

The Journal of Financial Crises

Volume 2 | Issue 2

2020

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Rosalind Z. Wiggins
Yale Program on Financial Stability

Andrew Metrick
Yale University

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Recommended Citation

Wiggins, Rosalind Z. and Metrick, Andrew (2020) "The Federal Reserve's Financial Crisis Response A: Lending & Credit Programs for Depository Institutions," *The Journal of Financial Crises*: Vol. 2 : Iss. 2, 34-66.

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The Federal Reserve's Financial Crisis Response A: Lending & Credit Programs for Depository Institutions¹

Rosalind Z. Wiggins² and Andrew Metrick^{3,4}

Yale Program on Financial Stability Case Study 2015-1a-v2
July 15, 2015, revised: July 15, 2020

Abstract

Beginning in summer 2007, the Federal Reserve (the Fed) was called upon to address a severe disruption in the interbank lending markets sparked by a downturn in the subprime mortgage market. As these developments began to impact the ability of banks to raise adequate funding, the Fed encouraged them to utilize the Discount Window (DW), its standing facility for lending to depository institutions, and repeatedly decreased the lending rate to make the facility more accessible. Despite the Fed's efforts, for a number of reasons, including historical perceptions of stigma, banks were reluctant to utilize the DW. In December 2007, the Federal Reserve introduced the Term Auction Facility (TAF), which provided term loans via auction utilizing the same collateral that could have been used at the DW. The TAF was immediately and aggressively utilized and would become one of the largest facilities employed by the Fed to combat the financial crisis. Ultimately, the Fed lent a total of \$3.8 trillion to 416 banks under the TAF. This case examines the Fed's use of the DW and the TAF to provide liquidity to depository institutions in fighting the financial crisis.

¹ This case study is one of five Yale Program on Financial Stability (YPFS) case modules considering the Federal Reserve's credit and lending responses to the global financial crisis:

- The Federal Reserve's Financial Crisis Response A: Lending & Credit Programs for Depository Institutions.
- The Federal Reserve's Financial Crisis Response B: Lending & Credit Programs for Primary Dealers.
- The Federal Reserve's Financial Crisis Response C: Providing U.S. Dollars to Foreign Central Banks.
- The Federal Reserve's Financial Crisis Response D: Commercial Paper Market Facilities.
- The Federal Reserve's Financial Crisis Response E: The Term Asset-Backed Securities Loan Facility.

Cases are available from the Journal of Financial Crises at <https://elischolar.library.yale.edu/journal-of-financial-crises/>.

² Director, The Global Financial Crisis Project and Senior Editor, Yale Program on Financial Stability (YPFS), Yale School of Management.

³ Janet L. Yellen Professor of Finance and Management, and YPFS Program Director, Yale School of Management.

⁴ The authors would like to thank Patricia Mosser, Senior Research Scholar, School of International and Public Affairs, Columbia University for her comments on this paper.

1. Introduction

On August 9, 2007, the French bank BNP Paribas⁵ announced that it was suspending redemptions from two of its investment funds that held substantial portfolios of subprime mortgages because of an inability to value the funds. The increasing turmoil in the subprime mortgage market was creating illiquidity in the secondary market. This announcement set off a panic among investors that led to a sudden contraction in lending as institutions pulled back from investments that they perceived as having increased risk. The downturn in the subprime mortgage market quickly collapsed the asset-backed securities commercial paper (ABCP) market, which incorporated many subprime mortgages, and then spread to other parts of the interbank funding markets. Despite having large depository sources of funds, banks also relied on ABCP and securitization to fund their operations. As these markets contracted, banks and other financial institutions soon experienced difficulty in meeting their funding needs. There was concern that institutions would begin to tighten their lending standards slowing their lending to business and households and impacting the economy beyond the financial system.

The Federal Reserve (the Fed) responded quickly to the tightening in the credit markets by cutting the primary credit rate, the main rate at which it lends to depository institutions through its Discount Window (DW), its main standing facility for providing liquidity to eligible institutions. However, banks were reluctant to borrow from the DW for a number of reasons including that they were afraid that doing so would be perceived as a sign of financial weakness. When pressures in the credit markets continued, the Fed enacted, in December 2007, the Term Auction Facility (TAF), an innovative auction funding program to make needed liquidity accessible to depository institutions and maintain the flow of credit throughout the economy.

In this case we explore the Fed's use of its conventional monetary policy tools as lender of last resort to provide critical liquidity to depository institutions during the Global Financial Crisis. Section 2 discusses the basics of the Fed's lending powers; Section 3 discusses the DW, while Section 4 discusses the problems of stigma associated with the DW; Section 5 explains in detail the TAF; and lastly, Section 6 examines the impact of the DW and TAF lending during the crisis.

⁵ See Bloyd (2007).

Questions

1. What is the primary function of the Discount Window and was it an effective tool in the Federal Reserve's efforts to combat the crisis? Why? Why not?
2. The Fed reduced the federal funds rate 10 times between August 2007 and December 2008 to an unprecedented low level. During that same period, it also adjusted the spread between the federal funds rate and the DW's primary credit rate. Considering the timing and magnitude of these changes, were they effective in serving their intended purpose?
3. What other options were available to the Fed to provide banks with the needed liquidity? Why do you think these other options were not implemented?
4. What were the intended advantages of the TAF over the DW? What elements of the TAF affected these advantages? Were these advantages realized in the operation of the TAF?
5. Did the DW and TAF effectively complement each other? Were there redundancies that could have been avoided? What does the co-existence of these two programs reveal about the Fed's tools for fighting the crisis?

2. The Federal Reserve's Lending Powers

In its role as lender of last resort (LOLR) and keeper of monetary policy, the Fed has three basic tools: reserve requirements, the DW and open market operations (OMOs). The Fed sets the amount of reserves that depository institutions are required to maintain with it to secure their operations. The Fed makes loans available to depository institutions⁶ through the DW at rates established by the Fed, the discount rate. Through adjustments via its OMOs (repo and reverse repo loans with primary dealers), the Fed influences the demand for and amount of balances that depository institutions in aggregate hold at the Fed, and therefore the targeted federal funds rate.

Traditionally, the prime credit rate at the DW has been 100 basis points higher than the target federal funds rate.⁷ This made the DW less attractive and more expensive, consistent with the Fed's role as LOLR. DW loans are made to banks by their regional Federal Reserve Bank with which they have established a relationship and posted collateral. DW lending is

⁶ The Fed only has authority to lend to depository institutions and bank holding companies through its Discount Window. A broader group of firms, including the primary dealers, some who are not depository institutions, may borrow from the OMOs, and thus, access funds at the federal funds rate. (See Wiggins and Metrick 2016B for a discussion of the Fed's use of these mechanisms to provide liquidity to Primary Dealers during the crisis.)

⁷ There are actually three rates at the Discount Window. The primary credit rate is available to banks in sound financial condition. The secondary credit rate is available to banks that are not eligible for the primary credit rate. The seasonal credit rate applies to loans provided to usually smaller banks that experience a recurring variation in seasonal liquidity demand, usually banks serving agriculture, tourism, or other similar industries. (Gilbert et al. 2012, 224).

usually for overnight terms and must be fully secured by collateral. By tradition, not requirement, the 12 Reserve Banks complied with common collateral rules. It should be noted, however, as will be discussed later, for a number of reasons DW lending to banks has historically been fairly minimal.

In addition, the Fed has the ability to make loans through its OMOs on an as-needed basis in order to offset other changes in its balance sheet and adjust the amount of reserves that it holds in order to maintain the federal funds rate around the target established by the Federal Open Market Committee (FOMC).⁸ This lending was usually in the form of overnight repo or reverse repo lending through its primary dealers against highly restricted classes of collateral that are limited by statute, specifically, U.S. Treasury and U.S. government agency securities, including mortgage-backed securities issued by Fannie Mae, Freddie Mac, and Ginnie Mae.

Collateral for Discount Window Loans

All DW loans (and later loans under the TAF) were made with recourse to the borrower and also had to be “secured to the satisfaction of the Federal Reserve” bank making the loan and supported by “acceptable collateral.” Acceptable collateral included most performing loans and most investment-grade securities, although for some types of securities (including commercial mortgage-backed securities, collateralized debt obligations, collateralized loan obligations, and certain non-dollar-denominated foreign securities) only AAA-rated securities were accepted. Instruments that were issued by the borrower or its affiliates were not acceptable as collateral.

