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AN EMPIRICAL ANALYSIS OF THE FED'S TERM AUCTION FACILITY

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ABSTRACT

The U.S. Federal Reserve used the Term Auction Facility (TAF) to provide term funding to eligible depository institutions from December 2007 to March 2010. According to the Fed, the purpose of TAF was to inject term funds through a broader range of counterparties and against a broader range of collateral than open market operations. The overall goal of the TAF was to ensure that liquidity provisions could be disseminated efficiently even when the unsecured interbank markets were under stress. In this paper I use the TAF micro-level loan data and find that about 60 percent of TAF loans went to foreign banks that pledged asset-backed securities as collateral for these loans. The data and analysis illustrate the major role that foreign – in particular, European – banks currently play in the U.S. financial system and the resultant currency mismatch in their balance sheets. The data suggest that foreign banks had to borrow from the Federal Reserve Bank to meet their dollar-denominated liabilities.

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Abstract

The U.S. Federal Reserve used the Term Auction Facility (TAF) to provide term funding to eligible depository institutions from December 2007 to March 2010. According to the Fed, the purpose of TAF was to inject term funds through a broader range of counterparties and against a broader range of collateral than open market operations. The overall goal of the TAF was to ensure that liquidity provisions could be disseminated efficiently even when the unsecured interbank markets were under stress. In this paper I use the TAF micro-level loan data and find that about 60 percent of TAF loans went to foreign banks that pledged asset-backed securities as collateral for these loans. The data and analysis illustrate the major role that foreign – in particular, European – banks currently play in the U.S. financial system and the resultant currency mismatch in their balance sheets. The data suggest that foreign banks had to borrow from the Federal Reserve Bank to meet their dollar-denominated liabilities.

1. INTRODUCTION

The Term Auction Facility (TAF) program was one of the main tools used by the Federal Reserve and the U.S. fiscal authorities during the financial crisis. The goal of this program – as described by the Federal Reserve Bank – was to intervene in the interbank money markets because of the difficulties experienced by banks in the United States and Europe. Initially, the Federal Reserve Bank used open market operations to maintain the effective federal funds rate near its target rate and enacted several measures to encourage borrowing at the discount window.¹ However, these moves failed to stimulate the market as the Fed has expected. On December 12, 2007, therefore, the Federal Reserve Bank introduced the Term Auction Facility. The TAF provided longer-term financing to eligible depository institutions through auctions at predetermined dates. At its peak, the TAF amounted to more than \$500 billion and was the largest expansion on the Federal Reserve

¹To encourage banks to borrow at the discount window, the Federal Reserve Bank reduced the discount window penalty rate from 100 basis points to 50 basis points on August 17, 2007, and extended the term of financing from overnight to as long as thirty days.

Bank's balance sheet. Lending through the TAF gradually faded away, and the final TAF auction was conducted on March 8, 2010.

One of the reasons for the introduction of TAF during the early stages of the financial crisis was to provide banks with Federal Reserve liquidity without forcing them to face the stigma of borrowing from the discount window. Indeed, according to the chairman of the Federal Reserve Bank, the associated stigma made banks reluctant to use the discount window:

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

Speech at the Federal Reserve Board Conference on Key Developments in Monetary Policy, Washington, D.C., by Chairman Ben Bernanke (Bernanke (2009))

However, even borrowing from the TAF had a stigma attached to it, and as a result, data on the loans that were made in TAF, as well as identity of the banks that participated in the auctions, were not disclosed initially. Later, the Federal Reserve Bank disclosed data on the loans made under the TAF, as well as information on the other credit and liquidity programs it used during the crisis.

While the effectiveness of TAF in reducing rates in the interbank market has been debated by both academic economists and policy makers (see e.g., McAndrews, Sarkar and Wang 2008 and Taylor and Williams 2009), little is known about the identity of the banks that participated in the auctions, the nature of the collateral used, and the terms on the individual loans. This paper fills the gap by using the micro-level loan dataset released by the Federal Reserve. The TAF data, which contain detailed information on the loans and the participating financial institutions, provide a rare glimpse into the injection of emergency liquidity by the Federal Reserve Bank, as well as the identity of the banks obtaining credit and in particular the type of assets they pledged as collateral.

I find that foreign banks accounted for 58 percent of TAF lending, with a total amount of \$2.2 trillion, compared to \$1.6 trillion for U.S. banks. During the auction of December 2007 and through most of 2008, foreign banks accounted for the vast majority of the lending, with amounts that ranged between twofold and fourfold the total lending to U.S. banks. U.K.-based Barclays was the largest borrower in the TAF, followed by Bank of America, Royal Bank of Scotland, Wells

Fargo, and Wachovia. Out of the ten largest borrowers, five are foreign banks, and out of the fifty largest borrowers, more than thirty are from foreign countries.

Next, I compare the collateral structure of domestic and foreign banks. I find that most of the banks and financial institutions that pledged asset-backed securities (ABS) as collateral were foreign – primarily European – banks. For example, the bank that pledged the largest amount of ABS for a given loan is Société Générale (France), followed by Norinchukin Bank (Japan), Dexia (Belgium), Barclays (U.K.), and UBS (Switzerland). Among the ten banks that pledged the largest amounts of collateral there are only two American banks (State Street and U.S. Central Federal Credit Union). Why did the Federal Reserve allocate the majority of TAF loans to foreign bank? Why were foreign banks more likely to pledge the riskier asset-backed securities and collateralized debt obligations (CDO) as collateral?

One potential explanation is that the meltdown of the structured finance market and the severe deterioration in the credit ratings of ABS necessitated liquidity injections to institutions that suffered major losses due to their exposure to the structured finance market. However, U.S. banks that borrowed from the TAF and had large exposures to ABS, such as Citibank and Bank of America, did not pledge asset-backed securities at the same level as European banks. Thus, while some of the Federal Reserve lending was probably aimed at injecting liquidity to financial institutions that held securities that were illiquid at the time, this is unlikely to be the only reason for the dominance of European banks in TAF.

Another explanation for the large number of loans made to foreign banks is that these banks suffered from a currency mismatch in their balance sheets. Many foreign banks were active players in the creation and issuance of structured finance products. As money markets ground to a halt, these banks required financing to meet the needs of rolling over their short-term liabilities. Furthermore, foreign banks were also subject to a currency mismatch in managing their assets and liabilities. While the main source of funding for some of these banks was based on demand deposits and other forms of credit in their home countries that were denominated in their home currencies – mostly the British pound and euro – many European banks issued liabilities in U.S. money markets that were denominated in the U.S. dollar. Thus, not only were foreign banks subject to a roll-over risk, but they also suffered from a currency mismatch and had to rely on special facilities such as the currency swap lines between central banks including the European Central Bank, Bank of England, and Swiss National Bank, and Federal Reserve Bank, as well as on special lending programs such

as the TAF. European banks were more likely to bid for TAF money because they were more severely affected by the financial crisis, given their exposure to currency mismatch between assets and liabilities.

