finance it in the future, they will be unwilling to hold that asset on their books. They will seek to sell it if they already own it, and will refuse to buy any from customers even if they would ordinarily have been in the business of making a market in that kind of asset. For example, as it became increasingly costly to finance both agency and private-label mortgage-backed securities, these securities cheapened and became less liquid as dealers avoided buying them. Indeed, as shown in Figure 1, a sharp decline in primary dealer repo outstanding accompanied the post-Lehman deterioration in financial market conditions.

Figure 1: Primary Dealer Repo Outstanding

Source: Adrian et al. FRBNY *Current Issues* 15, no. 4
FR 2004, Federal Reserve Bank of New York

Given these developments and risks, policymakers sought to put into place a liquidity facility for primary dealers, to act as a backstop to secured financing markets and to promote the continued operation of the private repo market. The need to stabilize repo markets was particularly important, since repo financing supported the liquidity and continued operation of fixed income markets, including the vital U.S. government securities and mortgage-backed securities markets.

But creating such a liquidity facility was easier said than done. Dealers did not have access to the Fed’s traditional lender of last resort operation, the discount window, and there were no legal agreements or technical infrastructure in place for lending to dealers against riskier collateral, to price the loans, to put the money on the wire, or to keep accounts.

Moreover, there was no policy determining who would receive the loans. The Fed maintained a small network of “primary dealers,” the purpose of which was to underwrite Treasury debt auctions and act as counterparties on the Desk’s open market operations. This was never intended to be the list of important nonbank financial firms. Indeed, the New York Fed had gone to some lengths over the years to emphasize that primary dealer status was not a “Good Housekeeping seal of approval” of a firm. However, the primary dealers were the set of firms with which the Fed had agreements and operational arrangements already in place.

Finally, there was the fundamental issue of the fairness of lending to dealers. The regulatory compact with banks was understood: in exchange for submitting to capital and liquidity regulations and other features of the bank supervision regime, banks got

access to programs aimed at providing a liquidity backstop that other financial firms did not get, namely FDIC insurance and the Fed’s discount window. Dealers had elected not to adopt this business model. Was it fair that they now get that backstop from the Fed? Would this promote a moral hazard?

In the end, the Fed created two main programs to support primary dealers around the same time in March 2008: the Term Securities Lending Facility, announced on Tuesday, March 11; and, before the staff could get the TSLF up and running, the Primary Dealer Credit Facility, announced on Sunday, March 16, and implemented Monday, March 17. They were closely related to the Single-Tranche Open Market Operations Program, another auction facility available to primary dealers implemented earlier in the same month under Section 14 of the Federal Reserve Act.³

The TSLF and PDCF were more alike than different, sharing a few commonalities in particular. First, both were borne out of the infrastructure of existing Fed operations: for TSLF, a program called securities lending, and for PDCF, a combination of discount window lending and reserve-management open-market operations. Both involved full-recourse “collateralized lending”: we give you something, you give us something, and later we will put it all back with a fee on top. It was a kludge, but the staff was able to adapt this setup within short time constraints. Primary dealers would be the group of dealers eligible to participate, if for no other reason than because those firms had the relationships and infrastructure already established.

Second, both programs were built on top of the existing “triparty” secured financing infrastructure, with the clearing banks at the center. This arrangement was familiar to the Fed, as it was used for some open market operations. It also had a few important benefits. First, it allowed the Fed to implement the program quickly, because primary dealers would finance their securities on the same platform they currently did. The clearing banks would in this arrangement also manage the collateral, for example by valuing it and applying haircuts, something that would take the Fed significant time to develop. Finally, because a lender of last resort capability was directly embedded in the clearing banks’ platform, they could be confident that their customers would be able to settle their intraday obligations, one way or another, and therefore had no need to pull the plug on any primary dealer.

One important way in which the programs differed was in their impact on bank reserves. The TSLF was a bond-for-bond program, meaning that in exchange for primary dealers’ less-liquid securities, the Fed gave Treasuries. These were of course easily convertible by the primary dealer into cash (because the Treasury repo market continued to work well), but it was another step. The benefit was that the Fed was not adding more cash to the economy and therefore did not have to take offsetting actions to manage the

³ Through this program, the Fed conducted one-month repos in which primary dealers obtained cash by delivering open market eligible collateral. These were variations on a standard open market operation and were not needed for Desk to control the fed funds target rate. Instead they were longer in term and intended to address liquidity pressures in term funding markets. One key difference in TSLF from the single-tranche repos is that as bond-for-bond transactions, they had no impact on the supply of bank reserves. Additionally, TSLF and PDCF allowed for a broader set of collateral to be pledged, which is why TSLF schedule 2 and PDCF operations were implemented under 13(3) authority.

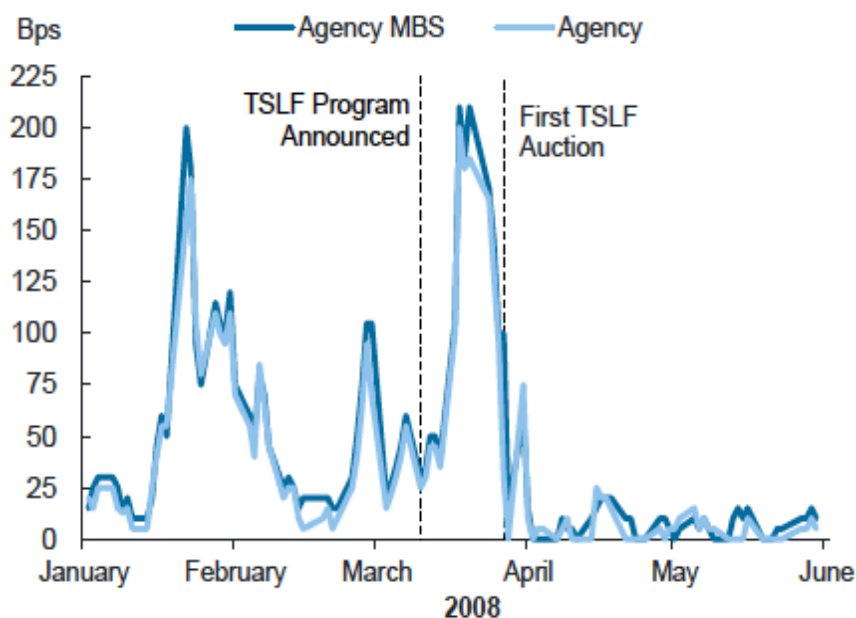
fed funds rate. This was a key difference in TSLF from the Single-Tranche repo program and from the PDCF, and meant it could be scaled up or down more quickly.

The two programs also differed in their pricing and how they allocated credit. The PDCF was a “standing facility,” meaning that loans were provided on a continuous basis in the amounts requested. The interest rate on PDCF repos equaled the relatively expensive primary credit rate plus a fee added for persistent usage. The TSLF was an “auction facility,” meaning that a specific quantity was periodically auctioned off. While the PDCF was therefore a more reliable source of funds, its elevated interest rate and persistent usage fee may have led to some stigma associated with its use.

The programs were widely seen as providing an important backstop to primary dealers, and helped forestall a rapid acceleration in fire sales, a drying up of liquidity in fixed income markets, or a broad collapse into bankruptcy of the securities industry. As the private market pulled back from financing housing-related assets, as was feared, primary dealers were able to finance these with the Fed. Clearing banks continued business, and when conditions normalized, primary dealers returned to private markets.

Some policymakers had hoped that the existence of the programs would be enough to promote confidence, and that their credibility as a backstop would mean they wouldn’t actually need to be used. This hope went unrealized. Spreads in repo markets fell as the programs took hold in March and April 2008 as seen in Figure 2, but the volume of Fed lending through these programs was significant. As the crisis continued to accelerate, the liquidity provided through the facilities served as a bridge, allowing time for other, broader actions to restore confidence in the dealers and the broader financial system.