Banks had to establish a borrowing relationship and deposit collateral with a Federal Reserve bank before they could execute a loan. Therefore, some banks would set up a relationship and deposit collateral just to ensure that they would be able to borrow from the Fed should the need arise. Assets accepted as collateral were assigned a “lendable value,” roughly fair market value less an applicable haircut.⁹ Haircuts varied greatly based on the type of asset and its duration. Haircuts were lowest for high-quality assets of very short-term duration and greatest for low-quality assets of long-term duration. Haircuts applied only to assets for which there were market prices being quoted. For assets for which a market price could not readily be obtained, even AAA-rated assets (such as certain collateralized bonds during the crisis), an internally modeled fair market value estimate based on comparable

⁸ The discount rates and reserve requirements are proposed by the board of directors of the regional Reserve Banks and are approved by the Board of Governors of the Federal Reserve System. The Federal Open Market Committee (FOMC) is responsible for open market operations and setting the federal funds rate.

⁹ “Lendable value is determined as the market price of the asset less a haircut, or, when a market price is not available, an internally modeled fair market value estimate less a haircut. Haircuts reflect credit risk and, for traded assets, the historical volatility of the asset’s price and the liquidity or illiquidity of the market in which the asset is traded. The Federal Reserve’s haircuts are generally in line with typical market practice. The Federal Reserve applies larger haircuts—and thus assigns lower lendable values—to assets for which no market price is available than to comparable assets for which a market price is available. Borrowers may be required to pledge additional collateral if their financial condition weakens” (Fed. Res. website).

assets was assigned. And in the case of loans, the margin for assets with a term greater than ten years was applied¹⁰.

3. Discount Window Lending During the Crisis

On August 10, 2007, the day after BNP Paribas made its announcement, the Federal Reserve announced that it was available to provide liquidity “to facilitate the orderly functioning of financial markets” in light of the current circumstances where “depository institutions may experience unusual funding needs because of dislocations in money and credit markets.” At that time the Fed did not take any action to make its DW funding any more attractive. Its stance was one of reassurance. It had money to lend and banks could borrow at the then primary credit rate of 6.25% (Fed. Res. Aug. 10, 2007).

However, one week later, on August 17, the Fed lowered its primary credit rate by 50 basis points to a rate of 5.75%. Significantly, this halved the traditional 100 basis point spread between the DW rate and the federal funds rate. Also, in response to a shortening of credit tenure in the market, the Fed changed the term of its DW lending from overnight to permit loans for up to 30 days. It further committed to maintain these liberal terms until it “determine[d] that market liquidity has improved materially” in order to “provide depositories with greater assurance about the cost and availability of funding” (Fed Res. Aug. 17, 2008).

A month later, on September 18, 2007, the Fed again made a 50-basis-point reduction in the primary credit rate. As shown in Figure 1, it would repeat this action and continue to reduce the rate aggressively over the next 90 days in an effort to stimulate the banks to borrow. By December 2007, the fed funds rate and primary credit rate were at 4.25% and 4.75%, respectively. A year later, in the midst of the worst financial upheaval since the Great Depression, the rates would stand at .25% and .50%, respectively.

This aggressive campaign by the Fed was recognition of the brewing volatility in the credit markets as the subprime mortgage market corrected. As early as August 10, 2007, the credit markets began to react to increased concerns about counterparty risk and liquidity by demanding increased rates for funding, especially with respect to unsecured lending. The Fed’s actions were an attempt to ensure the banks and the investment community that the Fed would provide the liquidity needed. By assuring that the liquidity would be available, the Fed hoped to prevent the problems in the mortgage market from spilling over to other credit markets and ultimately impacting the greater economy.

However, volatility continued. Soon, some ABCP issuers found it difficult to roll over their maturing paper (which sometimes incorporated subprime mortgages), and a run on ABCP ensued. The types of collateral that lenders would accept became more constrained as worries about structured securities increased. Banks, both foreign and domestic, which relied on securitization to manage loan inventory and fund future lending were faced with

¹⁰ For more details regarding the Fed’s DW loan collateral program, see The Federal Reserve System Guide to Discount Window Collateral, accompanying Collateral Margins Table, and Operating Circular No. 10.

having to take assets onto their balance sheets and also a retraction in their funding sources. They scrambled to fund these new assets and fill their funding gaps through a combination of unsecured CP, repos, and notably, U.S. banks financed mortgages through loans from the Federal Home Loan Bank System.¹¹ These alternative sources enabled banks to moderate the effects of the market upheaval. However, there still was concern that to preserve their liquidity, banks in this situation might begin to tighten the credit that they made available to households and businesses, weakening in the economy (Fed. Res. Sept. 17, 2007).

FIGURE 1: Changes to Federal Lending Rates—2007 to 2010

Date	Discount rate (change)	Fed funds target rate/range (change)
Jan - July, 2007	6.25%	5.25%
August 17, 2007	5.75% (-50 bp)	5.25% (no change)
September 18, 2007	5.25% (-50 bp)	4.75% (-50 bp)
October 31, 2007	5.00% (-25 bp)	4.50% (-25 bp)
December 11, 2007	4.75% (-25 bp)	4.25% (-25 bp)
January 22, 2008	4.00% (-75 bp)	3.50% (-75 bp)
January 30, 2008	3.50% (-50 bp)	3.00% (-50 bp)
March 16, 2008	3.25% (-25 bp)	3.00% (no change)
March 18, 2008	2.50% (-75 bp)	2.25% (-75 bp)
April 30, 2008	2.25% (-25 bp)	2.00% (-25 bp)
October 8, 2008	1.75% (-50 bp)	1.50% (-50 bp)
October 29, 2008	1.25% (-50 bp)	1.00% (-50 bp)
December 16, 2008	0.50% (-75 bp)	0-0.25% (-75 bp)
January 16, 2009	0.50% (no change)	0-0.25% (no change)
February 18, 2010	0.75% (+25bp)	0-0.25% (no change)

Source: Federal Reserve 2008 Developments.

The continued disruption in the credit markets compelled the Fed to seek ways to make the DW more effective. In December 2007, it introduced the Term Auction Facility (discussed below), a mechanism that would make DW funds available to banks through a market (auction) determined price for term loans every two weeks. The TAF would be aggressively utilized even as the DW was still shunned.

Even so, on March 16, 2008, following the near collapse of Bear Stearns, and significant continued deterioration in the term funding markets, the Federal Reserve announced that it

¹¹ For a discussion of Federal Home Loan Bank System lending during the crisis see Ashcraft, Bech and Frame (2008).

was reducing the spread for DW lending over the federal funds rate to 25 basis points, (to 3.25% and 3.00% respectively) (Fed. Bd of Gov. March 16, 2008). This was quickly followed by a further 75-basis-point reduction in both the federal funds rate (to 2.25%) and the DW rate (down to 2.5%) (Fed Bd of Gov., March 18, 2008). The Fed also increased the maximum maturity for DW loans to 90 days.

Although at this time, the TAF had supplanted the DW as the main source of government funding utilized by banks in need (See Figure 2.), these actions by the Fed in lowering the discount rate recognized that the already stressed market might yet be overtaxed by the effects of Bear Stearns. It was also recognition of the sudden nature of Bear's demise.¹² A rash of investors refusing to roll over funding could similarly cause an otherwise solvent bank to experience a severe hole in its funding. The TAF provided for periodic auctions, but only the DW could be accessed by any bank on any day for an immediate injection of funds to squelch a sudden liquidity need.

At no prior time in the Fed's history had it so aggressively reduced the borrowing rates. The federal funds rate was reduced ten times between August 2007 and December 2008, dropping by five points (from 5.25% to .25%), and the spread between that rate and the DW primary credit rate dropped from 1 percent to 25 basis points. As shown in Figure 2, however, the Fed's aggressive lowering of the borrowing rates had little success in persuading banks to borrow directly from the DW, especially prior to September 2008. (See discussion at page 15.)

Administrative details regarding the Fed's DW lending may be found at the following webpages: <https://www.frbdiscountwindow.org/> (Federal Reserve) and <http://www.newyorkfed.org/banking/discountwindow.html> (Federal Reserve Bank of New York).

4. The Problem of Stigma

Despite the availability of the Federal Reserve to provide funding as LOLR through the DW, there were several reasons why eligible banks were often reluctant to access these funds, even in the midst of the financial crisis. The fact that reserves didn't pay interest had a notably distorting influence on bank reserves management by banks, including their use (or lack thereof) of the DW. The Fed set very low, often zero, reserve requirements on deposits. Most reserve requirements were met by banks holding "vault cash," i.e., cash in their ATMs, not through their deposits at the Fed. As a result, depository institutions' deposits/reserves at the Fed were small. Of course, when overnight rates were positive, the banks didn't want to hold any reserves—required or excess—because reserves didn't pay interest. Instead they could loan funds out and earn interest. Banks employed many mechanisms to keep required reserves low and excess reserves near zero. The tiny size of (non-currency) reserves, meant that when a bank was accidentally "short" of reserves at the end of the day,

¹² Bear, an investment bank, followed a highly-leveraged business model like most of its peers and financed a substantial portion of its balance sheet with short-term lending (and by March 2008, even overnight repo). When lenders refused to roll over its debt, it had no LOLR to turn to.

the size of their miss was typically small as well. Therefore, the cost of paying a very high market interest rate to borrow reserves for one day in the Fed funds market (at a rate above the discount rate) was “small change,” and doing so was more convenient than accessing the DW.