The rest of the paper is organized as follows. Section 2 provides the institutional details of the Term Auction Facility. Section 3 describes the dataset and provides summary statistics on the evolution of the TAF over time. Section 4 displays the empirical analysis. Section 5 discusses the Federal Reserve Bank’s lending to foreign banks. Section 6 concludes.

2. THE TERM AUCTION FACILITY

Global money markets suffered serious disruptions in the summer of 2007 when the rates of interbank term loans rose to unusually high levels.² The TED spread – the difference between the three-month London inter-bank offered rate (LIBOR) and the three-month U.S. Treasury bill – rose from its typical level of 30 basis points to about 50 basis points and then to 200 basis points by the summer of 2007. This widening was a reason for major concern because the TED spread is an indicator of perceived credit risk in the general economy. Moreover, according to a New York Federal Reserve Bank research paper:

[T]he volume of transactions in the inter-bank market declined, and borrowers reportedly often could not obtain funds at the posted rates. Since the LIBOR affects interest rates on a wide variety of loans and securities (e.g. home mortgages and corporate loans), unusually high term rates can have disruptive effects on the economy. (McAndrews, Sarkar and Wang 2008, 1)

The Federal Reserve Bank responded to the disruptions in the money markets with the traditional tools of monetary policy – namely, open market operations to maintain the effective federal funds rate near its target rate. However, despite the Federal Reserve Bank’s efforts in the overnight funding market, the rates on term loans in the interbank market kept rising. In an attempt to ease the strains in the money markets, the Federal Reserve Bank resorted to non traditional tools of monetary policy. Perhaps the most important tool used for this purpose was the Term Auction Facility.

²Term funding is typically made with maturity terms of one-month or longer.

The TAF was introduced on December 2007 in the early stages of the financial crisis to provide Federal Reserve liquidity funding by auctioning off short-term funding, without forcing banks to face the stigma of borrowing from the Federal Reserve's discount window. Under the TAF, the Federal Reserve auctioned term funds to depository institutions. All depository institutions that were eligible to borrow under the primary credit program of the Federal Reserve Bank were eligible to participate in TAF auctions. All loans extended under the TAF were fully collateralized, and the funds were allocated through an auction, in which participating depository institutions placed bids specifying an amount of funds, up to a pre-specified limit, and an interest rate that they would be willing to pay for such funds. The funds were allocated beginning with the highest interest rate offered until either all funds were allocated or all bids were satisfied. All borrowing institutions paid the same interest rate, either the rate associated with the bid that would fully subscribe the auction or, in the case that total bids were less than the amount of funds offered, the lowest rate that was bid. The TAF was created under the Federal Reserves standard discount window lending authority granted under Section 10B of the Federal Reserve Act. The auctions were administered by the Federal Reserve Bank of New York, with loans granted through the twelve Federal Reserve Banks.

TAF funding supplemented the U.S. dollar funding received by global banks around the world under the central bank swap facilities between the Federal Reserve Banks and the Banco Central do Brasil, Bank of Canada, Danmark's Nationalbank, Bank of England, European Central Bank, Bank of Japan, Bank of Korea, Banco de Mexico, Reserve Bank of New Zealand, Norges Bank, Monetary Authority of Singapore, Sveriges Riksbank, and Swiss National Bank.

From the first facility on December 17, 2007, to the final TAF auction on March 8, 2010, the Federal Reserve Bank conducted sixty auctions. The amount of term loans auctioned was initially between \$20 and \$30 billion but was later increased to \$50 billion and \$75 billion. The facility size increased to \$150 billion in October 2008 and remained at that level until June 2009. During the second half of 2009 and the first three months of 2010, the amount auctioned gradually declined, and by the final auction in March 2010, only \$3.4 billion was loaned out.

Whether TAF was effective in reducing rates in the interbank market has been debated by both academic economists and policy makers. A working paper of the Federal Reserve Bank of New York (McAndrews, Sarkar, and Wang 2008) provides empirical evidence that TAF has helped to ease strains in the interbank market. In contrast, according to Taylor and Williams (2009,) TAF

had no impact on interest rate spreads. According to McAndrews, Sarkar, and Wang (2008), the major problem in the money markets in 2007-2008 was lack of liquidity, and hence the TAF was effective because it provided central bank liquidity to the banking system when the interbanking system collapsed. In contrast, Taylor and Williams (2009) argue that the main problem in the market was not liquidity but rather counter-party risk, which TAF funding could not have solved.

3. DATA AND SUMMARY STATISTICS

The data analyzed here come from the Federal Reserve Bank disclosure of each of the individual term loans provided under the TAF.³ The dataset lists 4,214 individual loans spanning the auctions from December 12, 2007, until the last auction on March 8, 2010.

The dataset includes micro-level detailed information for each loan contract on the contract terms, the borrower's identity, and the broad categories of the securities against which the loans were made. The loan contract terms include the interest rate on the loan (in percent), the loan maturity (in days), and the loan amount (in million of dollars). The dataset also provides information of the borrower that includes the borrower's name, city, and state.⁴ In addition, the Federal Reserve Bank discloses information on the underlying collateral against which the loan was granted. In particular, it reports the amount of unencumbered collateral (defined as the lendable value of the borrower's collateral), as well as the broad categories of the assets used as collateral. There are twelve asset type categories in the data: commercial loans, residential mortgages, commercial real estate loans, consumer loans, U.S. Treasury/Agency securities, municipal securities, corporate securities, MBS and CMO issued by government-sponsored enterprises, mortgage-backed securities (MBS) and collateralized mortgage obligations (CMO)issued by private corporations, asset-backed securities, international securities, and other collateral. Finally, the dataset breaks down the dollar value of collateral by broad credit rating categories.

3.1. Loan Characteristics

Table 1 displays descriptive statistics for the main loan characteristics. As Panel A shows, the average loan amount (in millions) is \$906.1 million and the median is \$125.0 million. The dispersion in loan amount ranges widely, from a minimum of \$1.4 million (First Merchant Bank of Indiana)

³The data can be downloaded at <http://www.federalreserve.gov/news/2008/january/taf.htm#datadesc> .

⁴For foreign borrowers the dataset lists the city and state of their U.S. branch, which is in most cases New York City.

to the largest loans of \$15,000 million (to Bank of America, Barclays, Citibank, JP Morgan Chase, Wachovia, and Wells Fargo). The average loan term is 45.6 days and ranges from 13 days to 85 days. The average annualized interest rate is 0.900 percent and ranges from 0.200 percent to 4.670 percent. As explained in Section 2, the TAF was conducted through auctions in which all successful bids were subject to the same interest rate and loan terms. Thus, although loan amounts vary across banks and over time, all banks borrowing in the same auction obtained loans with the same interest rates and loan maturities.