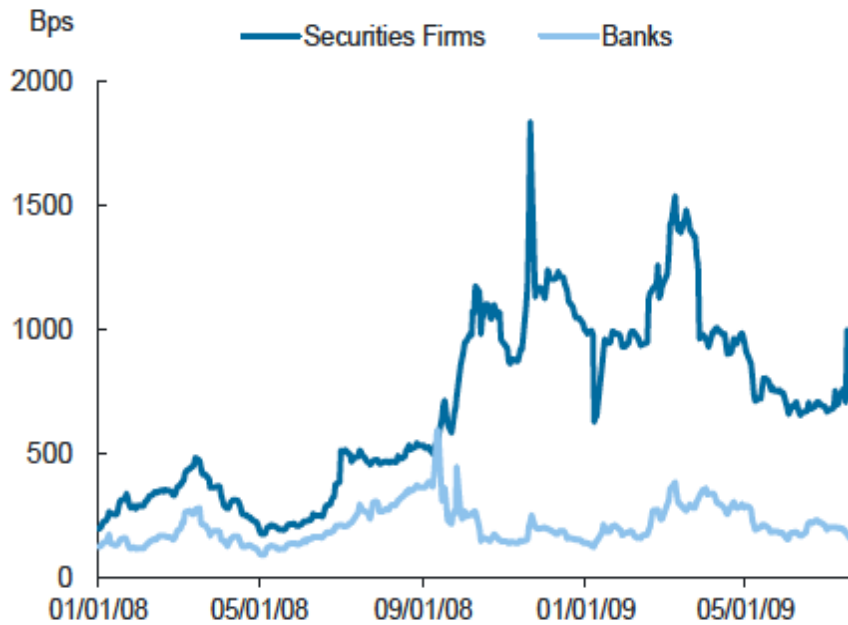
Figure 2: Financing Spreads and the TSLF



Source: Fleming et al. FRBNY *Current Issues* 15, no. 2
 Authors’ calculations, Bloomberg

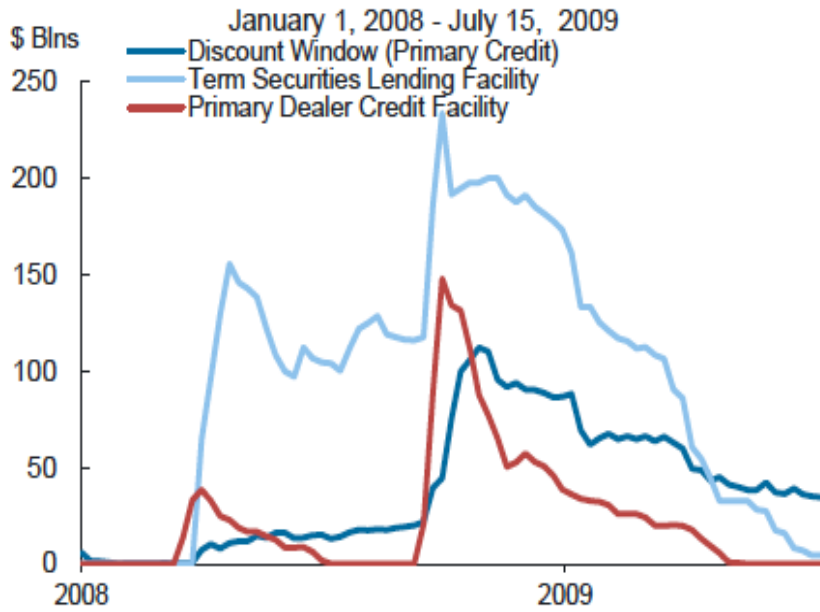
Importantly, the success of the PDCF and TSLF in operating as a bridge owed itself in part to a willingness among policymakers to make ad hoc changes as the programs proceeded. The original list of counterparties was supplemented with additional primary dealer-affiliated borrowers in September 2008. The list of eligible collateral was also repeatedly updated, along with other program parameters. For example, in September 2008 the PDCF’s acceptable collateral set was expanded, and the TSLF’s was similarly expanded from high-quality assets to all investment-grade debt securities. Additionally, the programs were priced so that they would be unattractive under normal market conditions. As strains eased over the course of 2009 with credit default swap spreads of primary dealers coming down from a peak in late-2008 as shown in Figure 3, borrowings from the programs unwound naturally. The programs were officially closed in 2010 to little fanfare, having reached near-zero levels of usage well beforehand as seen in Figure 4.

Figure 3: Credit Default Swap Spreads



Source: Adrian et al. FRBNY *Current Issues* 15, no. 4
 Datastream

Figure 4: Discount Window, Primary Dealer Credit Facility, and Term Securities Lending Facility Usage

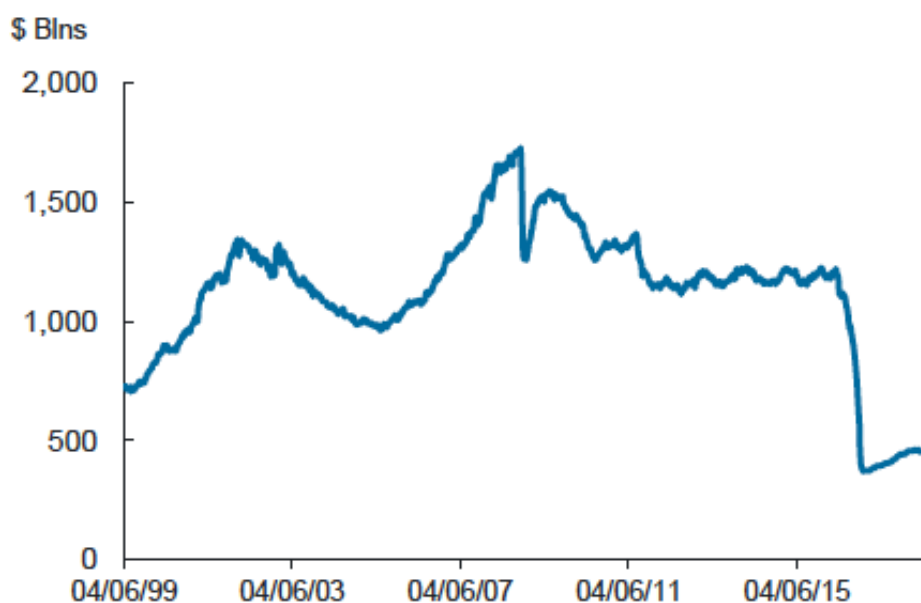


Source: Adrian et al. FRBNY *Current Issues* 15, no. 4
Federal Reserve "Factors Affecting Reserve Balances of Depository Institutions"

Providing Liquidity to MMFs: The AMLF

Lehman’s bankruptcy on Monday, September 15, revealed unanticipated fragility in the money market fund sector. Although Lehman’s vulnerability had been apparent to many, one MMF, the Reserve Primary Fund, held an amount of Lehman commercial paper so large that writing down its value forced the fund to “break the buck” on September 16. Concerned about other MMFs’ direct and indirect exposures to Lehman, over the next week, investors in “prime” MMFs withdrew nearly \$170 billion or about five percent of their total assets under management as shown, resulting in the sharp drop in prime fund assets under management seen in Figure 5.

Figure 5: Prime Fund AUM



Source: iMoneyNet

The Fed and the Treasury concluded that something must be done as soon as possible to ease the liquidity pressures on the MMFs, to avoid further strains on the markets for the instruments that they might be forced to sell, and to protect retail investors in MMFs. While Treasury explored how it might guarantee MMF assets and halt the runs as discussed in Chapter XXXX, the Fed explored how it might provide liquidity to MMFs that were still experiencing runs.

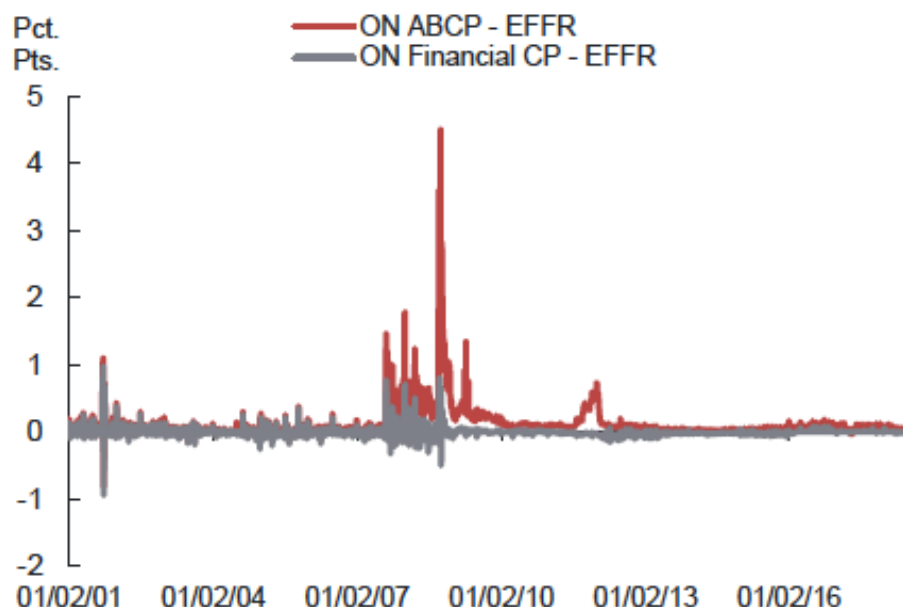
Fed Vice Chairman Don Kohn asked Federal Reserve Board staff to explore potential lender of last resort programs. As staff discussed potential options with money fund managers, however, a seemingly insurmountable problem became apparent: even if the Fed were willing to lend to MMFs, some funds lacked the authority to borrow money, and even those that had the authority generally were extremely reluctant to use it because they feared that disclosure of their borrowing would spook investors. When staff reported this to Kohn, he told them that failure to stop runs on MMFs was not an option. Rather than continuing discussions of what wouldn’t work, he told them to go back to their offices and not return until they had identified a program that would work.