However, the most significant reason that banks refused to access the DW was fear that doing so would signal that they had unusual funding needs and or that they could not raise funds in the market. To access the DW, the bank had to initiate the transaction and it might have been the only entity borrowing from the DW at the time. Although, prior to the Dodd-Frank Wall Street Reform and Consumer Protection Act (Pub. L. 111-203, H.R. 4173) the Fed did not publicly disclose the names of banks that borrowed from the window, there were nevertheless incidents when this information was released by the media and perceived negatively (Armantier et al., 2013, 2-3). Further, the Fed did report DW lending in its weekly H4.1 report, which, although it did not identify borrowers, did identify borrowing by region, which could lead to troubling and or harmful speculation.¹³

The issue of stigma and DW lending has a long history due to changes in the Fed’s policies and practices over time. Established by the Federal Reserve Act of 1913, the Fed’s DW was intended to provide a mechanism for the Fed to operate as the LOLR, anticipating and preventing bank runs by providing needed liquidity rather than merely lending into the run (Gorton and Metrick 2013, 6). In its early years, the DW lending rates were below market, and the new regime was successful in preventing runs of eligible national banks throughout the 1920s as banks freely borrowed from the DW. However, the Fed soon became concerned that some banks were borrowing too freely and or borrowing to speculate in the securities markets.

The Fed began to discourage DW borrowing and throughout the decade it quietly shifted its monetary policy to pressuring bank reserves through open market operations, while encouraging banks to be “reluctant to borrow” from the DW. The Fed promoted DW borrowing for temporary periods and unusual circumstances, rather than continuous borrowing for ordinary needs. In light of these new parameters, banks that did borrow were looked upon as weak, suffering a stigma (Ibid., 9-12). And so, as banks began to experience troubles during the Great Depression, they refused to borrow from the DW. Depositors panicked and sought to withdraw their funds. Many banks were unable to meet their obligations and failed. Bank runs broadened as depositors realized that despite the Fed’s role as LOLR, their banks couldn’t pay them.

The Fed’s “reluctance to borrow” policy persisted and over time became formalized in rules that required banks seeking to borrow to exhaust other sources of lending before borrowing

¹³ The H4.1 report provides borrowing by Fed district. Many felt it increased the DW stigma, because any disclosure of DW lending led to speculation about which bank, particularly which large bank, in a region was doing the borrowing. For example, if the 12th district (San Francisco Fed) reported any sizable DW borrowing for the week, market participants would immediately begin to speculate which large California bank (e.g. Wells, Fargo) was “in trouble” with the expected consequences. In this way borrowing from the DW could be particularly stigmatizing for the big banks.

at the DW, and to explain their need for the funds. The introduction of federal depository insurance after the Depression mitigated the effects of this policy, since even if the banks didn't borrow, depositors would be protected (Ibid.).

In 2003, the Fed finally changed course and created a "no ask" policy removing the need for banks to prove that they had exhausted other sources of borrowing or to explain why they were borrowing (Armantier et al., 2013, 7). Its new program, which also introduced the three-tier borrowing levels, was intended to "reduce institutions' reluctance to use the window as a source of back-up, short-term liquidity" (Fed. Res. Bd. Gov. 2003). Simultaneously, the primary credit rate was raised above the Federal funds rate. As a result, a bank could borrow from the DW for any reason, not just because it could not access other funding, but at a premium rate (Ibid.).

However, few banks did borrow. Despite the 2003 changes, banks continued to fear that they would be perceived as being troubled if they sought funding from the DW. The consequences of stigma could be severe for any bank and might include: sparking a run on deposits, a loss of confidence by analysts, a drop in the bank's stock price, or withdrawal of market sources of liquidity (Ibid., 1). Given these risks (which could be particularly dire for an institution experiencing real financial weakness), many banks decided that borrowing funds from the DW was too risky. However, failing to access the DW could also weaken a bank's situation by compelling it to borrow at higher rates or conduct sales of assets at fire-sale prices to meet liquidity needs. Further, banks' reluctance to borrow from the DW limited the Fed's ability to inject liquidity into the economy and thus fulfill its primary mission as overseer of monetary policy (Ibid., 7). (Also see Di Leo and Randall (2011) for further discussion of the stigma phenomenon.)

The Impact of Stigma during the Crisis

It is clear from the FOMC meeting transcripts that the Fed understood that this stigma continued to affect DW borrowing when the credit markets became disturbed in late 2007:

The second issue that we have been looking at is how to address the stigma of the discount window. Are there ways to provide liquidity that would help normalize money markets, particularly term money markets, and would allow banks to make use of the enormous amount of collateral they have at the discount window, but would avoid the stigma and create a more efficient system? The solution that the staff came up with on that was to have an auction facility that would essentially set an endogenous price and, because it was an auction, it might look more like a good business proposition rather than like a move of desperation and, therefore, would not have the same stigma. (FOMC Trans. Sept. 18, 2007, 128)

This continued to be the Fed's viewpoint at its December 2007 meeting where it finally adopted the TAF. In so doing, it also noted the different environments faced by the central banks in Europe and the United Kingdom:

The term funding spreads in the euro area are a bit narrower than those in the United States and the United Kingdom. This may reflect, in part, the term funding operations

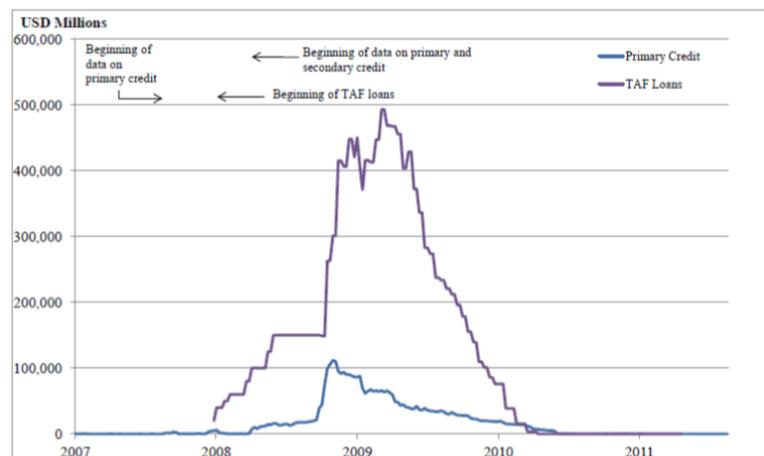
of the European Central Bank. The ECB monetary policy framework permits the ECB to provide a large amount of term funds to many different depository institutions that are secured by a broad range of collateral. In addition, little stigma appears to be associated with the use of the ECB's standing facility, in contrast to the United Kingdom and the United States, where stigma plays a much more important role in limiting borrowing from such facilities. (FOMC Trans. Dec. 6, 2007, 3-4)

This sentiment regarding stigma was also later confirmed by Chairman Bernanke:

In August 2007...banks were reluctant to rely on discount window credit to address their funding needs. The banks' concern was their recourse to the discount window, if it became known, might lead market participants to infer weakness—the so-called stigma problem. (Bernanke 2009)

As noted earlier, DW borrowing was limited even as the Fed continuously and aggressively lowered the primary credit rate. Armantier, Krieger, and McAndrews (2008) argue that this could have been because there was other well-priced market funding available, especially because the market's most severe strains were with respect to term funding not (yet) overnight funding. However, one must consider this possible explanation in light of the immediate and aggressive use of the TAF after implementation, as shown in Figure 2, and as discussed below.¹⁴

Figure 2: Amount of Discount Window Primary Credit and TAF Loans Outstanding



Source: Gilbert et al. 2012.

¹⁴ In a later paper, Armantier, et al. (2013) show that stigma was evidenced by banks' utilization of the TAF rather than the DW, and by their willingness to pay a premium to borrow from the TAF over the DW. Also see discussion at page 7.

5. The Term Auction Facility

The Term Auction Facility (TAF) was announced on December 12, 2007, and, as shown by the FOMC meeting transcripts, was specifically created to address perceptions of stigma that prevented banks from accessing the DW by requiring banks to step up to participate in the auctions en masse on a given day rather than to self-initiate the borrowing process¹⁵ (Armantier et al. 2013, 10).