In addition to the loan amount there is strong heterogeneity in the amounts and types of collateral posted by the borrowing banks. Borrowers pledged unencumbered collateral with an average value of \$4,285.4 million. The median collateral value is \$571.0 million and the range is from \$5.1 million (Timberwood Bank) to \$185,410.0 million (Bank of America). I also calculate the ratio of the face amount of the loan to the value of the unencumbered collateral and report it in the last row of Table 1. As the table shows, the average loan-to-collateral ratio is 0.334 and the median is 0.286. Loan-to-collateral rates increased after the peak of the crisis as collateral values increased and haircuts on collateral declined. For example, the average loan-to-value in 2008 was 0.255 compared to 0.370 and 0.460 in 2009 and 2010, respectively. Although the loan-to-collateral ratios appear to be low and conservative, it is not clear whether these numbers are based on market values or on face values of the underlying collateral.

3.2. The Collateral Structure of TAF Loans

I now analyze the composition of collateral in TAF loans. Given that loan terms as well as loan rates were determined at the auction level, the only sources of inter-bank variation were the amount of the loan and the amount and type of the collateral. Indeed, banks pledged different types of assets as collateral for their loans, and most TAF loans were secured by numerous securities from different asset types. Table 2 provides a detailed analysis of collateral structure for the 4,214 TAF loans. The table reports summary statistics for the dollar amount (in millions) as well as the number of loans for which collateral was pledged in each asset category.

The largest collateral category (based on the dollar amount of the assets pledged) is *residential mortgages*. The mean amount of residential mortgages used as collateral is \$3,786.3, and it was used as collateral in 465 individual loans. The next largest category is *asset-backed securities*, which according to the Federal Reserve definitions include securities collateralized by assets other than

first-lien mortgages, including collateralized debt obligations (CDOs). More than 1,301 loans were backed by ABS and the mean collateral pledged in this category is \$2,562.8 million and ranges from \$0.4 million to \$25,953.7 million.

The most popular asset class based on the number of loans that used it as collateral is commercial loans, which were used in 2,291 loans, followed by commercial real estate and corporate securities, which were used in 1,624, and 1,507 loans, respectively. Finally, U.S Treasury/Agency securities were used in 833 loans with a mean collateral value of \$348.8 millions.

The dataset also breaks down the collateral pool by credit rating categories.⁵ Table 3 reports summary statistics for the collateral assets by the major credit rating classifications. AAA-rated U.S Treasury/Agency securities (including agency MBS and CMO) amounted, on average, to \$650.3 million. The amount of other AAA-rated securities pledged as collateral was on average \$1,845.8 per loan, and these were used in 1,859 loans. AA-rated and A-rated securities were used in 1,681, and 1,817 loans, respectively, and accounted for about \$380 million each of the collateral pool. Other rating categories include BBB-rated (mean \$238.0 million) and “other investment grade” securities (mean \$1,232.6).

4. EMPIRICAL ANALYSIS

4.1. Determinants of Loan Characteristics

I begin the empirical analysis of TAF loans by analyzing the characteristics of the loans. The eight OLS regressions reported in Table 4 use different specifications to predict the determinants of the loan terms. For each of the four loan determinants I report results from regressions that do not include bank fixed-effects (*between* analysis) and regressions that utilizes variation over time using bank fixed-effects (*within* analysis). As explanatory variables I use collateral dummy variables that take the value of one if a particular asset is included in the collateral pool and zero otherwise. All regressions include year×month fixed-effects to account for time-varying effects.⁶

The table reports results for the following loan characteristics:loan amount (in logs), interest rate, loan term, and loan-to-collateral ratio. However, it should be noted that because TAF loans were granted at auction, the same interest rate and loan term applied to all banks participating in

⁵The dataset reports asset types and credit ratings separately and hence does not enable classification that is based on both credit ratings and asset class.

⁶Although I use collateral dummy variables, the analysis yields similar results when using the actual share of collateral in each asset category.

each auction. In contrast, the loan amount, the ratio of loan to collateral (the inverse of the loan “haircut”), and the nature of the assets pledged as collateral varied across banks within an auction. As Table 4 shows, the composition of the collateral has little explanatory power in bearing on loan outcomes. First, few if any of the explanatory variables turn out to be significant in regressions that use the interest rate or loan term as dependent variables. Second, the R-squared in the regressions shows that the addition of bank fixed-effects does not change the adjusted R-squared in the interest rate and loan term regressions, indicating that bank-specific effects had no impact on the loan rate and maturity.⁷

In contrast, collateral composition significantly affected both loan amount and loan-to-collateral ratio. As the first column shows, asset-backed securities, commercial real estate, international securities, Treasuries, private mortgage-back securities, and consumer loans are associated with larger loans, whereas municipal securities are correlated with smaller loans. However, given that the regressions do not control for bank characteristics, it is likely that some of the collateral results are driven by omitted variables. For example, if larger banks are also more likely to hold asset-backed securities or international bonds, then the positive coefficient in Column 1 might be capturing the simple correlation between bank size and loan amount. In an attempt to address this concern, the regression specification reported in Column 2 adds bank fixed-effects to the analysis and hence uses variation within bank from repeated loans in several TAF auctions over time. Indeed, as the second column of the table demonstrates, only commercial real estate, Treasury, and private MBS survive the addition of fixed-effects and are still positive and significant. In addition, residential mortgages and corporate bonds turn out to be positive and significant when fixed-effects are added.

Turning to the last two columns of the table, I find that loans secured by asset-backed securities obtained loan-to-collateral ratios that are between -0.150 and -0.052 lower. Likewise, consumer loans led to lower loan-to-value ratios, while loans secured by Treasuries had loan-to-collateral ratios that were higher by 0.030. The results are consistent with the notion that haircuts on collateral are used as an important tool for monetary policy. This is important especially when non traditional monetary policy is conducted through auctions in which the interest rate and loan terms do not vary across borrowers.

⁷The high R-squared in the interest rate is completely driven by the year×month fixed-effects since there was an overall trend of declining interest rates throughout the TAF time period.

4.2. The Evolution of TAF over Time

Figure 1 displays the evolution of the TAF lending facility size over time. As described in Section 2, the Federal Reserve Bank announced in advance the offering amount in each auction. As Figure 1 shows, the initial auctions were smaller, with amounts that were between \$20 and \$30 billion. The offering amount was raised to \$50 billion in the auction of March 10, 2008, and was further increased to \$75 billion on May 5th, 2008. While the amounts fluctuated between \$25 and \$75 billion in August and September 2008, the lending facilities increased dramatically to \$150 billion on October 6, 2008, during the peak of the financial crisis, and remained at that level until the end of June 2009. The offering amount gradually declined to \$125 and \$100 billion in July and August 2009, respectively, and later fluctuated between \$75 and \$25 billion. The final auction was held on March 8, 2010 for \$25 billion.