Back in their offices, the staff concluded that what was needed was a plan that would permit money funds to meet redemptions by selling assets at amortized cost (that is, without incurring a loss). The Fed did not have authority to buy private money market instruments, but it could lend to others for the purpose of buying such instruments. Thus, a plan was developed to lend to banks at the discount window to finance banks' purchases of eligible ABCP from MMFs at amortized cost. The program also authorized lending to dealers and bank holding companies on the same terms, which is why it was authorized under Section 13(3) (emergency lending authority) as well as Section 10B (regular lending authority). But the vast majority of loans actually made as part of the program were discount window loans to banks, primarily to the large custody banks that served the mutual fund industry.

To induce banks to participate, the Fed offered to lend to the banks at favorable terms—without recourse, for the full amount of the assets purchased (no haircut), and for the remaining maturity of the assets—that effectively transferred all of the risks to the Fed and made the banks' intermediation risk-free. Moreover, the loans would be extended at the primary credit rate, which was well below the yields on the assets, and thus provided the banks with profits on their riskless intermediation. Even under these terms, the banks were still concerned that the purchases might undermine the confidence of their creditors if their regulatory capital ratios declined. To address this concern, the Fed made temporary modifications to its capital rules to exempt assets purchased as part of the program.

Given that its loans to the banks were nonrecourse, the Fed was relying entirely on the value of the assets that the banks had purchased from the MMFs for repayment. The assets were limited to ABCP, so that the loans were backed not only by the issuer's promise to repay the principal at maturity but also by the collateral. Furthermore, to limit credit risk to the Fed, the facility purchased ABCP with only the highest short-term ratings from the credit rating agencies. Importantly, prime MMFs as a group held about 12 percent of their assets in ABCP, so that, even with this limit, the program would provide many MMFs access to substantial liquidity.

That said, investors perceived the collateral in ABCP as risky and illiquid and demanded higher spreads on ABCP than on uncollateralized CP issued by the sponsors of the ABCP, as seen in Figure 6.

Figure 6: Commercial Paper Rate Spreads

Source: Bloomberg

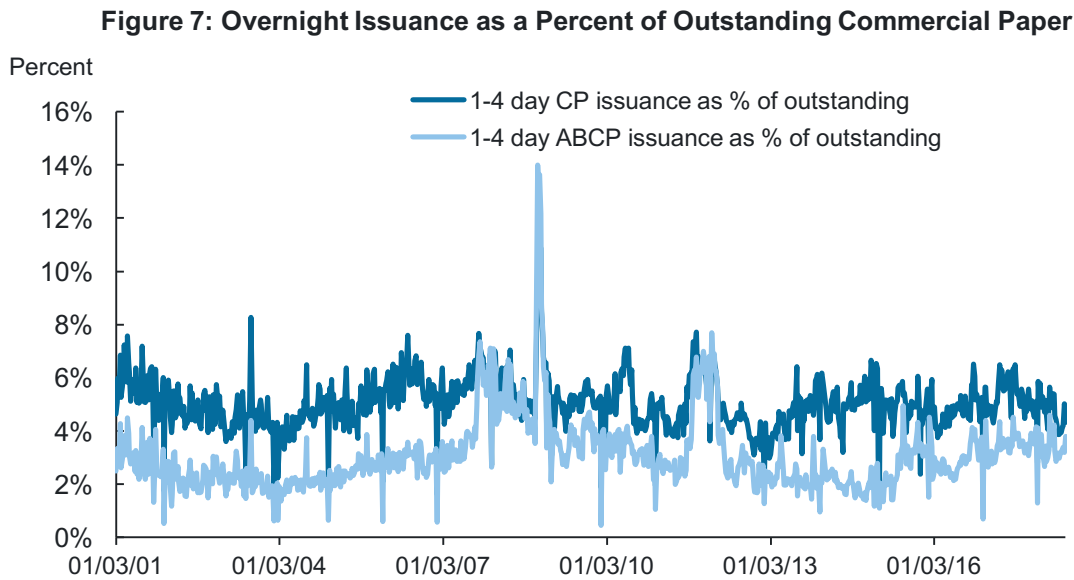
This program was announced just three days after Reserve Fund broke the buck and the program became operational just one business day later. While the other novel lender-of-last-resort programs were operated by the New York Fed, the AMLF was operated by the Federal Reserve Bank of Boston. With so many programs in place or under development, even the considerable operational capacity of the New York Fed was being strained. The Boston Fed offered to operate the program because it had deep knowledge of the money fund industry and ongoing relationships with many MMFs because many were based in Boston. And, because the vast majority of AMLF loans were made through the discount window, the Boston staff was well-prepared to implement the program quickly.

This innovative program, implemented by the Federal Reserve Bank of Boston, provided substantial liquidity to MMFs at a critical moment. Although the Treasury's MMF guarantee, announced the same day as the AMLF, was ultimately quite effective in curtailing redemptions, during the first few weeks after the announcement (when the program details were still unclear), some MMFs continued to experience significant redemptions. Consequently, the AMLF was used heavily almost immediately; lending under the program reached a peak of about \$150 billion after only 10 days. Over the remainder of 2008, loan balances fell to around \$20 billion at year-end as liquidity pressures on MMFs diminished, no doubt in part because the Treasury guarantee curtailed outflows. An upturn in AMLF lending in mid-2009 seemed to be spurred by MMFs' concerns about the credit quality of ABCP sponsors rather than by liquidity pressures on the MMFs. To ensure that the facility was used only for liquidity reasons, in June 2009 the Fed limited the program to ABCP purchased from MMFs that were experiencing significant redemptions. After that, balances resumed their downward path, and no further loans were made after July 2009.

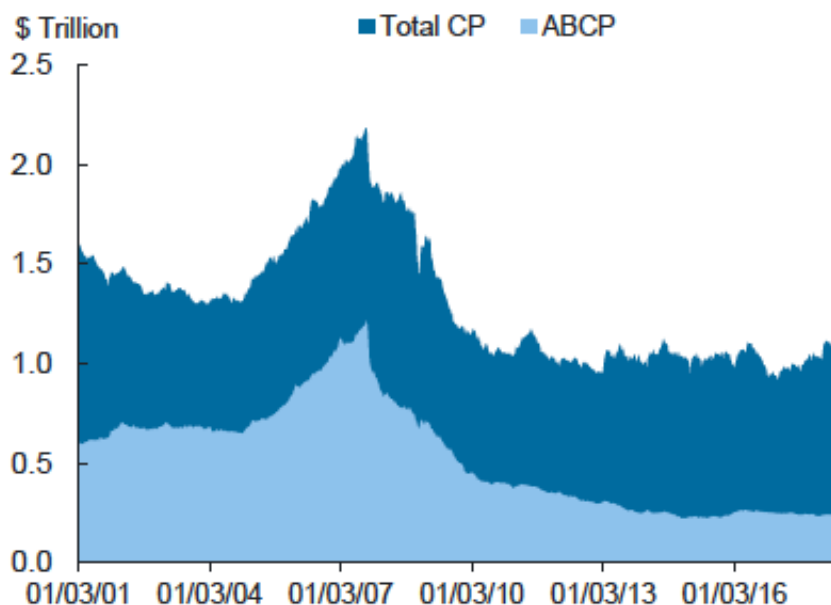
Providing Liquidity to the CP Markets: The CPFF

Although announcement and implementation of the AMLF and the Treasury Department’s guarantee of investments in MMFs forestalled further forced sales of assets by MMFs, weeks after Lehman’s bankruptcy the CP and ABCP markets remained under considerable strain. Investors remained reluctant to purchase these instruments, and what purchases they made were of paper with very short maturities, as seen in Figure 7. The volume of outstanding paper continued to shrink as shown in Figure 8, spreads remained very wide, and an increasingly high percentage of outstanding paper needed to be refinanced each day. Large foreign and domestic banks issued much of the outstanding CP, were the sponsors of much of the outstanding ABCP, and had committed to provide backstop liquidity to many issuers of much of the paper that they themselves did not issue or sponsor. If investors stopped rolling over maturing paper, those banks would have been subject to extreme funding and balance sheet pressures that almost surely would have forced them to sharply curtail lending to businesses and households.

Figure 7: Overnight Issuance as a Percent of Outstanding Commercial Paper



Source: Federal Reserve

Figure 8: Outstanding Commercial Paper Balances

Source: Federal Reserve.