The TAF was the result of many months of deliberate study and intense work by the staffs of the Federal Reserve Board and the Reserve Bank of New York,¹⁶ which, beginning in August 2007, were tasked with how to make the DW more effective. The Fed Board and FOMC first considered a proposal for a TAF-like facility at their September 18, 2007, joint meeting but delayed implementation since market conditions had improved somewhat. The facility was later reconsidered and the TAF approved in December as conditions in the interbank lending markets continued to deteriorate, pressuring the banks.¹⁷

Other options considered in lieu of the TAF were (1) a temporary reduction in the spread between the primary credit rate and the target federal funds rate¹⁸ and (2) the adoption of a term credit program, under which term credit could be extended, potentially at a lower rate than the primary credit rate, at a borrower's initiative (FOMC Trans. Dec. 6, 2007, 5).

¹⁵ The following answer was given in response to the question of how the facility addresses the stigma issue:

“MR. MADIGAN: Well, partly by auctioning credit, so institutions are coming to the Federal Reserve voluntarily and paying a price that is market based. Another point is that the institutions are regarded as generally sound. They have to meet a certain qualification standard to get to the discount window, and we would be taking certain steps in terms of our reports to try to distinguish this from other discount window credit. Now, that said, I think we have to admit that we're not sure the degree to which this would deal with the stigma issue.

MR. FISHER. I mean, aren't they still saying that they are distressed?

MR. DUDLEY. No. No, the economics are better because you have to think about the minimum rate. The minimum rate is the swap rate plus 10 basis points, which is well below one-month LIBOR and well below the one-month term fed funds rate. So, there is that room in-between. You could actually criticize a bank for not participating in this. They are somehow leaving money on the table by not taking advantage of this” (FOMC Trans. Sept. 18, 2007, 140).

¹⁶ FOMC Trans. Sept. 18, 2007, 131.

¹⁷ “In addition, participants noted that some intermediaries were facing balance-sheet pressures and could become constrained by concerns about rating-agency or regulatory capital requirements. Among other factors, banks were experiencing unanticipated growth in loans as a result of continuing illiquidity in the market for leveraged loans, persisting problems in the commercial paper market that had sparked draws on back-up lines of credit, and, more recently, consolidation of assets of off-balance-sheet affiliates onto banks' balance sheets. . . . Concerns about credit risk and the pressures on banks' balance-sheet capacity appeared to be contributing to diminished liquidity in interbank markets and to pronounced widening in term spreads for periods extending through year-end” (FOMC Mins Dec. 11, 2007, 6).

¹⁸ The Fed did do this on March 16, 2008, when it narrowed the spread between the primary credit rate and the federal funds rate to only 25 basis points. It also lengthened the permitted maturity to up to 90 days (Armantier et al. 2011, 10). These changes did result in higher borrowings from the DW. (See Figures 1 and 2.)

However, the TAF was selected in part because it had several advantages relative to the other two options.

First, it allowed the Federal Reserve to control when liquidity was released into the market and to retain close control over the supply of reserves because auction size would determine the auction amounts—at least assuming that the minimum bid rate was not binding. Second, the facility arguably had a better chance of avoiding stigma, because the auction format required all banks to bid at the same time, so there is no “first mover” disadvantage. In addition, the auction implied that no institution was being forced to borrow. Third, each auction revealed information about the strength of the demand for funds. Finally, a TAF could also have potential longer-run benefits for managing reserves and conducting monetary policy both in routine circumstances and in circumstances of financial stress (Ibid., 6-7).

In adopting the TAF, the Fed was also addressing the broader U.S. dollar funding issue and in connection therewith approved the first U.S. dollar swaps with the European Central Bank (ECB) and the Swiss National Bank (FOMC Mins. Dec. 11, 2007, 6). Prior to September 2008, the U.S. dollar swaps were very closely connected to the TAF auctions but were disconnected thereafter as the central banks executed more control over their auctions given the tremendous market upheaval that had to be dealt with. (See [Wiggins and Metrick 2016C](#) for consideration of the U.S. dollar swaps program.)

Figure 3: Comparison Between the Discount Window and the Term Auction Lending Facilities

	Discount Window (Primary Credit)	Term Auction Facility (TAF)
Similarities		
Collateral and haircut	Same collateral and haircut calculations as TAF for 28-day loans	Same collateral and haircut calculations as TAF for 28-day loans
eligibility	All banks with reserve account and high supervisory rating	Primary credit eligible banks with enough collateral to make the minimum TAF bid
Minimum bid or loan amount	None	\$10 million until February 1, 2008, \$5 Million after that
identification	Identities of DW borrowers were not revealed until December 23, 2011	Identities of TAF participant were not revealed until December 1, 2010
Differences		
Frequency	Any time during normal business hours	Generally, once every two weeks
Loan Term	Overnight through 30 days before March 16, 2008, and 90 days thereafter as determined	Generally, 28 or 84 days as determined by the Fed

	by the borrower; renewable by borrower	
Maximum bid or loan amount	Up to available collateral	10% of auction size or up to available collateral (whichever is smaller)
prepayment rate	Allowed without penalty Spread over fed funds target rate (target+50 bp until March 16, 2008; target +25 bp thereafter)	Not allowed Determined through competitive bidding at an auction
Settlement	Credited on the same day	Credited to the winning bidders three days after the auction

Source: Armantier et al. 2013.

Design Features of the TAF

As shown in Figure 3, the TAF operationally utilized many of the same administrative mechanisms of the DW since it was in essence an auction of DW loans. Participating banks were required to have in place their respective Federal Reserve Bank standard borrowing agreements and collateral, just as with DW lending; similar agreements were utilized. The same collateral standards and haircuts were also applied. The Fed changed the pricing mechanism of DW lending and by so doing succeeded in repackaging an unsuccessful lending program into one that was highly utilized. (See FOMC Trans. Sept. 18, 2007, 131-33 for a detailed description of the operational aspects of the TAF.)

Eligibility

Any bank that was solvent and met the Fed's standards of eligibility for the DW primary credit rate, and which had adequate collateral could participate. A higher standard—"well capitalized and well managed—the financial holding company type standards" had been discussed but was abandoned for fear that it might lead to administrative complication and perception problems.¹⁹

It was also considered that large banks that were troubled might participate and co-opt the funding giving the impression that the facility was aimed at specific large institutions—that it was a "big institutional facility"—rather than a solution aimed at the broad market (Ibid., 135-40). These concerns were addressed in part by a reduction in the maximum bid from 20% of the allotted funds to 10%, ensuring that at every auction at least 10 banks would participate.

¹⁹ There was concern that if a higher standard were imposed, it might disqualify some banks that met the standard for the primary credit rate and send a signal that the Fed thought those banks were weak (FOMC Sept. 18, 2007, 141).

Another design change was a reduction in the minimum amount that could be bid to \$10 million, lowered from an original proposed \$50 million in order to make the facility more accessible to smaller institutions (FOMC Trans. Dec. 6, 2007, 8). Additionally, beginning on February 1, 2008, the minimum bid was further reduced to \$5 million in order to “facilitate participation by smaller institutions” (Fed. Res. Feb. 1, 2008). (See footnote 23 for how amounts were allocated to bidders.)

With respect to the issue of whether failing banks took advantage of the TAF, Gilbert et al. (2012) concluded that during the crisis only 53 banks borrowed from the Fed (DW and TAF) while undercapitalized and for only short periods, and well within the Federal limits.²⁰ They found that over 90% of the banks that became undercapitalized during the crisis did not borrow from the Fed while undercapitalized (Gilbert et al. 2012, 232).

Foreign Banks

U.S. branches of foreign banks were consolidated and treated as a single bidder for purposes of the TAF limits. And it was debated whether to permit “double dipping,” in essence allowing the U.S. subsidiaries of foreign banks to borrow from the TAF while their foreign parents could borrow U.S. dollars from their home central banks under the swap agreements. Ultimately it was recognized that this duality was consistent with the Fed’s monetary policy role, promoted the maintenance of the interconnected global dollar markets, and that U.S. banks had a similar dual ability (FOMC Trans. Sept. 18, 2007, 133-39). In practice, U.S. subsidiaries of foreign banks were some of the most frequent and heaviest borrowers under the TAF as shown in Figures 4 and 5. The Fed was criticized for this when the information was later revealed.²¹ (See also Yang et al. [2010], Keoun [2011], and Appendices C and D.)