Although Figure 1 plots the offering amounts in each of the auctions and hence the potential (*the supply of funds*), it does not show the amount demanded by banks that submitted bids for TAF money or the amount that was actually loaned. Figure 2 supplements the information in Figure 1 by plotting both the total amount of proposition submitted by banks (*the demand for loans*) (dashed line) and the amount that was actually awarded (solid line).⁸ As the figure illustrates, the demand for funds exceeded the supply from the first auction in December 2007 until the auction of September 22, 2008. For example, on December 12, 2007, the offering amount by the Federal Reserve was \$20 billion, but the amount demanded by the 93 banks that submitted bids was \$61.6 billion. In the auction of September 22, 2008, the facility was increased to \$75 billion, but 85 banks submitted bids totaling \$133.6 billion.

Following the Federal Reserve's increase of the facility size to \$150 billion in October 2008, the amount of propositions submitted by banks was lower than the amount offered by the Federal Reserve Bank until the end of the TAF. In the October 8, 2008, auction – the first auction with a facility size of \$150 billion – 71 banks submitted bids totaling \$138.1 billion. The largest amount requested by banks was \$142.5 billion, when 117 banks participated in the auction of February 9, 2009. The largest number of banks participating in a single auction was 124 (May 4, 2009), compared to only 16 banks on November 24, 2008.

⁸I use the notion of demand and supply here fairly loosely. Of course, given the auction structure, there was no excess demand at a given rate.

4.3. TAF Lending to Foreign Banks

Table 5 lists the number of loans, average loan size, and total amount loaned in each month from the first auction in December 2007 through the final auction in March 2010. The table further breaks down monthly lending by whether the borrowing bank is a U.S. depository institution or a foreign bank.⁹ Overall, foreign banks amounted for 58 percent of the overall amount lent over time, with a total amount of \$2,214.688 million, compared to only \$1,603,723 for U.S. banks. From December 2007 through most of 2008, foreign banks accounted for the vast majority of the lending, with amounts that were between twofold and fourfold the total lending to U.S. banks. However, during the peak of the crisis and following the collapse of Lehman Brothers, and especially in October and November 2008, lending to U.S. banks exceeded borrowing by foreign banks. By April 2008 and until the end of the TAF, foreign banks accounted again for the majority of TAF lending.

Table 6 and Figure 3 present the fifty largest borrowers (measured by the total amount borrowed). For each of the largest borrowers, Table 6 lists the total loan amount, the average loan size, the number of loans obtained under the TAF, and the home country of the bank. Likewise, Figure 3 displays the largest fifty borrowers in a bar chart. As both Table 6 and Figure 6 show, U.K.-based Barclays is the largest borrower, with a total amount of \$232,283 million in forty-nine loans, followed by Bank of America, with a total amount of \$212,617 million in fifteen loans. The next largest borrowers are Royal Bank of Scotland (\$180,920 million), Wells Fargo (\$153,953 million), and Wachovia (\$147,025 million). Furthermore, out of the ten largest borrowers, five are foreign bank and out of the fifty largest borrowers, thirty-three are from foreign countries.

4.4. The Collateral Structure of Foreign Banks

As I argued previously, the loan term and interest rate were determined at the auction level regardless of the identity of the borrowing bank participating in the auction. In contrast, the size of the loan and the collateral pledged by the bank were the only margins that both the bank and the Federal Reserve Bank could adjust at the loan level. Given the importance of collateral in general and in particular given the unique setup of the TAF, I now compare the collateral structure of domestic banks to the collateral used by foreign banks. Table 7 presents summary statistics on the usage of collateral by domestic and foreign banks. For each asset category reported by the Federal Reserve the table lists the mean share of the asset category in the collateral pool, the standard

⁹Foreign banks were eligible to participate in the TAF through their agencies or branches in the United States.

deviation of the share, and the number of loans pledging this asset as part of their collateral.

The summary statistics are reported separately for domestic and foreign banks, and a two-sample T-test for equal means is also presented. As Table 7 shows, foreign banks rarely used residential mortgages as collateral – only 5 loans made to foreign banks were secured by residential mortgages, compared to 460 loans to domestic banks. On the other hand, asset-backed securities were used in 983 loans to foreign banks, compared to 318 loans to domestic banks. Furthermore, asset-backed securities account for a larger share of the overall collateral pool in foreign banks (9.323 versus 0.151, significant at the 1 percent level). As in the case of residential mortgages, foreign banks used consumer loans in only 44 loans, while U.S.-based banks had consumer loans in 1,043 loans. Private MBS/CMO are more prevalent in foreign banks (although their share is slightly lower than in U.S. banks), and commercial real estate loans were used in only 222 foreign loans. Other significant differences between foreign and domestic banks are that foreign banks were less likely to use Agency MBS/CMO, U.S. Treasury/Agency, and U.S. municipal bonds and were much more likely to pledge international securities as collateral.

Table 8 supplements the results in Table 7 using regression analysis of the collateral composition of foreign banks. For each of the main asset categories I use two dependent variables. The first dependent variable is a dummy variable for whether a security type is pledged as collateral for a particular loan – this variable captures the average tendency to use an asset as collateral. The second dependent variable is the actual share of the collateral in each asset group conditional on the asset being used as collateral. That is, while the first variable uses information on all loans, the second variables captures only the cross-sectional variation *within* an asset category conditional on its use. All regressions include year×month fixed-effects as well as a control for the loan amount (in logs) and a dummy variable that takes the value of one for foreign banks, and zero otherwise. Regressions for which the dependent variable is a dummy variable are estimated using probit where marginal effects are reported. Table 8 confirms the univariate findings. Foreign banks are more likely to use asset-backed securities, international assets, and Treasuries and are less likely to use commercial real-estate.

5. WHY FOREIGN BANKS?

Given that more than 58 percent of TAF lending went to foreign banks, it is important to understand why the Federal Reserve allocated its lending to foreign banks that are not under its direct supervision. In addition, the information contained in the collateral structure of these banks suggests that the collateral pledged by the foreign banks consisted of harder-to-value, riskier assets such as asset-backed-securities. In particular, ABS held by the foreign banks are – according to the data definitions provided by the Federal Reserve Board – collateralized debt obligations secured by ABS, which were the securitized assets that declined the most during the crisis (Benmelech and Dlugosz (2009)).

5.1. Exposure to Asset-Backed Securities

One potential explanation for both the elevated lending to foreign banks and their usage of asset-backed securities as collateral is that foreign banks were hit harder than U.S. banks and hence required more liquidity. Given that many of these banks had exposure to assets that deteriorated in value – mostly ABS and CDOs – these banks had weaker balance sheets.