Well before the end of September, the Fed and the Treasury Department had concluded that the commercial paper markets needed a liquidity backstop. But the design of a backstop proved challenging and implementation required setting up new infrastructure, unlike the AMLF, which used the existing infrastructure of the discount window. The backstop, called the Commercial Paper Funding Facility (CPFF), was not announced until October 7 and did not become operational until October 27. The CPFF involved the creation of a special purpose vehicle (SPV) to purchase CP and ABCP directly from the issuers, with funding provided via loans from the Federal Reserve Bank of New York, authorized under Section 13(3). It was a broad market backstop, in that all U.S. issuers of CP and ABCP, including U.S. issuers with a foreign parent, were eligible to issue paper to the SPV, provided that the paper had earned the highest short-term ratings from the credit rating agencies. Furthermore, the SPV was allowed to purchase from each eligible issuer an amount of paper equal to the highest amount of paper it had outstanding earlier in 2008, thereby preventing issuers from expanding their programs to take further advantage of the facility.

The CPFF met the need for term funding by purchasing three-month paper at spreads that were significantly narrower than the prevailing spreads. This three-month term was itself an important innovation, since it effectively reduced rollover risk among issuers that had become forced into overnight funding. Still, the spreads were significantly wider than those before the crisis, so, like other facilities, it provided issuers an incentive to exit the facility as spreads normalized.

By far the most difficult and contentious design issue was how to ensure that the New York Fed's credit extensions to the SPV would be "indorsed or otherwise secured to the satisfaction of the Federal Reserve Bank," as required by Section 13(3). Clearly the credit extensions would need to be made with full recourse to the SPV and secured by all

the assets of the SPV. But consensus quickly emerged that relying solely on the CP and ABCP held by the SPV would not provide satisfactory security, and hopes that TARP funds could be used to capitalize the SPV went unfulfilled. Instead, issuers were required to pay an upfront registration fee of 10 basis points on the maximum amount of paper that they were eligible to sell. In addition, issuers of CP (other than ABCP) were required to pay an additional fee of 100 basis points per annum on paper sold to the SPV, unless the issuer posted acceptable collateral or had its paper endorsed by an acceptable endorser. Finally, because CP was sold at a discount, as paper matured and the principal was repaid, earnings accrued and accumulated within the SPV, providing collateral to absorb any losses from subsequent defaults by other issuers.

From its first day of operation the CPFF was heavily used, purchasing the overwhelming majority of new term paper. In January 2009, when the program's size peaked, the CPFF held \$350 billion of CP and ABCP, which was 20 percent of total paper outstanding. The existence of the program greatly contributed to the normalization of markets conditions, and as the environment stabilized, issuers had strong incentives to sell their paper in the market. Throughout 2009 CPFF use steadily declined, reaching a level of around \$10 billion in December. The program shrank to less than \$50 billion by year-end 2009 and expired on February 1, 2010. Although staff involved in the development of the novel lender-of-last-resort programs generally agree that the CPFF (and the AMLF) posed somewhat greater risk to the Fed than the other programs discussed in this chapter, over its life no issuers of paper purchased by the CPFF defaulted. In addition, the SPV accumulated about \$5 billion of capital, due to fees and interest received from issuers, that was ultimately accounted for as income to the New York Fed and subsequently remitted to the Treasury for the benefit of taxpayers.

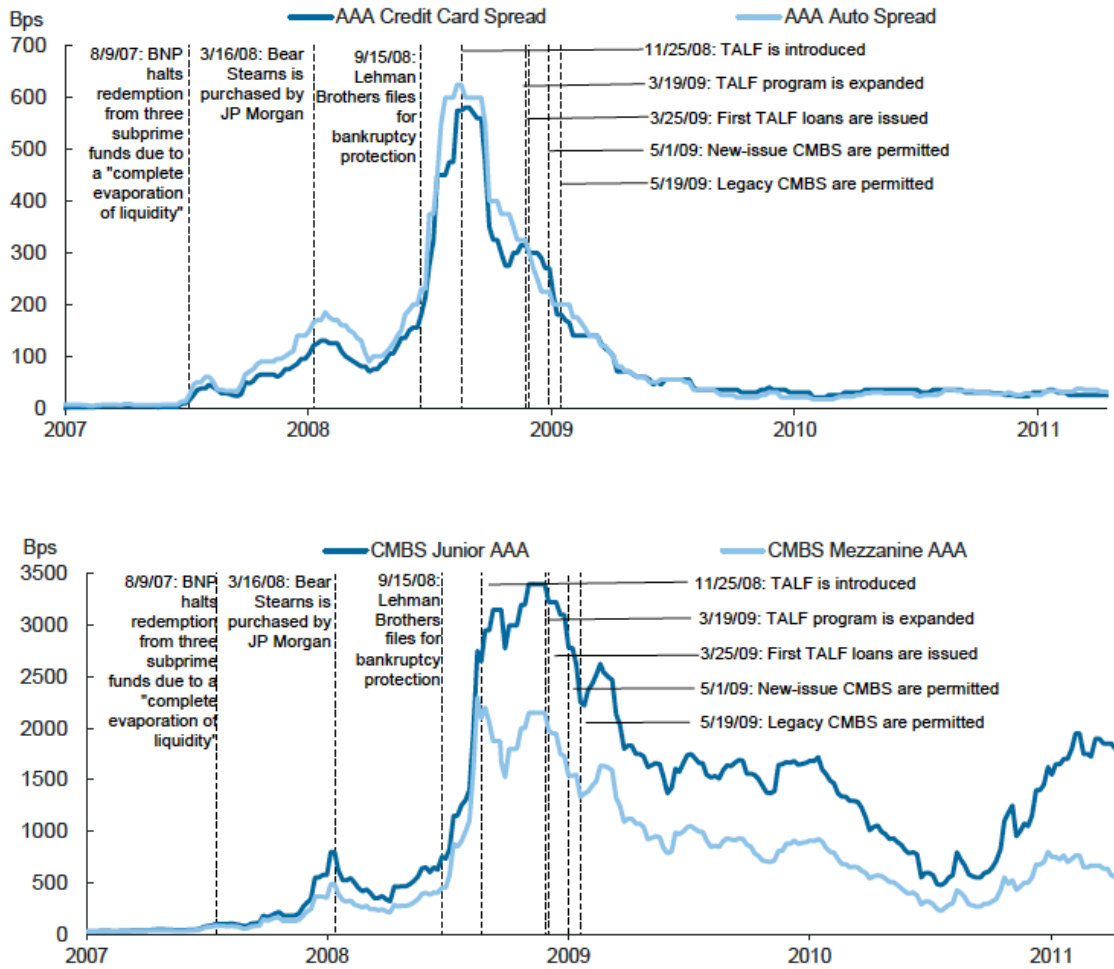
Reviving the ABS Markets: The TALF

In the decades leading up to the financial crisis, securitization became an increasingly common technique for financing consumer and business loans, including subprime and other non-agency mortgages, home equity lines of credit, small business loans, auto loans, student loans, business equipment loans, and credit card loans. For example, about one-half of credit card loans and one-third of auto loans were funded through securitization in the years preceding the crisis. Securitization involves pooling loans or other receivables and funding the pool with asset-backed securities (ABS). The securities are typically divided into tranches, with the senior tranche having first claim to proceeds and last responsibility for losses. In addition, the issuer of the loan typically retains some of the risk of the pool. In 2006, gross issuance of asset-backed and private mortgage-backed securities totaled nearly \$2.4 trillion.

Before the financial crisis, many investors in highly rated ABS relied on short-term funding markets, such as the repo and ABCP markets, to finance their ABS investments. However, beginning in the summer of 2007, creditors pulled back from lending in short-term funding markets, and when the financial crisis intensified in the fall of 2008, investor demand for highly rated ABS evaporated. Spreads on ABS widened dramatically as seen in Figure 9, and issuance of new ABS dwindled to near zero. In response, lenders that relied on securitization for funding tightened their lending terms and standards. For example, the average interest rate on auto loans extended by finance companies—

companies that were heavily dependent on securitization—rose from 3.25 percent in July 2008 to more than 8 percent by December 2008. This sharp deterioration in credit conditions contributed to the severe contraction in the economy that followed.

Figure 9: Consumer Asset-Based-Security and Commercial-Mortgage-Backed-Security (CMBS) Spreads



Source: Ashcraft et al. *The Federal Reserve's Term Asset-Backed Securities Loan Facility* JPMorgan Chase, Bloomberg

In October 2008, Federal Reserve Board, New York Fed and Treasury staff began discussing ways to encourage a revival of issuance of ABS using a combination of Federal Reserve lending and TARP funds. Revival of the ABS markets was not an end in itself, but a means of restoring credit access to businesses and households and thereby promoting economic recovery.