Collateral

TAF loans were fully collateralized and applied DW collateral standards and haircuts. (See discussion at page 4.) For any auction, a bank’s bid and award could also be limited so that all outstanding DW and TAF loans would not exceed 50% of its pledged collateral, a reduction from an initially proposed 80% limit (FOMC Trans. Dec. 6, 2007, 8).

It should also be noted that use of the TAF by foreign banks was extensive. Slightly more than 58% of TAF funds were borrowed by foreign banks which pledged a larger portion of asset-backed securities and residential mortgages than did U.S. banks (Benmelech 2012, 27). U.S. banks on the other hand, pledged more whole loan collateral such as commercial real estate loans, private label MBS and CDOs. Nevertheless, the majority of collateral pledged by U.S. and foreign banks was highly opaque, hard to value, and increasingly illiquid.

²⁰ Changes in the law adopted in 1991, the Federal Deposit Insurance Corporation Improvement Act (FDICIA), after the savings and loan crisis limited the amounts that the Federal Reserve could loan to distressed banks.

²¹ The Fed did not publish the results of the TAF auctions until two years later, to militate against stigma.

Figure 4: Most Frequent Term Auction Facility Borrowers*

Institution	Number of Borrowings	Average Amount Borrowed	Maximum Amount Borrowed
Mitsubishi UFJ Trust and Banking Corp.	55	0.4	1.2
Sumitomo Mitsui Banking Corp.	49	1.2	2.8
Mizuho Corporate Bank Ltd.	47	1.1	3.5
Arab Banking Corp.	46	0.6	1.4
Bayerische Hypo and Vereins Bank	43	0.8	2.2
Bank of Scotland PLC	40	4.5	9.0
DZ Bank AG Deutsche Zentral	38	1.0	3.0
Barclays Bank PLC	37	5.1	15.0
Bayerische Landesbank	37	2.9	7.0
Dresdner Bank AG	37	3.3	7.5
All 416 program borrowers	4,214	0.9	15.0

**New York branches were borrowing entities for all 10 institutions listed. Average and maximum amounts borrowed by institutions are per operation and in billions of dollars. Maximum amounts borrowed by institutions at a given time can and do exceed the per-operation maximum because of overlapping borrowing periods for the various operations. Source: Fleming 2012.*

Figure 5: Top 5 TAF Borrowers, in Billions

Parent Company	Total TAF Loans	Percent of Total
Bank of America Corporation	\$260	7.3%
Barclays PLC (United Kingdom)	232	6.1
Royal Bank of Scotland Group PLC (United Kingdom)	212	5.5
Royal Bank of Scotland PLC (United Kingdom)	181	4.7
Wells Fargo	154	4.2

Source: Federal Reserve and GAO; Note: Also see Appendix C.

Rates

Rates for loans under TAF were established to make the facility attractive. Prior to January 12, 2009, the minimum bid rate was based on a measure of the average expected overnight fed funds rate over the term of the credit being auctioned. From January 12, 2009, to the conclusion of the program, the minimum bid rate was set equal to the rate that Reserve

Banks paid on excess reserve balances so as to prevent arbitrage. Bidders had to bid above the minimum rate. Loan rates were set through the auction process with one rate (the stop-out rate) being applied to all funds lent at that auction. The stop-out rate is the lowest accepted bid rate.²²

Also see TAF Terms and Conditions and TAF Frequently Asked Questions for additional operational details regarding the TAF. Other detailed historical materials and transaction data are available at <http://www.federalreserve.gov/monetarypolicy/taf.htm>.

6. Use and Impact of the Discount Window and TAF

A few banks utilized the Discount Window, mostly smaller ones and the U.S. subsidiaries of foreign institutions. Primary credit loans remained near zero until March 2008, when the interbank funding markets became even more strained in the turmoil around Bear Stearns, and when the spread between the prime credit rate and the Federal funds rate was lowered to 25 basis points. At that time, borrowing activity increased and Discount Window loans peaked in late 2008 at a maximum amount outstanding of approximately \$100 billion. Without doubt, however, TAF loans accounted for the overwhelming majority of liquidity assistance to depository institutions during the crisis.

Extensive Usage of TAF

The TAF was an “immediate success in terms of amounts borrowed” and “seems to have been designed effectively to remove stigma concerns” (Armantier et al. 2011, 4, 15). Evidence of utilization of the TAF is evidence of the market’s need for it—it would become one of the largest liquidity programs instituted by the Fed, second only behind the amounts funded through the central bank liquidity swaps that maintained the flow of U.S. dollars around the world and which were originally coordinated with the TAF auctions. (See Wiggins and Metrick 2015C.) It should also be noted that use of the TAF by foreign banks was extensive. Slightly more than 58% of TAF funds were borrowed by foreign banks (Benmelech 2012, 27).

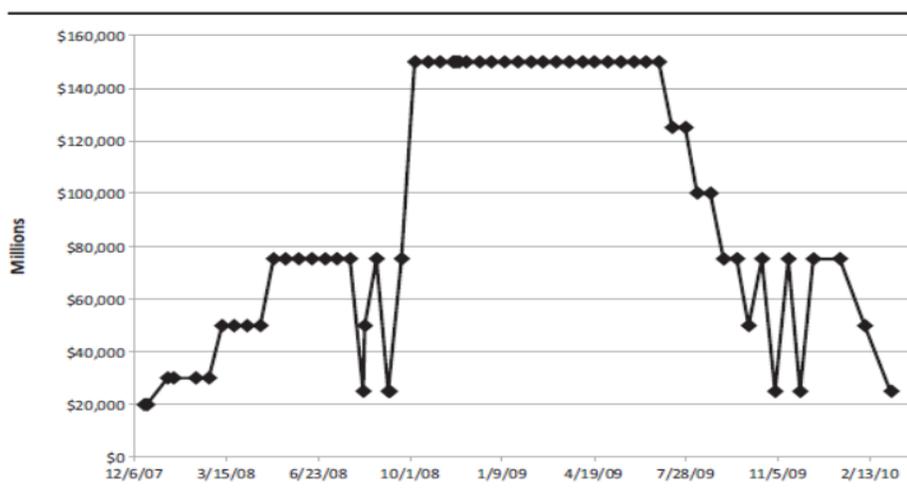
Approximately 60 TAF auctions were held every two weeks between December 2007 and March 2010, when the TAF was terminated. For each auction the Fed would specify an amount of funds that was available, usually varying between \$20 billion to as high as \$150 billion at the peak of the crisis in October 2008. The loans were for 28-day terms initially, and after August 11, 2008, were for 84 days. Beginning with the auction held on October 6, 2008, the Fed significantly increased the offer amount for 84-day maturities and for the first

²² The process for determining the TAF auction allocation and the stop-out rate was as follows: Bids were ordered from the highest to the lowest rate. Bids were then accepted starting with the highest rate submitted, down to successively lower rates, until the Offering Amount of the auction had been allocated or until the Minimum Bid Rate was reached (whichever occurred first). The lowest accepted interest rate was the “stop-out rate.” Bids at interest rates above the stop-out rate were allocated the full amount of TAF Advance bid for. Bids at the stop-out rate were subject to being prorated if allocating the full amount requested would cause the total amount allocated in the auction to exceed the Offering Amount (TAF Frequently Asked Questions).

time provided full allotments to all bidders, lending the full amounts bid at the minimum bid stop-out price.

This action by the Fed was similar to actions taken by the ECB at this time to provide increased U.S. dollar liquidity to its banks. Unlike the ECB, however, the Fed did not announce or commit to providing full allotments. Instead, it just increased the auction offer amount to \$150 billion, for each monthly auction of one-month loans, and for all three monthly auctions of three-month loans, bringing total potential credit available to \$600 billion. This amount was greater than the oversubscribed total bids that it had been recently receiving. As discussed below, with the increase in the size of the auction, the stop-out rate for the first time equaled the minimum bid rate, whereas previously in the oversubscribed auctions the stop-out rate had exceeded the minimum rate. Thus, bidders were more likely to receive the maximum amount of funds that they requested at a lower cost. (See Appendices A and B, for examples of TAF auction announcements and settlements.)

Figure 6: Size of TAF Auctions



It is interesting to note that 19 of the 25 largest borrowers were headquartered in foreign countries. Of the \$2.8 trillion borrowed by the largest 25 participants, 69 percent (\$1.9 trillion) was borrowed by foreign institutions. (See Appendices C and D for more detail regarding borrowings by individual institutions.)