However, foreign banks were not the only banks that were exposed to ABS CDOs. Table 9 provides information on aggregate crisis-related write-downs as well as write-downs for some of the largest financial institutions in the world.¹⁰ As the table demonstrates, as of October 2008, Citigroup had written down \$34.1 billion as a result of exposure to ABS CDOs, followed by Merrill Lynch with \$26.1 billion, and Bank of America (\$9.1 billion). As of February 2009, the total value of write-downs by financial institutions around the world was \$520.1 billion, out of which \$218.2 billion were due to exposure to ABS CDOs, representing 42 percent of total write-downs by the financial sector. Write-downs driven by ABS CDOs were more than four times the size of corporate credit-related write-downs. North American Banks accounted for the largest share of ABS CDOs write-downs, followed by European banks. The European bank with the largest exposure to ABS was UBS (\$21,870 million), followed by Fortis Banks (\$4,359 million), Royal Bank of Scotland (\$3,609 million) and Deutsche Bank (\$2,092 million).

If banks that were more likely to participate in the TAF were those that had worse balance sheets

¹⁰The data are from Creditflux, a leading information source globally for credit trading and investing, credit derivatives, structured credit, distressed credit, and credit research. This table is based on the results presented in Benmelech and Dlugosz (2009).

due to exposure to structured finance products, we should expect the institutions with the most exposure to ABS CDOs to borrow more under the TAF and pledge these securities as collateral. However, mere exposure to structured finance assets does not seem to explain either the amount of borrowing or the collateral used by the banks.

Table 10 lists the fifty banks that pledged the largest amounts of asset-backed securities per loan. As the table clearly shows, and consistent with Tables 7 and 8, most of the banks and financial institutions that pledged ABS as collateral were foreign – mostly European – banks. For example, the bank that pledged the largest amount of ABS for a given loan was Société Générale (France), followed by Norinchukin Bank (Japan), Dexia (Belgium), Barclays (U.K.), and UBS (Switzerland). Among the ten banks that pledged the largest amounts of asset-backed securities as collateral, only two were American banks (State Street and U.S. Central Federal Credit Union).

In contrast, the American banks that had the largest exposure and write-downs due to ABS CDOs – Citigroup and Bank of America – had only modest borrowing secured by ABS. For example, as Table 9 demonstrates, Citibank had the largest write downs due to ABS CDOs borrowed against \$760.8 million of ABS, compared to Société Générale with \$16,352.0 million and UBS with \$9,419.0 million. Thus, despite their exposure to ABS and structured finance assets, American banks were less likely to obtain term funding through the TAF or to pledge asset-backed securities as collateral.

5.2. The European Banks' Dollar Crisis

Another explanation for the large number of loans made to foreign banks is that these banks suffered from a currency mismatch in their balance sheets. Many foreign banks were active players in the creation and issuance of structured finance products. As money markets came to a halt, these banks required financing to meet the needs of rolling over their short-term liabilities. Moreover, foreign banks were also subject to a currency mismatch in managing their assets and liabilities. Although the main source of funding for some of these banks was based on demand deposits and other forms of credit in their home countries that were denominated in their home currencies – mostly the British pound and euro – many European banks issued liabilities in U.S. money markets that were denominated in the U.S. dollar. Thus, not only were foreign banks subject to a roll-over risk, but they also suffered from a currency mismatch and had to rely on special facilities such as the currency swap lines between central banks including the European Central Bank, Bank of England, Swiss National Bank, and Federal Reserve Bank, as well as special lending programs such

as the TAF.

Indeed, foreign banks have played an important role in American financial markets during the years leading to the financial crisis. According to Shin (2011): “The US-dollar denominated assets of banks outside the United States are comparable in size to the total assets of the US commercial banking sector, peaking at over \$10 trillion prior to the crisis. The BIS banking statistics reveal that a substantial portion of external U.S. dollar claims are the claims of European banks against US counterparties.” Likewise, studies from the Bank for International Settlements (BIS) by Baba, McCauley, and Ramaswamy (2009) and McGuire and von Peter (2009) show that US dollar wholesale deposits and money market funds were an important source of funding for European global banks in the years leading to the crisis.

Moreover, Shin (2011) provides evidence based on data from the BIS that European global banks raised their assets in the United States in the years leading to the crisis, increasing their claims against U.S. borrowers by almost 40 percent from 2005 to 2007. Although European banks had access to U.S. credit markets, they still had their core funding in their home countries in European currencies. It was the currency mismatch between their assets – many in the form of private-label ABS and CDOs – and their liabilities that made them vulnerable to the halt in U.S. short-term lending markets.

According to this view, European banks were more likely to bid for TAF money because they were affected more severely by the financial crisis, given their exposure to currency mismatch between assets and liabilities. Shin (2011) draws similar conclusions from the fact that a large fraction of TAF lending was originated to European banks. He writes:

Two features stand out from the charts in Figure 11. The first is that the non-US banks' total borrowing is large relative to US banks' borrowing. The relative magnitudes are roughly comparable at the peak. The second feature that stands out is the preponderance of European banks in the list of non-US recipients of TAF funding. The UK banks are especially prominent, led by Barclays, RBS and Bank of Scotland. The list also reveals some unlikely names, such as Norinchukin (the Agricultural Savings Bank of Japan) and the German landesbanks, who are likely to have ventured into US dollar lending in their search for higher yielding assets to deploy their large domestic deposit bases. (Shin 2011, 17-18)

Thus, it is likely that the elevated lending to foreign banks and in particular to European banks reflects their prominent role in the U.S. financial system, their involvement in the structured finance markets – especially the private-name ABS and CDOs – and the currency mismatch in their balance sheets.

6. CONCLUSION

This paper provides detailed analysis of the Term Auction Facility plan using micro-level data on the individual loans, the assets posted as collateral, and the identity of the borrowing banks. I find that foreign banks accounted for about 60 percent of TAF lending and that the largest borrowers in the program were mostly European banks. Moreover, most of the banks that pledged asset-backed securities as collateral were European banks.

I argue that the main reason for the large number of loans made to foreign banks is that European banks suffered from a currency mismatch in their balance sheets. Many European banks were active players in the creation and issuance of structured finance products, and as money markets came to a halt, these banks required financing to meet the needs of rolling over their short-term liabilities. These European banks were also subject to a currency mismatch in managing their assets and liabilities. Although the main source of funding for some of these banks was based on demand deposits and other forms of credit in their home-countries that were denominated in their home currencies, they issued liabilities in U.S. money markets that were denominated in the U.S. dollar. Thus, foreign banks not only were subject to a roll-over risk but also suffered from a currency mismatch and had to rely special facilities such as the TAF.