Staff quickly settled on two possible models. The model favored by Board staff involved market participants forming funds that would invest in ABS to which the Fed would provide leverage, Treasury would provide mezzanine financing, and private investors would provide equity. A similar model was eventually adopted by Treasury as

the Public-Private Investment Program (PPIP), although the PPIP did not include leverage from the Fed. New York Fed staff favored a model under which the Federal Reserve would lend to private investors in the ABS, with Treasury providing the Federal Reserve credit protection. The latter model was adopted and became the Term Asset-Backed Securities Loan Facility, or TALF. An important advantage of the TALF model was that it would naturally sunset when credit risk spreads normalized and alternative financing became more attractive than TALF loans.

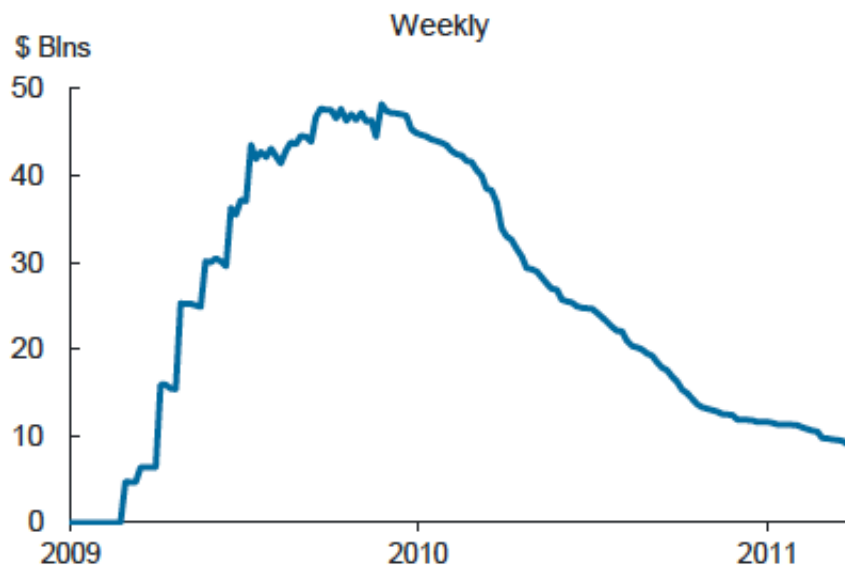
In the initial program announcement, TALF loans had maturities of one year. After further consultation with potential participants in the program, the maturities were extended to three-to-five years to better match the maturities of the underlying collateral. The interest rate spreads on TALF loans were set below spreads on highly rated ABS prevailing during the financial crisis but well above spreads in more normal market conditions, providing investors an incentive to repay the loans as financial conditions normalized. TALF loans were collateralized by the ABS purchased but did not provide for further recourse to the borrower except in very limited circumstances.

The non-recourse aspect of the loans provided investors with downside protection during a period of extraordinary economic uncertainty and risk aversion. If the collateral declined in value to less than the value of the loan, borrowers had the option of walking away from the loan, leaving the Fed and Treasury with the collateral, so the borrower could not lose more than the initial amount invested to cover the haircut.

The program was announced in November 2008 and began operations in March 2009, with the four-month gap reflecting the challenge of designing the program so that it was both safe and effective, as described below. Initially, the program accepted only newly issued, highly rated ABS backed by new or recently extended auto loans, credit card loans, student loans, and small business loans. It was reasoned that these categories of ABS all had securitization structures that had performed well in the crisis, or were backed by loans that were completely or partially guaranteed by the government, and therefore could be evaluated quickly and generally posed less risk.

The authorized size of the program was initially \$200 billion, backed by \$20 billion in credit protection for the Fed from the Treasury. Because of the credit protection provided by the TARP funds, the Fed was able to participate in the program in its traditional role as liquidity provider without taking on more than minimal credit risk, notwithstanding the longer terms and nonrecourse nature of the loans provided.

The program quickly expanded, as evident in Figure 10. On March 19, 2009, the Federal Reserve and Treasury increased the program size to a maximum of \$1 trillion backed by \$100 billion in TARP funding. They also announced they would consider expanding collateral to both newly issued and legacy collateralized loan obligations (CLOs), commercial mortgage-backed securities (CMBS), and private residential mortgage backed securities (RMBS).

Figure 10: Outstanding TALF Loans

Source: Ashcraft et al. *The Federal Reserve's Term Asset-Backed Securities Loan Facility*
Federal Reserve Statistics Release H.4.1.

By May, the program was expanded again to include newly issued, highly rated securities backed by business equipment loans, loans to retailers to finance their inventories, mortgage servicer advances, vehicle fleet receivables, insurance premium loans, and commercial mortgages (CMBS), as well as highly rated existing CMBS. We considered but ultimately decided not to recommend accepting newly issued or existing residential mortgage-backed securities or newly issued or existing collateralized loan obligations because the TALF appeared unlikely to be able to improve conditions in the markets for those securities at acceptable levels of risk to the government. For example, the team that evaluated the possibility of lending against legacy private RMBS concluded that the level of haircut needed to protect the government from losses could be as high as 100 percent.

While the TALF was authorized to make up to \$1 trillion in loans, because of the improvement in financial markets in the latter half of 2009, only about \$70 billion in loans were extended. This included more than 2,000 loans to nearly 200 different borrowers, including to traditional to asset managers, pension funds, hedge funds, and banks, as well as many smaller financial companies. The TALF closed for new loans backed by ABS and existing CMBS in March 2010, and for new loans backed by new-issue CMBS in June 2010.

To protect the Fed and the Treasury, several layers of risk controls were built into the TALF program. First, TALF loans were extended only to finance purchases of securities acquired in arms-length transactions—an investor borrowing from the TALF had to be unaffiliated with the originator or seller of the ABS presented as TALF collateral, and no side-payments could be made between the investor and seller. Second, the securities were required to have triple-A ratings from two or more rating agencies and were subject to an additional risk-assessment by the Federal Reserve. Third, the

maximum allowable amount of each TALF loan was always less than the market value of the ABS purchased by a haircut that depended on the riskiness of the collateral.

While extensive credit protections were necessary because of the complexity and variety of the underlying collateral, the program's effectiveness was diminished because of the long time it took to begin operation. In particular, there was a four-month period between initial conception and initial operation, an additional two months before the subsequent expansion was largely complete, and five more months before the last type of TALF loan, backed by newly issued CMBS, was extended. The non-recourse nature of the lending program made it especially important that it be designed carefully, while the disparate nature of the collateral made the design challenging and time-consuming. To speed up the design, staff considered establishing only broad collateral criteria and applying a large haircut, leaving it to the borrowers to determine the specific type of ABS to pledge. However, this blanket approach was potentially subject to serious adverse selection.

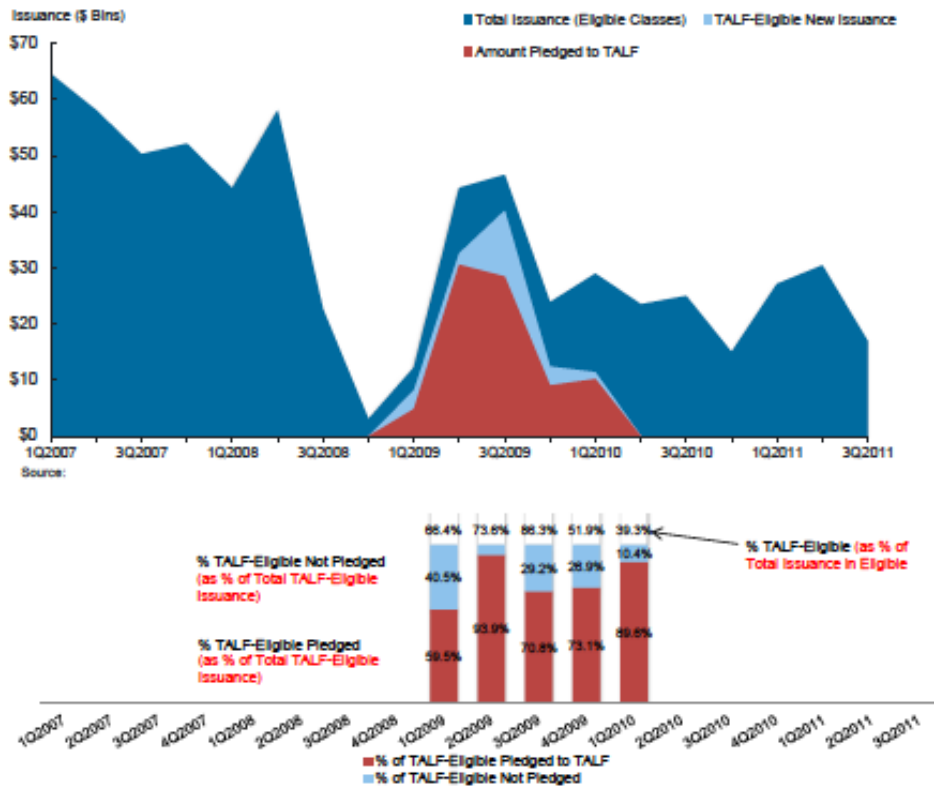
A few examples may help illustrate the many hurdles that needed to be overcome to bring the TALF to market. For primary dealers to operate as the New York Fed's agents, it was necessary for the SEC to issue an exemption from the prohibition on dealers' "arranging for the extension or maintenance of credit." For closed-end funds to participate as investors in the program, it was necessary for the SEC to issue an exemption from the custody provision of the Investment Company Act of 1940. Hedge funds were unwilling to participate as investors until the Fed issued an exemption from limits it had imposed on executive compensation of companies that received 13(3) loans. Because the initial operations took place before the Fed had its own credit review capacity built, we relied on ratings by credit agencies. Before accepting the ratings, the Fed staff had to get comfortable with the ratings methodology given that the methodologies were largely discredited in other parts of structured finance. Similarly, in the legacy CMBS program, following feedback from investors and additional analysis, we concluded that super senior conduit CMBS (AAA rated) was acceptable but mezzanine conduit CMBS (also AAA rated but structurally junior) was too risky.