Auction Premium

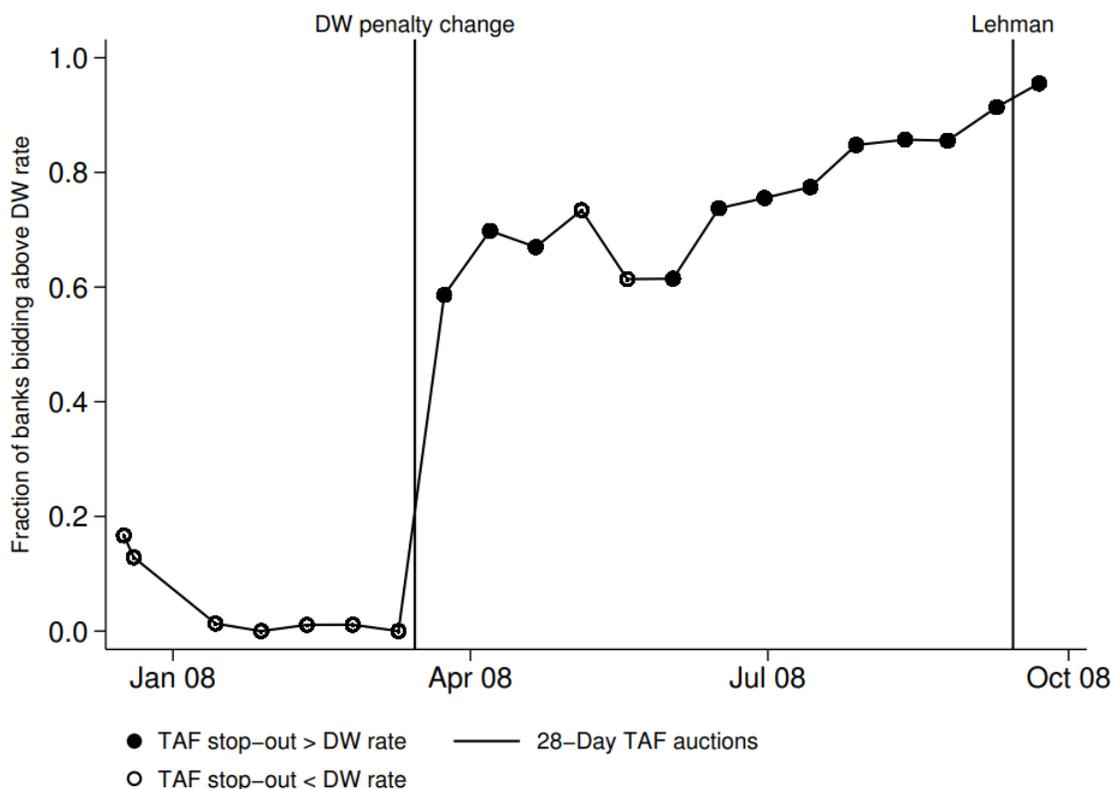
Further evidence of the TAF's effectiveness is that banks were willing to pay a premium to borrow from the TAF. The stop-out rate for a TAF auction could be higher or lower than the DW lending rate, depending on the bids submitted. If the stop-out rate was determined to be higher than the primary credit rate, for example, the overall cost of \$50 billion in loans under TAF could cost more than the same loans under the DW. And, as shown in Figure 4, for periods during 2008, prior to the changes made in October, funding under the TAF was consistently more expensive than at the DW (Armantier 2013, 27).

For example, for the auction conducted on September 22, 2008, when the DW rate was 2.25%, the minimum bid was a rate of 1.949% and the stop-out rate was 3.75%. The amount bid was \$134 billion, and the amount awarded was the preannounced \$75 billion, leaving many bids unfulfilled (Appendix A), illustrative of the fact that at that time the TAF auctions were consistently oversubscribed. Once the offering amounts were expanded, in essence to provide full allotment (the maximum was raised to historical bid levels), the stop-out rates dropped to the minimum bid rate, which were lower than the DW rate. This was the case with the October 6, 2008, auction, when the DW rate was then 2.25%. The minimum bid rate and the stop-out rate were the same (1.39%) as were the amount bid and the amount allotted (\$138.0921 billion) (Appendix B).

Select Research Findings

Armantier, et al. (2013) found that participating banks bid for TAF loans at prices greater than the primary credit rate approximately half the time. (See Figure 7.) As a result, there was a higher cost of \$300 million, \$6.56 million per auction for each participating bank, on average, to borrow under the TAF than to borrow the amount under the window. They attribute the banks' willingness to pay this premium to the DW stigma. The spread between the DW and the TAF was greatest during the fall after the bankruptcy of Lehman Brothers (prior to the expansion of the auction amounts), when the aggregate per-auction premium over DW reached \$2.5 billion. The authors see this premium as "conclusive evidence of DW stigma" during the crisis (Ibid., 23).

Figure 7: TAF Bids Above the DW Rate and Frequency Distribution



Note: The figure above shows the share of banks that submit a TAF bid above the DW rate. If a bank submits two bids, only the bid with the highest rate is considered. Auctions with a stop-out rate above the DW rate are indicated by solid circles, while auctions with a stop-out rate below the DW rate have hollow circles. The reduction in the DW penalty from 50 to 25 basis points on March 16, 2008, is indicated by the first vertical line, and the date of the Lehman Brothers bankruptcy, September 15, 2008, by the second vertical line.

Source: Armantier 2013.

In their paper regarding the effectiveness of the TAF, McAndrews, Sarkar, and Wang (2008) found that the facility had the effect of lowering the three-month LIBOR-OIS spread on the dates of announcement of TAF auctions and on the actual settlement dates. Wu (2011) found

similar results and that the differences occurring were between 50 and 70 basis points lower.²³

Wind Down

As the credit markets improved and as the cost of market funding declined, utilization of the TAF decreased, as had been planned. On September 24, 2009, the Fed announced that it would scale back the TAF, and the auction amounts were reduced for both the 24-day and 84-day terms. The last TAF auction was held on March 8, 2010, maturing on April 8, 2010. All TAF loans were repaid in full, with interest, and the facility expired in March 2010.

References

Applebaum, Binyamin and Jo Caren McBody, *The Fed's Crisis Lending: A Billion Here, a Thousand There*, The New York Times, March 31, 2011, http://www.nytimes.com/2011/04/01/business/economy/01fed.html?_r=0.

Armantier, Olivier, Eric Ghysels, Asani Sarkar, and Jeffrey Shrader, *Discount Window Stigma During the 2007-2008 Financial Crisis*, Federal Reserve Bank of New York Staff Report No. 483, January 2011, Revised September 2013.

Armantier, Oliver, Sandy Krieger, and James McAndrews, *The Federal Reserve's Term Auction Facility*. Federal Reserve Bank of New York Current Issues in Economics and Finance 15, no. 5, July 2008.

Artuc, Erhan, and Selva Demiralp, *Provision of Liquidity Through the Primary Credit Facility During the Financial Crisis: A Structural Analysis*, FRBNY Economic Policy Review/August 2010, 43-51.

Ashcraft, Adam, Morten L, Bech, and W. Scott Frame, *The Federal Home Loan Bank System: The Lender of Next-to-Last Resort?* FRBNY Staff Report no 357, Nov. 2008.

Benmelech, Efraim, *An Empirical Analysis of the Fed's Term Auction Facility*, Cato Papers on Public Policy, Vol. 2, 2012.

Bernanke, Ben, *The Federal Reserve's Balance Sheet: An Update*, Speech at the Federal Reserve Board Conference on Key Developments to Monetary Policy, Washington DC 2009.

Bloyd, Sebastian, *BNP Paribas Freezes Funds as Loan Losses Roil Markets (Update5)*, Bloomberg.com, August 9, 2007, <http://www.bloomberg.com/apps/news?pid=newsarchive&sid=aW1wj5i.vyOg>.

²³ See Fleming (2012) for discussion of additional studies.

Board of Governors of the Federal Reserve System, DISCOUNT AND ADVANCE RATES—Reduction in the Primary credit rate from 3-1/2 percent to 3-1/4 percent, Approved March 16, 2008.

_____, DISCOUNT AND ADVANCE RATES —Reduction in the primary credit rate from 3-1/4 percent to 2-1/2 percent, Approved March 18, 2008.

_____, Interagency Advisory on: The Use of the Federal Reserve's Primary Credit Program in Effective Liquidity Management, 2003.

_____, Press Release, Federal Reserve will offer \$75 billion in 28-day credit through its Term Auction Facility today, September 22, 2008.

_____, Press Release, Federal Reserve announces results of auction of \$75 billion in 28-day credit held on September 22, 2008, September 23, 2008.

_____, Press Release, Federal Reserve will offer \$150 billion in 85-day credit through its Term Auction Facility today, October 6, 2008.