The data illustrate the scale of the operation of foreign – in particular European – banks in U.S. financial markets. What precise role do European banks play in the American economy? What led to their involvement in the U.S. financial system? These questions are left for future research.

References

- Baba, Naohiko, Robert N. McCauley, and Srichander Ramaswamy. 2009. "US Dollar Money Market Funds and Non-US Banks." *BIS Quarterly Review*, March 2009, 65-81.
- Benmelech, Efraim, and Jennifer Dlugosz. 2009. "The Credit Rating Crisis," NBER Macro Annual 2009, 161-207.
- Bernanke, B. 2009 "The Federal Reserve's Balance Sheet: An Update." Speech at the Federal Reserve Board Conference on Key Developments in Monetary Policy, Washington, D.C.
- McAndrews, James, Asani Sarkar, and Zhenyu Wang. 2008. "The Effect of the Term Auction Facility on the London Inter-Bank Offered Rate." *Staff Report no. 335, Federal Reserve Bank of New York Staff Reports*.
- McGuire, Patrick, and Goetz von Peter. 2009. "The US Dollar Shortage in Global Banking." *BIS Quarterly Review*, Bank for International Settlements.
- Shin, Hyun Song. 2011. "Global Banking Glut and Loan Risk Premium." 2011 Mundell-Fleming Lecture Conference Draft.
- Taylor, John B., and John C. Williams. 2008. "A Black Swan in the Money Market." *American Economic Journal: Macroeconomic* 1: 58-83.

Table 1:
Loan Characteristics

	Mean	25th Percentile	Median	75th Percentile	Standard Deviation	Min	Max	Observations
Loan amount (\$ millions)	\$906.1	\$22.0	\$125.0	\$1,000.0	\$1,922.5	\$1.4	\$15,000	4,214
Loan term (days)	45.6	28	28	84	25.6	13	85	4,214
Interest rate	0.900%	0.250%	0.250%	1.390%	1.093%	0.200%	4.670%	4,214
Collateral (\$ millions)	\$4,284.5	\$79.3	\$571.0	\$4,157.9	\$10,544.7	\$5.1	\$185,410.1	4,214
Loan to Collateral	0.334	0.150	0.286	0.477	0.227	0.004	1.001	4,214

**Table 2:
Collateral Composition by Security Type (\$ millions)**

	Mean	25th Percentile	Median	75th Percentile	Standard Deviation	Min	Max	Observations
Residential mortgages	\$3,786.3	\$7.9	\$27.5	\$402.9	\$11,070	\$0.0	\$76,847.5	465
ABS	\$2,562.8	\$91.5	\$780.6	\$2,513.4	\$4,486.9	\$0.4	\$25,953.7	1,301
Commercial loans	\$2,232.1	\$40.1	\$338.0	\$1,544.4	\$6,911.8	\$0.1	\$76,784	2,291
Consumer loans	\$1,462.5	\$8.8	\$86.1	\$1,194.1	\$3,875.5	\$0.0	\$32,679.2	1,087
Private MBS/CMO	\$1,154.9	\$69.6	\$241.7	\$922.5	\$2,378.8	\$0.0	\$14,599.2	1,045
Commercial real estate	\$1,091.0	\$35.9	\$104.3	\$718.9	\$2,471.5	\$0.0	\$30,469.6	1,624
Corporate	\$747.6	\$43.6	\$209.3	\$1,115.9	\$1,090.0	\$0.1	\$6,840.6	1,507
International securities	\$703.1	\$28.7	\$129.7	\$580.4	\$1,492.0	\$0.1	\$11,302.5	1,138
Agency MBS/CMO	\$567.9	\$12.2	\$80.2	\$498.7	\$1,681.2	\$0.0	\$26,679.8	1,151
Municipals	\$370.3	\$7.0	\$20.1	\$93.6	\$1,180.6	\$0.0	\$8,911.9	1,099
U.S Treasury/Agency	\$348.8	\$11.3	\$48.5	\$241.6	\$968.7	\$0.0	\$8,762.4	833

**Table 3:
Collateral Composition by Credit Rating (\$ millions)**

	Mean	25th Percentile	Median	75th Percentile	Standard Deviation	Min	Max	Observations
AAA-rated								
U.S Treasury/Agency/ Agency MBS-CMOs	\$650.3	\$13.4	\$106.1	\$555.8	\$1,709.2	\$0.0	\$26,679.8	1,375
Other AAA-rated	\$1,845.8	\$22.2	\$352.9	\$1,801.7	\$3,532.8	\$0.0	\$22,364.7	1,859
AA-rated								
A-rated	\$381.6	\$7.9	\$74.2	\$370.9	\$857.8	\$0.0	\$8,505.2	1,681
BBB-rated	\$386.5	\$13.3	\$96.3	\$420.8	\$783.3	\$0.1	\$7,775.7	1,817
Other investment grade	\$238.0	\$12.2	\$68.5	\$296.8	\$422.9	\$0.1	\$4,881.4	1,694
	\$1,232.6	\$42.3	\$295.7	\$1,088.1	\$2,714.3	\$0.0	\$22,726.2	1,417

Table 4:
Determinants of Loan Terms

	log (loan amount)		interest rate		loan term		loan to collateral	
	between	within	between	within	between	within	between	within
ABS dummy	1.570 *** (0.084)	-0.001 (0.088)	0.008 (0.006)	-0.016 (0.020)	0.444 (1.152)	0.544 (2.708)	-0.150 *** (0.010)	-0.052 *** (0.019)
Commercial real estate dummy	0.446 *** (0.061)	0.220 *** (0.068)	-0.004 (0.004)	-0.010 (0.009)	-1.079 (0.813)	-0.680 (1.859)	-0.069 *** (0.007)	-0.034 ** (0.014)
International dummy	0.850 *** (0.082)	0.047 (0.069)	-0.007 (0.007)	-0.008 (0.014)	2.417 ** (1.122)	-0.775 (1.967)	0.004 (0.011)	-0.005 (0.016)
Municipal dummy	-0.242 *** (0.059)	-0.017 (0.059)	0.002 (0.004)	0.017 (0.011)	-1.396 (0.899)	-2.951 * (1.762)	0.011 (0.008)	-0.022 (0.014)
Treasury dummy	0.279 *** (0.067)	0.217 *** (0.062)	-0.004 (0.005)	-0.005 (0.010)	-1.170 (0.998)	-2.762 (1.899)	0.051 *** (0.009)	0.030 ** (0.014)
Private MBS dummy	0.881 *** (0.087)	0.275 *** (0.086)	0.001 (0.010)	-0.017 (0.016)	-0.214 (1.152)	-1.899 (2.268)	0.045 *** (0.010)	-0.019 (0.016)
Agency dummy	0.046 (0.062)	0.048 (0.057)	-0.003 (0.004)	-0.008 (0.009)	0.088 (0.960)	-3.398 ** (1.673)	0.004 (0.009)	0.002 (0.013)
Residential mortgages dummy	0.035 (0.095)	0.324 *** (0.108)	-0.000 (0.005)	0.024 (0.020)	-6.267 *** (1.105)	-7.223 *** (2.549)	0.052 *** (0.012)	-0.037 * (0.022)
Consumer loans dummy	0.454 *** (0.070)	0.203 ** (0.103)	-0.003 (0.004)	-0.005 (0.017)	0.959 (0.865)	-4.037 * (2.401)	-0.073 *** (0.008)	-0.063 *** (0.020)
Corporate securities dummy	0.111 (0.077)	0.340 *** (0.082)	0.007 (0.006)	0.007 (0.015)	-1.613 (1.091)	1.740 (2.192)	0.047 *** (0.011)	-0.034 * (0.020)
Fixed-Effects								
year × month	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank	No	Yes	No	Yes	No	Yes	No	Yes
Pseudo/Adjusted R^2	0.41	0.93	0.99	0.99	0.39	0.39	0.19	0.59
Observations	4,214	4,214	4,214	4,214	4,214	4,214	4,214	4,214