While reducing the time needed to begin lending, the initial announcement that only a few types of ABS were acceptable added to the perception that the Fed and Treasury were engaged in "credit allocation": pursuing an industrial policy that promoted some economic sectors over others. The use of a uniform standard for evaluating ABS aimed to resolve this concern, but achieving this in practice was challenging, since ABS often follow bespoke structures to meet the idiosyncratic business situations of their issuers.

Another challenge for the TALF was that there was a perception that it was a giveaway program for the rich because its counterparties were largely hedge funds or specialized TALF funds established by asset management companies. For example, *Rolling Stone* magazine published an article on TALF, illustrated with pigs in makeup, pointing out that some wives of Wall Street executives, which it called the "Real Housewives of Wall Street," had made money under the program. In contrast to that perception, the Fed engaged in extensive outreach to minority- and women-owned potential borrowers, and the New York Fed approved several additional "TALF agents," chosen to help bring in a more diverse investor base. Staff and policymakers also emphasized the objective of encouraging lending to Main Street and gave concrete examples of lending that actually occurred because of the program whenever possible.

Looking back, despite the lengthy process involved in its launch, the TALF contributed importantly to a revival of ABS markets and a renewed flow of credit to households and businesses. Issuance of non-mortgage ABS jumped to \$35 billion over the first three months of TALF lending in 2009, after having slowed to less than \$1 billion per month in late 2008. During its initial months of operation, the TALF financed about half of the issuance in the ABS market, with the degree of support then declining as market functioning improved. This is depicted in Figure 11, which shows how eligibility and issuance in TALF-eligible asset classes evolved over the course of the program.

Figure 11: Total Issuance in TALF-Eligible Classes and Breakdown of TALF Issuance



Data Sources: Ashcraft et al. *The Federal Reserve's Term Asset-Backed Securities Loan Facility*
 Total Issuance (Eligible Classes)—Bloomberg; TALF-Eligible New Issuance—JP Morgan ABS Issuance Reports; Amount Pledged to TALF—Federal Reserve TALF Data.

II. Policy Assessment

The overarching goal of these novel lender of last resort programs was to mitigate potential increases in the cost and decreases in the availability of credit to US businesses and households. A number of research papers, and our own experience, found that the programs contributed to a narrowing of spreads and helped to slow the liquidity runs, averting a far more serious contraction in credit supply.

As these programs were announced and implemented, both policymakers and market participants perceived them to be effective. As discussed in previous sections, after the launching of the TSLF and PDCF, runs on secured financing of dealers generally slowed. The AMLF helped avoid fire sales by prime MMFs until the Treasury guarantee restored confidence among MMF investors. The CPFF allowed issuers to resume issuance of term CP and ABCP and contributed to the narrowing of spreads that enabled issuers eventually to sell term paper to investors other than the CPFF. And the TALF helped revive the ABS markets, which had been moribund in the immediate aftermath of Lehman’s failure. All of these developments headed off what surely would have been a much more severe contraction of credit.

In retrospect, though, we think that earlier introduction of broader programs and in some cases, in larger initial size could have been more effective. The programs were not approved and implemented until it was abundantly clear that runs were seriously impairing the ability of the financial institutions affected to meet the credit needs of the economy. Furthermore, the TSLF and PDCF initially financed rather narrow ranges of collateral which were broadened only when it became clear that the narrow parameters were limiting the effectiveness of the programs. Although we can’t prove that earlier introduction of broader programs that recognized the importance of capital markets in the financial system would have headed off the greater financial pressures and reductions in credit supply that later emerged, we believe it to be quite plausible. Furthermore, by “getting ahead of the panic” the Fed might actually have needed to do less emergency lending than it did by enhancing confidence and encouraging firms to continue to intermediate credit.

To be sure, the earlier launch of broader programs would have posed somewhat more risk to the Fed but potential losses to the Fed still would seem to pale in comparison to the shortfalls in economic activity that were associated with the higher costs and reduced availability of credit that occurred.

But these views are not only the product of hindsight, they also ignore the legitimate concerns that policymakers had to take into account. As noted above, in 2007 and well into 2008, the economic outlook was not so dire that policymakers could put aside worries that a dramatic expansion of the Fed’s balance sheet would get in the way of the Fed’s monetary policy objectives. And, in setting program parameters, policymakers had to strike a balance between limiting moral hazard and credit risk with the need to support the credit needs of the economy.

III. Lessons Learned

LESSON 1: BE PREPARED. The Fed had some well-developed plans to respond to its conception of a “banking crisis.” One was modeled on the failure of Continental Illinois in 1984. That episode involved a single institution experiencing a run on its deposits following credit losses. The plan in this case involved lending to it through the discount window, on the order of tens of billions of dollars, while maintaining interest rate control through conventional tools and by liquidating a portfolio of Treasury bills.

This plan proved of little use: the lending demand was far larger than had been conceived because the crisis was systemic; the systemic panic reduced the utility of the discount window because of signaling and stigma; and since the need for lending was largely outside the traditional banking system, the discount window alone poorly addressed it. The Fed also maintained a “crisis binder” that included a list of potential dire scenarios and a list of responses as well as summaries of crisis tools, but it did not envision anything like the 2008 financial crisis. The Fed found itself improvising under short time and operational constraints.

In improvising, policymakers were greatly aided by the presence of emergency authorities that were broad enough to be able to usefully confront the emergency. It would have been very difficult ahead of the crisis to write down exactly the type of facilities, the type of collateral, and the type of pricing that would have been appropriate for the specific circumstances that presented themselves, but having a broad authority promptly available was essential to be positioned to act. Put another way, tightly constrained programs may be fine in ordinary times, but not during crises.

Even with the necessary authority, it still took time to put into place robust, operationally sound programs, especially as these required using infrastructure or practices that are not part of routine business. Even in a crisis, there remains a need to protect the integrity of the Fed, such as by maintaining appropriate controls, maintaining proper books and records, establishing clear governance and compliance, putting well-considered legal agreements in place, and so on. Future crisis responses will be faster and more robust should this type of work continually be conducted well in advance as part of prudent planning. Indeed, the Fed now conducts operational readiness testing of a variety of types of open market operations to ensure it is prepared to implement monetary policy across a range of possible conditions. These efforts could be expanded to also incorporate readiness testing for future novel facilities, including ensuring that such facilities appropriately evolve over time along with the financial and economic environment.

While the Fed’s improvising was ultimately successful, maintaining both this operational infrastructure, market expertise, and creativity will be crucial in developing a faster and more robust response to the next crisis—even if the plans themselves again fail to fully foresee the specific situation at hand. Moreover, Congress should ensure that the Fed has the legal authority it needs to respond nimbly to the next financial crisis.

LESSON 2: MAINTAIN OPERATIONAL FLEXIBILITY IN THE MONETARY POLICY IMPLEMENTATION FRAMEWORK. During the crisis, the Fed’s ability to provide an effective lender of last resort function came into conflict with the monetary policy implementation framework. The constraints imposed fell along two lines: the need to maintain reserve scarcity, and the fact that traditionally, the monetary policy transmission mechanism relied on intermediation through the banking system. This lesson focuses on the first constraint, while the second is discussed in Chapter XXXX.