_____, Press Release, Federal Reserve announces results of auction of \$150 billion in 85-day credit held on October 6, 2008, October 7, 2008.

De Leo, Luca and Maya Jackson Randall, *Banks Face Borrowing Stigma*, The Wall Street Journal, April 1, 2011.

Federal Reserve Bank of New York, website—<http://www.newyorkfed.org/>, (FRBNY website).

_____, (Discount Window Lending): <http://www.newyorkfed.org/banking/discountwindow.html>

_____, Press Release: Statement Regarding System Open Market Account Activity, March 7, 2008.

Federal Reserve Open Market Committee, Transcript of the Federal Open Market Committee Conference Call on December 6, 2007.

_____, Transcript of the Federal Open Market Committee Meeting on September 18, 2007.

_____, Transcript of the Federal Open Market Committee Meeting on December 11, 2007.

_____, Transcript of the Federal Open Market Committee Conference Call on March 10, 2008.

Federal Reserve System, Discount Window website: <https://www.frbdiscountwindow.org/>, (FRDW website).

_____, Extensions of Credit by Federal Reserve Banks, 12 CFR Part 201, (Federal Register/Vol.79, No.3 January 6, 2014).

_____, The Federal Reserve System Guide to Discount Window Collateral <https://www.frbdiscountwindow.org/~media/Documents/FRcollguidelines.ashx?la=en>, (FRDW collateral).

_____, Operating Circular No. 10.

Fleming, Michael J., Federal Reserve Liquidity Provision during the Financial Crisis of 2007-2009, *Annu. Rev. Finance. Econ.* 2012.4:161-77.

Geithner, Timothy, F., Actions By The New York Fed in Response to Liquidity Pressure in Financial Markets, Testimony of Mr. Timothy F. Geithner, President and Chief Executive Officer of the Federal Reserve Bank of New York, before the U.S. Senate Committee on Banking, Housing and Urban Affairs, Washington DC, 3 April 2008.

Gilbert, Alton R., Kevin L. Kliesen, Andrew P. Meyer, and David C. Wheelock, Federal Reserve Lending to Troubled Banks During the Financial Crisis, 2007-2010, *Federal Reserve Bank of St. Louis Review*, May/June 2012, 221-243.

Gorton, Gary and Andrew Metrick, *The Federal Reserve and Financial Regulation: The First Hundred Years*, July 1, 2013.

Keoun, Bradley, Foreign Banks Used Fed Secret Lifeline Most at Crisis Peak, *Bloomberg Business*, April 1, 2011, <http://www.bloomberg.com/news/articles/2011-04-01/foreign-banks-tapped-fed-s-lifeline-most-as-bernanke-kept-borrowers-secret>

Sakar, Asani, Liquidity Risk, Credit Risk, and the Federal Reserve's Responses to the Crisis, *Federal Reserve Bank of New York Report No. 389*, September 2009.

Wiggins, Rosalind and Andrew Metrick, *The Federal Reserve's Financial Crisis Response B: Lending & Credit Programs for Primary Dealers*, Yale Program on Financial Stability Case Study Case Number 2015-1B-v1, Feb. 1, 2016.

_____, *The Federal Reserve's Financial Crisis Response C: Providing U.S. Dollars to Foreign Central Banks*, Yale Program on Financial Stability Case Study Case Number 2015-1C-v1, Feb.1, 2016.

Yang, Jia Lynn, Neil Irwin, and David S. Hilzenrath, Fed aid in financial Crisis went beyond U.S. banks to industry, foreign firms, *WashingtonPost.com*, December 2, 2010, <http://www.washingtonpost.com/wp-dyn/content/article/2010/12/01/AR2010120106870.html>

Development of this case has been supported by a generous grant from the Alfred P. Sloan Foundation to the Yale Program on Financial Stability.

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Appendix A: TAF Auction Announcement - September 22, 2008**FEDERAL RESERVE press release**

Release Date: September 22, 2008

For release at 10:00 a.m. EDT

On September 22, 2008, the Federal Reserve will offer \$75 billion in 28-day credit through its Term Auction Facility. Additional information regarding the auction is listed below; the auction will be conducted as specified in this announcement, Regulation A, and the terms and conditions of the Term Auction Facility (www.federalreserve.gov/monetarypolicy/taf.htm).

Note: Some key deadlines have changed for this TAF auction. Please review the following parameters. For a list of key times to be used in upcoming auctions, see <http://www.federalreserve.gov/monetarypolicy/tafdates20080811.htm>

Description of Offering and Auction Parameters

Offering Amount:	\$75 billion
Term:	28-day loan
Bid Submission Date:	September 22, 2008
Opening Time:	11:00 a.m. EDT
Closing Time:	12:30 p.m. EDT
Notification Date:	September 23, 2008
Settlement Date:	September 25, 2008
Maturity Date:	October 23, 2008
Minimum Bid Amount (per bid):	\$5 million
Bid Increment:	\$100,000
Maximum Bid Amount (per institution):	\$7.5 billion (10% of Offering Amount)
Minimum Bid Rate:	1.94 percent
Incremental Bid Rate:	0.001 percent
Minimum Award:	\$10,000
Maximum Award:	\$7.5 billion (10% of Offering Amount)

Submission of Bids

Participants must submit bids by phone to their local Reserve Bank between the opening time and closing time on the bid submission date.

Notification

Summary auction results will be published on the website of the Board of Governors of the Federal Reserve System (www.federalreserve.gov/monetarypolicy/taf.htm) at approximately 10:00 a.m. EDT on the notification date. Between 10:00 a.m. and 11:30 a.m. EDT on the notification date, Reserve Banks will notify individual institutions in their districts that have submitted winning bids of their awards. Participants have until 12:30 p.m. EDT on the notification date to inform their local Reserve Bank of any error.

Rounding Convention

Pro rata awards will be rounded to multiples of \$10,000. Normal rounding convention will be used, except that awards under \$10,000 will be rounded to \$10,000.

Source: Federal Reserve Website.

Appendix A-1: TAF Auction Results—September 23, 2008

FEDERAL RESERVE press release



Release Date: September 23, 2008

For release at 10:00 a.m. EDT

On September 22, 2008, the Federal Reserve conducted an auction of \$75 billion in 28-day credit through its Term Auction Facility. Following are the results of the auction:

Stop-out rate:	3.750 percent
Total propositions submitted:	\$133.562 billion
Total propositions accepted:	\$ 75.000 billion
Bid/cover ratio:	1.78
Number of bidders:	85

Bids at the stop-out rate were prorated at 58.10% and resulting awards were rounded to the nearest \$10,000 (except that all awards below \$10,000 are rounded up to \$10,000).

The awarded loans will settle on September 25, 2008, and will mature on October 23, 2008. The stop-out rate shown above will apply to all awarded loans.

Institutions that submitted winning bids will be contacted by their respective Reserve Banks by 11:30 a.m. EDT on September 23, 2008. Participants have until 12:30 p.m. EDT on September 23, 2008, to inform their local Reserve Bank of any error.

Source: Federal Reserve Website.

Appendix B: TAF Auction Announcement—October 6, 2008**FEDERAL RESERVE** press release

Release Date: October 6, 2008

For immediate release

On October 6, 2008, the Federal Reserve will offer \$150 billion in 85-day credit through its Term Auction Facility. Additional information regarding the auction is listed below; the auction will be conducted as specified in this announcement, Regulation A, and the terms and conditions of the Term Auction Facility (www.federalreserve.gov/monetarypolicy/taf.htm).

Description of Offering and Auction Parameters

Offering Amount:	\$150 billion
Term:	85-day loan
Bid Submission Date:	October 6, 2008
Opening Time:	11:00 a.m. EDT
Closing Time:	12:30 p.m. EDT
Notification Date:	October 7, 2008
Settlement Date:	October 9, 2008
Maturity Date:	January 2, 2009
Minimum Bid Amount (per bid):	\$5 million
Bid Increment:	\$100,000
Maximum Bid Amount (per institution):	\$15 billion (10% of Offering Amount)
Minimum Bid Rate:	1.39 percent
Incremental Bid Rate:	0.001 percent
Minimum Award:	\$10,000
Maximum Award:	\$15 billion (10% of Offering Amount)

Submission of Bids

Participants must submit bids by phone to their local Reserve Bank between the opening time and closing time on the bid submission date.

Notification

Summary auction results will be published on the website of the Board of Governors of the Federal Reserve System (www.federalreserve.gov/monetarypolicy/taf.htm) at approximately 10:00 a.m. EDT on the notification date. Between 10:00 a.m. and 11:30 a.m. EDT on the notification date, Reserve Banks will notify individual institutions in their districts that have submitted winning bids of their awards. Participants have until 12:30 p.m. EDT on the notification date to inform their local Reserve Bank of any error.