Omitted collateral category is commercial loans.

**Table 5:
Evolution of the TAF over Time: Foreign Banks versus Domestic Banks**

	Number of Loans	Average Loan size	Total Amount	Number of Loans	Average Loan size	Total Amount
	Domestic banks			Foreign banks		
December 2007	13	\$374.9	\$4,873	42	\$836.4	\$35,127
January 2008	46	\$460.3	\$21,172	35	\$1,109.4	\$38,828
February 2008	41	\$423.6	\$17,368	34	\$1,253.9	\$42,632
March 2008	45	\$615.2	\$27,683	41	\$1,763.8	\$72,318
April 2008	32	\$487.5	\$15,560	44	\$1,918.2	\$84,400
May 2008	76	\$729.2	\$55,418	56	\$1,669.0	\$94,581
June 2008	57	\$848.0	\$48,335	50	\$2,033.3	\$101,665
July 2008	105	\$821.2	\$86,230	79	\$1,756.6	\$138,770
August 2008	73	\$912.7	\$66,627	55	\$1,515.9	\$83,373
September 2008	40	\$1,064.9	\$42,595	46	\$1,791.4	\$82,405
October 2008	86	\$1,730.4	\$148,818	61	\$1,681.1	\$102,545
November 2008	113	\$1,394.4	\$157,561	60	\$1,430.9	\$85,856
December 2008	124	\$608.2	\$75,412	61	\$1,602.9	\$97,776
January 2009	185	\$1,062.8	\$196,617	89	\$1,687.2	\$150,160
February 2009	150	\$1,025.6	\$153,838	66	\$1,519.7	\$100,302
March 2009	149	\$689.6	\$102,743	71	\$1,643.3	\$116,672
April 2009	136	\$608.4	\$82,743	67	\$1,602.8	\$107,386
May 2009	159	\$568.8	\$90,446	61	\$1,584.1	\$96,633
June 2009	140	\$258.5	\$36,195	62	\$1,723.5	\$107,416
July 2009	210	\$240.1	\$50,417	87	\$1,908.8	\$166,062
August 2009	132	\$192.2	\$25,371	56	\$1,624.5	\$90,974
September 2009	109	\$210.2	\$22,912	49	\$1,321.6	\$64,759
October 2009	116	\$192.5	\$22,326	42	\$1,001.7	\$42,070
November 2009	104	\$160.7	\$16,713	31	\$889.0	\$27,558
December 2009	110	\$155.8	\$17,140	41	\$1,112.8	\$45,625
January 2010	98	\$111.2	\$10,893	23	\$1,201.7	\$27,638
February 2010	89	\$64.8	\$5,763	14	\$690.2	\$9,663
March 2010	49	\$39.1	\$1,914.7	4	\$373.8	\$1,495
December 2007-March 2010	2,787	\$575.4	\$1,603,723	1,427	\$1,552.0	\$2,214,688

Table 6:
Largest Borrowers (in \$ millions)

	Bank	Total Loans Amount	Average Loan Size	Number of Loans	Country
1.	Barclays	232,283	4,740.5	49	United Kingdom
2.	Bank of America	212,617	14,144.5	15	U.S.
3.	Royal Bank of Scotland	180,920	4,523	40	United Kingdom
4.	Wells Fargo	153,953	8,102.9	19	U.S.
5.	Wachovia	147,025	6,392.4	23	U.S.
6.	Société Générale	124,377.2	4,442.0	28	France
7.	Dresdner Bank	123,328.2	3,333.2	37	Germany
8.	RBS Citizens	117,510	4,039.7	29	U.S.
9.	Citibank	110,349.7	4,244.2	26	U.S.
10.	Bayerische Landesbank	108,190	2,924.1	37	Germany
11.	Dexia	105,166.8	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	78,406.3	2,178.0	36	United Kingdom
15.	Deutsche Bank	76,882	3,844.1	20	Germany
16.	Regions Bank	72,443.5	3,149.7	23	U.S.
17.	Unicredit	62,210	2,592.1	24	Italy
18.	Fortis Bank	58,650	1,725	34	Belgium
19.	Sumitomo	56,400	1,151.0	49	Japan
20.	UBS	55,500	3,468.8	16	Switzerland
21.	Royal Bank of Scotland	53,500	8,916.7	6	United Kingdom
22.	HSH Nordbank	52,550	1,545.6	34	Germany
23.	Mizuho	51,284.2	1,091.2	47	Japan
24.	Commerzbank	51,161.2	2,046.5	25	Germany
25.	Depfa Bank	46,798	2,600.0	18	Ireland
26.	First Tennessee	45,419.3	1,297.7	35	U.S.
27.	Fifth Third Bank	44,478.2	1,533.7	29	U.S.
28.	State Street	42,000	2,100	20	U.S.
29.	Keybank	40,214.4	1,827.9	22	U.S.
30.	DZ Bank	39,476.6	1,038.9	38	Germany
31.	Citizens Bank	39,380	1,790.0	22	U.S.
32.	Bank of Tokyo Mitsubishi	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	26,464.7	661.6	40	Canada
40.	Arab Banking Corporation	26,350	572.8	46	Bahrain
41.	Standard Chartered	25,100	896.4	28	United Kingdom
42.	Mitsubishi UFJ	24,456.6	444.7	55	Japan
43.	Crédit Industriel et Commercial	23,910	703.2	34	France
44.	Rabobank	23,750.6	2,375.0	10	Netherlands
45.	BB&T	22,700	2,522.2	9	U.S.
56.	Landesbank Baden	22,580	1,411.3	16	Germany
47.	Ally Bank	21,600	1,963.6	11	U.S.
48.	Marshall & Ilsley	21,022.7	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.