Historically, the Fed has maintained control of its policy rate through a framework based on reserve scarcity. Broadly speaking, lender of last resort programs increase the stock of reserves. This would tend to put downward pressure on overnight rates. An effective lender of last resort program needs to be able to commit to lending potentially

large amounts of cash and in amounts that might be hard to anticipate at times. But to maintain interest rate control, the Fed needed to keep a fairly tight control of reserve balances. However, it became evident that the size of the emergency lending programs exceeded the Fed's ability to sterilize with its existing tools.

Instead, policymakers tried, at least initially, to design the liquidity facilities in ways that would limit reserve creation and increase reserve balance predictability, such as capping the size of lending programs, running them only as term facilities that were offered infrequently and on a lag, or using intricate noncash structures like TSLF. However, the approach was problematic amid a severe deterioration in market conditions.

To improve the capacity for sterilization and provide the necessary flexibility to provide the liquidity the system needed, the Fed and Treasury worked together to develop a novel solution. The Treasury issued a special series of Treasury bills, and parked the cash raised by selling these bills in a segregated account at the Fed. This approach, known as the Supplementary Financing Program and launched two days after the failure of Lehman Brothers, efficiently and scalably reduced the outstanding stock of reserves, aiding in the Fed's efforts to maintain interest rate control, while working around the fact that the Fed, acting on its own, would not have been able to issue debt in this way. But this program suffered from two flaws. First, debt issued under this program was subject to the statutory "debt ceiling," and second, the program was entirely controlled by Treasury. Both concerns could be addressed if the Fed were granted the ability to issue bills.

A crucial change to the monetary policy implementation framework came in October 2008 when Congress provided the Fed immediate authority to pay interest on reserves. This adjustment makes it much less likely that the Fed will find itself caught in the artificial tradeoff between interest rate control and financial stability in the future.

Policymakers have yet to settle on a long-term monetary policy implementation framework. However, the experience through the crisis suggests that the framework and available tools should be flexible enough to allow the Fed to broaden its efforts to provide liquidity to the financial system as needed without having to balance control of short-term interest rates.

LESSON 3: COORDINATE PLANNING ACROSS THE OFFICIAL SECTOR. Fed independence is broadly premised on the notion that the aims of monetary policy are best accomplished by putting it at some distance from the day-to-day of politics. The Fed would operate using policy tools that had broad effects on the economy, and it would have the freedom to calibrate those tools to pursue the economic objectives it was given by Congress. Outside the scope of monetary policy lay "credit allocation," under which the Fed would pursue policies that would alter interest rates across types of borrowers, as well as actions more akin to fiscal spending.

As the crisis mounted and reliance on novel lending tools increased, concerns grew among some that the Fed's actions were pushing the institution's boundaries in ways that risked its independence. The concerns fell along four main lines. First, since it had taken

on significant credit risk and faced the risk of loss, it was taking an action some saw as proximate to fiscal spending such as through the TALF. Second, by lending to nontraditional counterparties and against nontraditional types of assets, it was seen by some as engaging in credit allocation. Third, by expanding reserves to fund this lending without full confidence in the ability to control interest rates in that environment, it for a time relied on the Treasury-operated Supplementary Financing Program to help drain reserves in the banking system to maintain interest rate control. And finally, by operating in close cooperation with Treasury over a prolonged period of time to resolve the crisis, some worried that this relationship would become entrenched and that Treasury would come to exert inappropriate influence over core monetary policy decisions.

These concerns were largely addressed in March 2009, at the peak of crisis-era risk aversion and around the launch of a large expansion of the TALF with a joint statement between the Fed and the Treasury. The statement promised four key things. First, the Fed and Treasury would collaborate on emergency lending, making clear that the Treasury approved of it. Second, the Fed would confine its focus to broad aggregates and avoid credit allocation. Third, the Fed would maintain its monetary independence and that the Treasury would seek legislative authority for “additional tools the Federal Reserve can use to sterilize the effects of its lending or securities purchases on the supply of bank reserves.” And fourth, the Fed and Treasury would collaborate to address the regulatory weaknesses that contributed to the crisis. This statement was followed by a comprehensive speech in April 2009 by Chairman Bernanke, “[The Federal Reserve’s Balance Sheet](#),” that elaborated on these points.

Following the crisis, many of the principles of the joint statement were put into action in some form. In the Dodd-Frank Act, the Fed’s authority to undertake emergency lending is now available only for broad-based programs, and then only with the Secretary of the Treasury’s concurrence. This served to address concerns about credit allocation and clarify that the fiscal authority would be accountable for the results of these programs. Regulatory reform also of course occurred. And authority to pay interest on reserves supplemented by the ability to conduct reverse repos proved sufficient to control rates with abundant levels of bank reserves.

That said, the underlying tension of how much risk the central bank should take in a crisis, and how far it should be willing to deviate from its traditionally narrow portfolio composition and collateral and counterparty lists, was never entirely resolved. Although the statute now says that the Fed and Treasury must collaborate, some argue that it provides limited guidance on how that collaboration would unfold, leaving it to policymakers to negotiate the boundaries somewhat anew in the heat of the next moment of crisis. With this context and given the experience with novel lending programs during the crisis, we recommend that planning together in advance around potential crisis responses is critical to work through remaining ambiguity, and ultimately to prevent crucial delays from operational, process, and communication complexities to launch robust and flexible programs in the future.

LESSON 4: TO ACHIEVE THEIR OBJECTIVE, LENDER OF LAST RESORT PROGRAMS MUST BE DESIGNED TO AVOID STIGMATIZING BORROWERS. The fundamental purpose of a lender of last resort is to encourage financial institutions to continue extending credit to households and businesses, even if

the institutions themselves are having difficulty obtaining credit from private sources. Without a lender of last resort, financial institutions are likely to horde liquidity through actions such as curtailing credit or selling illiquid assets into stressed markets. Indeed, the crisis demonstrated that lender of last resort programs can be structured not only to avoid such damaging actions but also to induce financial institutions to expand credit provision, as was the case with the AMLF and TALF.

But such programs can achieve that fundamental purpose only if financial institutions are willing to use them. Experience during the crisis demonstrated that financial institutions often are reluctant to draw on lender of resort facilities in a timely manner because of fear that disclosure of their use of the facilities could be damaging to their reputations and their access to private credit—an impediment to use that often is referred to as “stigma.” In a future crisis stigma could be an even more severe, because lender of last resort facilities subsequently often were characterized as “bailouts” of the institutions that used them.

Two aspects of program design are critical determinants of the potential for stigma to inhibit their use—the terms at which the loans are offered and whether (and when) the identities of the borrowers are disclosed.

With respect to the terms on which credit is offered, generations of central bankers have been taught that central bank credit should be extended at a “penalty rate,” in part to discourage borrowers from excessive reliance on central bank credit. But the crisis demonstrated that charging a rate in excess of the rate that the borrower would pay in the private market dooms a lender of last resort program to failure. In stressed market conditions, borrowing at an above market rate would signal that the borrower is unable to borrow at the market rate, presumably because it is financially troubled. Sending that signal would compound whatever funding difficulties the borrower was experiencing. So a program that involves lending above current market rates won’t be used and therefore won’t achieve its fundamental purpose.

The novel lender of last resort programs discussed in this chapter generally involved extending central bank credit at rates below the market rates prevailing during the crisis but above the rate that had prevailed under normal market conditions. Borrowers were incentivized to use the programs during the crisis but were also incentivized to curtail their use as soon as market conditions normalized. Although this policy was successful in mitigating the adverse effects of the runs and it facilitated an orderly exit from the programs, some may see such a policy as entailing an unacceptable degree of moral hazard, encouraging financial institutions to rely excessively on cheaper but unreliable sources of funding and then expect to tap central bank credit when such funding sources dry up. But this ignores the potential for moral hazard to be mitigated by prudential regulation, as it has been since the crisis through more robust liquidity regulation of banks and bank holding companies (including, on a consolidated basis, dealer subsidiaries of BHCs) and MMFs. Banks, BHCs, and MMFs today have far larger liquidity buffers than going into the crisis and therefore are less reliant on the existence or future creation of LLR facilities.

With respect to disclosure of borrowers, the users of the novel lender of last resort programs discussed in this chapter were not disclosed until well after the crisis was over.

Some believe that disclosure is necessary to accommodate the public interest and to hold the Fed accountable for its actions. But contemporaneous disclosure is unnecessary for these purposes and even the prospect of delayed public disclosure may cause financial institutions to conclude that curtailing credit or selling assets is preferable to being identified as the recipient of what some will characterize as a bailout. When making decisions about the timing and content of public disclosures, legislators and other policymakers need to take into account the potential for disclosures (even ex post disclosures) to render the programs ineffective.