Rounding Convention

Pro rata awards will be rounded to multiples of \$10,000. Normal rounding convention will be used, except that awards under \$10,000 will be rounded to \$10,000.

Source: Federal Reserve Website.

Appendix B-1: TAF Auction Results—October 7, 2008

FEDERAL RESERVE press release



Release Date: October 7, 2008

For release at 10:00 a.m. EDT

On October 6, 2008, the Federal Reserve conducted an auction of \$150 billion in 85-day credit through its Term Auction Facility. Following are the results of the auction:

Stop-out rate: 1.390 percent

Total propositions submitted: \$138.092 billion

Total propositions accepted: \$138.092 billion

Bid/cover ratio: 0.92

Number of bidders: 71

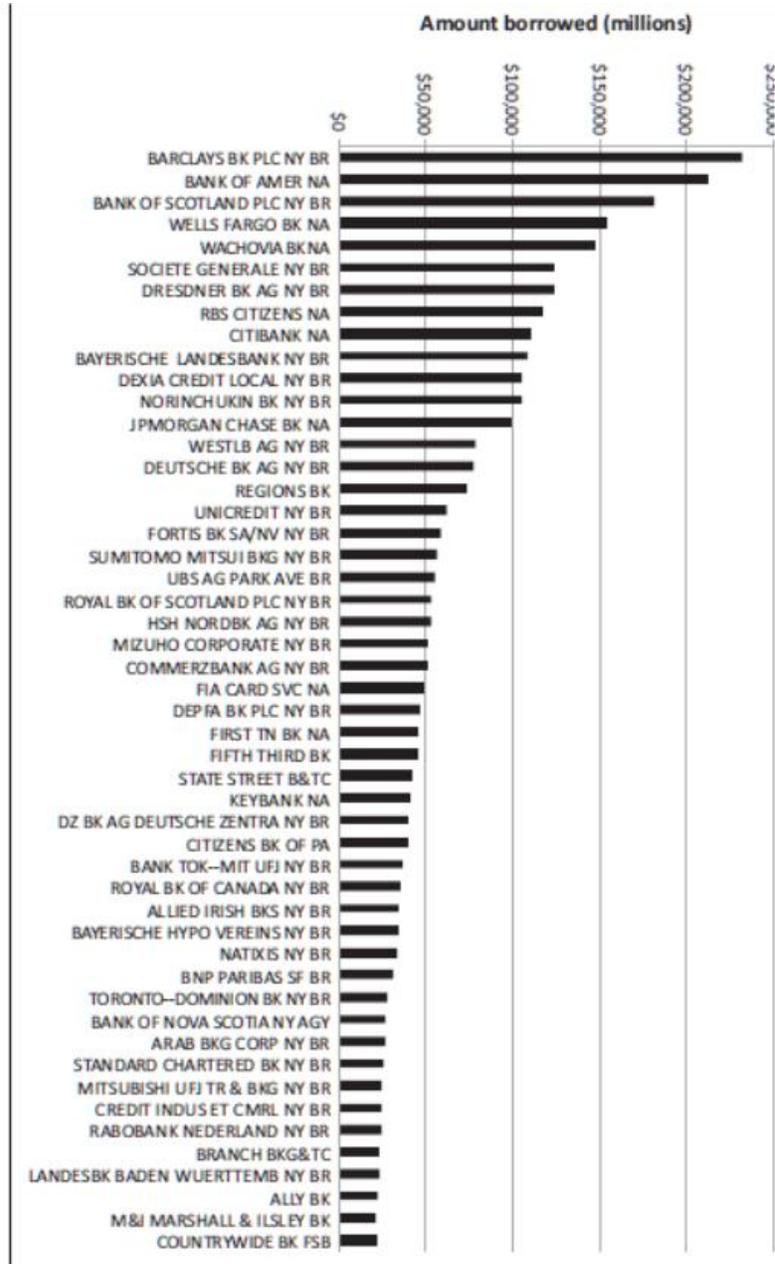
The awarded loans will settle on October 9, 2008, and will mature on January 2, 2009. The stop-out rate shown above will apply to all awarded loans.

Institutions that submitted winning bids will be contacted by their respective Reserve Banks by

11:30 a.m. EDT on October 7, 2008. Participants have until 12:30 p.m. EDT on October 7, 2008, to inform their local Reserve Bank of any error.

Source: Federal Reserve Website.

Appendix C: Largest TAF Borrowers



Source: Benmelech 2012.

Appendix D: Details re: The 50 Largest TAF Borrowers

Rank	Bank	Total Loan Amount (Millions)	Average Loan Size (Millions)	Number of Loans	Country
1	Barclays	\$232,283	\$4,740.5	49	UK
2	Bank of American	\$212,617	\$14,144.5	15	U.S.
3	Royal Bank of Scotland	\$180,920	\$4,523.0	40	UK
4	Wells Fargo	\$153,953	\$8,102.9	19	U.S.
5	Wachovia	\$147,025	\$6,392.4	23	U.S.
6	Société Générale	\$124,377	\$4,442.0	28	France
7	Dresdner Bank	\$123,328	\$3,333.2	37	Germany
8	RBS Citizens	\$117,510	\$4,039.7	29	U.S.
9	Citibank	\$110,350	\$4,244.2	26	U.S.
10	Bayerische Landesbank	\$108,190	\$2,924.1	37	Germany
11	Dexia	\$105,167	\$4,382.0	24	Belgium
12	Norinchukin Bank	\$105,010	\$3,281.6	32	Japan
13	JP Morgan Chase	\$98,782	\$4,939.1	20	U.S.
14	WestLB	\$78,406	\$2,178.0	36	UK
15	Deutsche Bank	\$76,882	\$3,844.1	20	Germany

16	Regions Bank	\$72,444	\$3,149.7	23	U.S.
17	Unicredit	\$62,210	\$2,592.1	24	Italy
18	Fortis Bank	\$58,650	\$1,725.0	34	Belgium
19	Sumitomo	\$56,400	\$1,151.0	49	Japan
20	UBS	\$55,500	\$3,468.8	16	Switzerland
21	Bank of Scotland	\$53,500	\$8,916.7	6	UK
22	HSH Nordbank	\$52,550	\$1,545.6	34	Germany
23	Mizuho	\$51,284	\$1,091.2	47	Japan
24	Commerzbank	\$51,161	\$2,046.5	25	Germany
25	Debfa Bank	\$46,798	\$2,600.0	18	Ireland
26	First Tennessee	\$45,419	\$1,297.7	35	U.S.
27	Fifth Third Bank	\$44,478	\$1,533.7	29	U.S.

(Continued on the next page)

Appendix D: Details re: The 50 Largest TAF Borrowers (continued)

Rank	Bank	Total Loan Amount (Millions)	Average Loan Size (Millions)	Number of Loans	Country
28	State Bank	\$42,000	\$2,100.0	20	U.S.
29	Keybank	\$40,214	\$1,827.9	22	U.S.
30	DZ Bank	\$39,477	\$1,038.9	38	Germany
31	Citizens Bank	\$39,380	\$1,790.0	22	U.S.
32	Bank of Tokyo	\$35,900	\$1,087.9	33	Japan
33	Royal Bank of Canada	\$34,734	\$1,085.4	32	Canada
34	Allied Irish	\$34,700	\$1,927.8	18	Ireland
35	Bayerische Hypo	\$34,390	\$802.1	43	Germany
36	Natixis	\$32,817	\$1,131.6	29	France
37	BNP Paribas	\$31,275	\$1,303.1	24	France
38	Toronto Dominion	\$27,465	\$1,445.5	19	Canada
39	Bank of Nova Scotia	\$26,465	\$661.6	40	Canada
40	Arab Banking Corporation	\$26,350	\$572.8	46	Bahrain
41	Standard Chartered	\$25,100	\$896.4	28	UK

42	Mitsubishi UFJ	\$24,457	\$444.7	55	Japan
43	Crédit Industriel et Commercial	\$23,910	\$703.2	34	France
44	Rabobank	\$23,751	\$2,375.0	10	Netherlands
45	BB&T	\$22,700	\$2,522.2	9	U.S.
46	Landesbank Baden	\$22,580	\$1,411.3	16	Germany
47	Ally Bank	\$21,600	\$1,963.6	11	U.S.
48	Marshall & Ilsley	\$21,045	\$841.8	25	U.S.
49	Countrywide	\$20,750	\$6,916.7	3	U.S.
50	Union Bank	\$20,100	\$1,182.4	17	U.S.

Source: Benmelech 2012.