LESSON 5: CONSIDER EXTENDING ACCESS TO THE DISCOUNT WINDOW TO DEALERS THAT ARE SUBJECT TO BANK-LIKE REGULATION. Access to the discount window remains limited to insured depository institutions (and to U.S. agencies and branches of foreign banks). But in the United States, unlike most other major financial systems, most of the credit needs of the economy are met through markets-based finance rather than through intermediation by banks (and other insured depository institutions). Dealers are the critical intermediaries in the securities markets, where they act as market-makers, and, as the financial crisis demonstrated, their funding model, which is reliant on short-term secured financing transactions, is susceptible to a loss of confidence by creditors. While standing access to the discount window has historically only been granted to depository institutions in large part because the associated moral hazard is contained by stringent regulation and supervision, post crisis nearly all the large dealers are in bank holding companies or “intermediate holding companies” subject to bank-like oversight. Accordingly, the extension of discount window access to dealers that are subsidiaries of regulated holding companies should be considered. In this regard the United States would be following the example of the United Kingdom. Since the crisis, dealers in the United Kingdom have been granted routine access to liquidity from the Bank of England.

IV. Conclusion

The Fed's novel lender of last resort facilities served an important role in mitigating the effects of the crisis by extending liquidity to the crucial non-bank sector, supporting repo and securitization markets, and helping to limit the tightening of credit to businesses and households. The facilities also served as vital stopgap measures until fiscal authorities were able to take necessary actions.

The range of programs, in terms of the markets they were directed at, the types of participants they lent to, and the collateral they accepted, underscores the value of broad emergency lending authority. The programs were innovative and imaginative, but they also were fundamentally reactive, as policymakers strove to balance the need to provide necessary support to the economy with the uncertainty of the environment and desire to limit moral hazard and credit risk.

The programs also highlight a number of lessons that will be crucial in the next crisis. Broad authorities, intellectual nimbleness, and operational planning are key. Liquidity provision should not conflict with monetary policy implementation. Lending facilities should be designed with stigma in mind. The Fed must be able to expand its liquidity provision and footprint in financial markets during times of crisis. Fiscal and monetary authorities should be clear on the types of risks each will take and coordinate plans in advance. These issues will be central to the effective management of the next crisis.

Appendix A: Summary Table of Novel Lender of Last Resort Facilities

| Facility | PDCF | TSLF | TALF | CPFF | AMLF |
|-----------------------------------|--|--|--|--|---|
| Full Name | Primary Dealer Credit Facility | Term Securities Lending Facility | Term Asset-Backed Securities Loan Facility | Commercial Paper Funding Facility | Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility |
| Peak Usage | \$171 billion | \$236 billion | \$48 billion | \$348 billion | \$152 billion |
| Date Announced | 3/15/2008 | 3/11/2008 | 11/25/2008 | 10/7/2008 | 9/19/2008 |
| First Operation | 3/17/2008 | 3/27/2008 | 3/25/2009 | 10/27/2008 | 9/22/2008 |
| Facility Closed | 2/1/2010 | 2/1/2010 | 6/30/2010 | 2/1/2010 | 2/1/2010 |
| Description | Overnight loan facility providing funding to primary dealers in exchange for tri-party-eligible collateral | Weekly loan facility that offered Treasury securities held by the System Open Market Account (SOMA) for loan over a one-month term against program-eligible collateral | A funding facility that supported the issuance of asset-backed securities (ABS) collateralized by loans of various types to consumers and businesses of all sizes | Program, whereby FRBNY provided three-month loans to the CPFF LLC, a specially created limited liability company (LLC) that used the funds to purchase commercial paper directly from eligible issuers | Program whereby the Federal Reserve provided nonrecourse loans to U.S. depository institutions, U.S. bank holding companies, U.S. broker-dealer subsidiaries of such holding companies, and U.S. branches and agencies of foreign banks. These institutions used the funding to purchase eligible ABCP from MMWFS |
| Eligible Borrowers/Counterparties | Primary Dealers | Primary Dealers | Any U.S. company that owned eligible collateral could borrow from the TALF through an account relationship with a parent, were eligible to sell commercial paper to the SPV. | Only U.S. issuers of commercial paper, including U.S. issuers with a foreign parent, were eligible to sell commercial paper to the SPV. | U.S. depository institutions; U.S. bank holding companies; U.S. broker-dealer subsidiaries of such holding companies; and U.S. branches and agencies of foreign banks |
| Legal Authority | Section 13(3) of the Federal Reserve Act | Schedule 1: Section 14(b) of the Federal Reserve Act Schedule 2: Section 13(3) of the Federal Reserve Act | Federal Reserve Act | Section 13(3) of the Federal Reserve Act | Section 13(3) of the Federal Reserve Act |

Note: PDCF peak usage includes lending to foreign affiliates of some primary dealers. TSLF Options Program (TOP) is not shown.
Source: GAO, Board of Governors of the Federal Reserve System, New York Fed

Appendix B: Subsequent Analysis of the Effectiveness of the Novel LLR Facilities

TSLF

A report by the Federal Reserve Board's Office of Inspector General (2010) notes that although it may not be possible to assess the specific, direct impact of the TSLF, there were indications of improvements in functioning of financial markets. Fleming et al (2010) found that banks had been reluctant to use the Fed's discount window because of a perceived stigma associated with banks' creditworthiness if their borrowing were to become known and that the TSLF may have overcome this stigma because of its competitive auction format. Wiggins and Metrick (2016) found that the TSLF successfully mitigated part of the liquidity problem suffered by primary dealers. A report by Hrung and Seligman (2011) found that, for every estimated \$1 billion increase in Treasury collateral from TSLF, the federal funds-repo spread narrowed by roughly 1.2 basis points. By contrast, Wu (2008) found that, while TAF had a strong effect in reducing financial strains in the inter-bank money market, primarily through relieving financial institutions' liquidity concerns, the TSLF and PDCF had less discernible effects in relieving financial strains in the Libor market.

PDCF

Adrian, Burke and McAndrews (2009) note that borrowing from the Primary Dealer Credit Facility (PDCF) was widely used when, in the wake of Lehman Brothers failure, other primary dealers experienced severe difficulties obtaining funding in the capital markets as lenders imposed higher haircuts on repos and would not accept all types of securities as collateral. The PDCF fulfilled one of its purposes, namely it was available to primary dealers when a failure of a primary dealer led to severe funding disruptions for the surviving dealers. Regarding usage, the U.S. Government Accountability Office (2011) did not find evidence of a systematic bias favoring one or more eligible institutions, although Boyson et al (2014) found that borrowing from Fed liquidity programs remained concentrated through the crisis and the largest loans were provided to primary dealers under the PDCF facility.

AMLF

The Fed's Inspector General Report (2010) found that the AMLF effectively provided liquidity to money funds to help ease redemption concerns and fostered liquidity in money markets generally. Duygan-Bump et al (2013) reached a similar conclusion. They found that facility participation was more likely among funds that experienced larger redemptions and that held a larger share of asset-backed commercial paper in their portfolios. Using a difference-in-difference approach, they find that outflows were lower at funds that held higher levels of AMLF-eligible collateral and that spreads on AMLF-eligible ABCP narrowed by more than yields on similar but ineligible securities.

CPFF

Adrian, Kimbrough and Marchioni (2011) find that the CPFF supported the orderly functioning of the commercial paper market during the crisis. They find that the facility contributed to a material reduction in the fraction of commercial paper issued on an overnight basis and a narrowing of spreads on eligible CP. They report that the spreads on one-month AA-rated unsecured CP and ABCP declined sharply over the first few months of operation, whereas spreads on A2/P2 commercial paper, which was ineligible for the CPFF, edged up.

TALF

A number of studies have found that TALF had a beneficial impact on ABS markets, although the impact is difficult to measure precisely in part because there was an improvement in financial market conditions generally when the program began. Agarwal et al (2010) analyzed the role of ABS markets in generating credit and liquidity and how this role was disrupted during the financial crisis. Before the creation of TALF, spreads on two-year and three-year AAA-rated ABS soared to up to 600 basis points for auto ABS and 550 basis points for credit card ABS. Soon after the creation of TALF on November 28, 2008, spreads dropped by over 200 basis points in both of these sectors. The authors found that the introduction of TALF caused the ABS interest rates to narrow from its historical highs in the fourth quarter of 2008, declining progressively at each expansion; at the completion of TALF, spreads have fallen to approximately pre-crisis levels.

Ashcraft et al (2012) found that the program contributed to a sharp decline in spreads in ABS markets by improving liquidity conditions and also had a longer-term impact by encouraging improvements in the design of CMBS. Ashcraft, Garleanu, and Pedersen (2010), moreover, found some evidence that TALF reduced the spreads on legacy CMBS that were accepted into the program. By examining the behavior of asset prices around TALF announcements, Campbell et al (2012) found that TALF had broad positive impacts on ABS markets rather than at the security level, suggesting that the program worked by improving investor sentiment rather than by subsidizing or certifying the particular securities that were funded by the program.