**Table 7:
Collateral Share: Foreign Banks versus Domestic Banks**

	Standard Mean	Number of Loans	Standard Mean	Number of Loans	Difference	Two-sample T-test
	Domestic banks			Foriegn banks		
Residential mortgages	0.280	0.01	460	0.733	0.01	5
Asset-backed Securities	0.151	0.01	318	0.323	0.01	983
Commercial loans	0.470	0.01	1,656	0.427	0.02	635
Consumer loans	0.358	0.01	1,043	0.477	0.07	44
Private MBS/CMO	0.183	0.01	349	0.141	0.01	696
Commercial real estate	0.563	0.01	1,402	0.159	0.01	222
Corporate securities	0.192	0.01	428	0.263	0.01	1,079
International securities	0.133	0.02	194	0.208	0.01	944
Agency MBS/CMO	0.392	0.01	673	0.225	0.01	478
Municipals	0.233	0.01	611	0.055	0.01	488
U.S. Treasury/Agency	0.238	0.02	384	0.149	0.01	449

Table 8:
Collateral Composition of Foreign Banks

	Asset-backed Securities		Commercial Real Estate		International Securities		Treasury Securities	
	extensive	intensive	extensive	intensive	extensive	intensive	extensive	intensive
Log (loan amount)	0.090 *** (0.004)	0.025 *** (0.005)	0.034 *** (0.004)	-0.072 *** (0.003)	0.018 *** (0.004)	-0.008 * (0.005)	0.006 * (0.004)	-0.064 *** (0.005)
Foreign dummy	0.393 *** (0.018)	0.143 *** (0.015)	-0.403 *** (0.015)	-0.231 *** (0.018)	0.611 *** (0.017)	0.136 *** (0.021)	0.178 *** (0.016)	0.082 *** (0.015)
Fixed-Effects								
year × month	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo/Adjusted R^2	0.39	0.13	0.11	0.41	0.39	0.09	0.05	0.26
Observations	4,214	1,301	4,214	1,624	4,214	1,138	4,214	833

Table 9:
ABS CDOs and Write-Downs

Panel A: Crisis-Related Write-Downs for Selected Banks (\$ millions)					
	ABS CDOs	Corporate credit	RMBS	Other	Total
<i>North American Banks</i>					
Bank of America	9,089	932	-	2,834	12,855
Bear Stearns	2,300	-	-	-	2,300
Citigroup	34,106	4,053	1,319	15,904	55,382
Goldman Sachs	-	4,100	1,700	1,400	7,200
JP Morgan Chase	1,300	5,467	5,305	-	12,072
Lehman Brothers	200	1,300	4,100	3,400	9,000
Merrill Lynch	26,100	2,845	12,998	13,125	55,068
Morgan Stanley	7,800	3,810	3,781	1,992	17,383
<i>European Banks</i>					
Credit Suisse	3,427	3,057	530	2,523	9,357
Deutsche Bank	2,092	5,820	3,386	3,677	14,974
Fortis Bank	4,359	3,660	144	-	8,163
ING	565	-	8,028	25	8,617
Royal Bank of Scotland	3,609	1,849	2,566	4,122	12,146
UBS	21,870	348	1,716	13,871	37,805
<i>Asian and Emerging Market Banks</i>					
Aozora Bank	510.0	-	-	-	510.0
Mitsubishi UFJ	359.5	2,348	921	11	3,640
Mizuho	3,898	629	2,539	584	7,650
National Australia Bank	669.5	-	-	-	669.5
Sumitomo Mitsui	56	-	-	-	561.7
Panel B: Aggregate Crisis-Related Write-Downs (\$ millions)					
	ABS CDOs	Corporate credit	RMBS	Other	Total
North American Banks	84,319	23,702	42,272	59,011	209,305
European Banks	63,464	18,579	26,423	62,634	171,100
Asia/Emerging Markets Banks	9,358	4,724	5,728	3,743	23,553
Total	218,216	53,324	84,810	163,735	520,084

Table 10:
Banks Pledgeing Most Asset-Backed Securities (in \$ millions)

	Bank	ABS amount	Country
1.	Société Générale	16,532.0	France
2.	Norinchukin Bank	14,607.9	Japan
3.	Dexia	11,429.7	Belgium
4.	Barclays	9,805.1	United Kingdom
5.	UBS	9,419.0	Switzerland
6.	State Street	9,125.6	U.S .
7.	Royal Bank of Scotland	8,227.8	United Kingdom
8.	Bank of Scotland	6,518.5	United Kingdom
9.	U.S. Central Federal Credit Union	5,293.2	U.S .
10.	Bank of Tokyo Mitsubishi	4,650.5	Japan
11.	Depfa Bank	3,405.0	Ireland
12.	Abbey National Treasury	3,143.3	United Kingdom
13.	Bayerische Landesbank	2,605.4	Germany
14.	Deutsche Bank	2,590.0	Germany
15.	Landesbank Baden	2,505.4	Germany
16.	WestLB	2,096.3	United Kingdom
17.	HSH Nordbank	2,028.8	Germany
18.	Calyon	1,904.7	France
19.	Shinkin Central Bank	1,824.0	Japan
20.	DZ Bank	1,496.5	Germany
21.	Skandinaviska Enskilda	1,444.3	Sweden
22.	Dresdner Bank	1,436.3	Germany
23.	PNC Bank	1,390.9	U.S.
24.	Natixis	1,308.3	France
25.	Sumitomo	959.0	Japan
26.	Washington Mutual	920.2	U.S .
27.	Erste Bank	884.1	Austria
28.	Standard Chartered	869.3	United Kingdom
29.	Fortis Bank	838.4	Belgium
30.	Royal Bank of Canada	802.0	Canada
31.	Allied Irish	770.5	Ireland
32.	HSBC	761.0	United Kingdom
33.	Citibank	760.8	U.S .
34.	Fifth Third Bank	736.8	U.S.
35.	Bank of Montreal	667.7	Canada
36.	Commerzbank	565.0	Germany
37.	Mizuho	510.3	Japan
38.	Metlife	504.3	U.S .
39.	Sallie Mae	503.0	U.S.
40.	Zions First National Bank	426.3	U.S .
41.	RBC Bank	417.5	U.S.
42.	Advanta	236.6	U.S .
43.	Crédit Industriel et Commercial	226.3	France
44.	Ally Bank	194.8	U.S .
45.	Mitsubishi UFJ	192.1	Japan
46.	First Hawaiian Banks	155.0	U.S.
47.	Bank Hapoalim	149.3	Israel
48.	California National Bank	113.0	U.S .
49.	Norddeutsche Landesbank	262.2	Germany
50.	M&T Bank	89.7	U.S .

Figure 1: Facility size (\$ million)

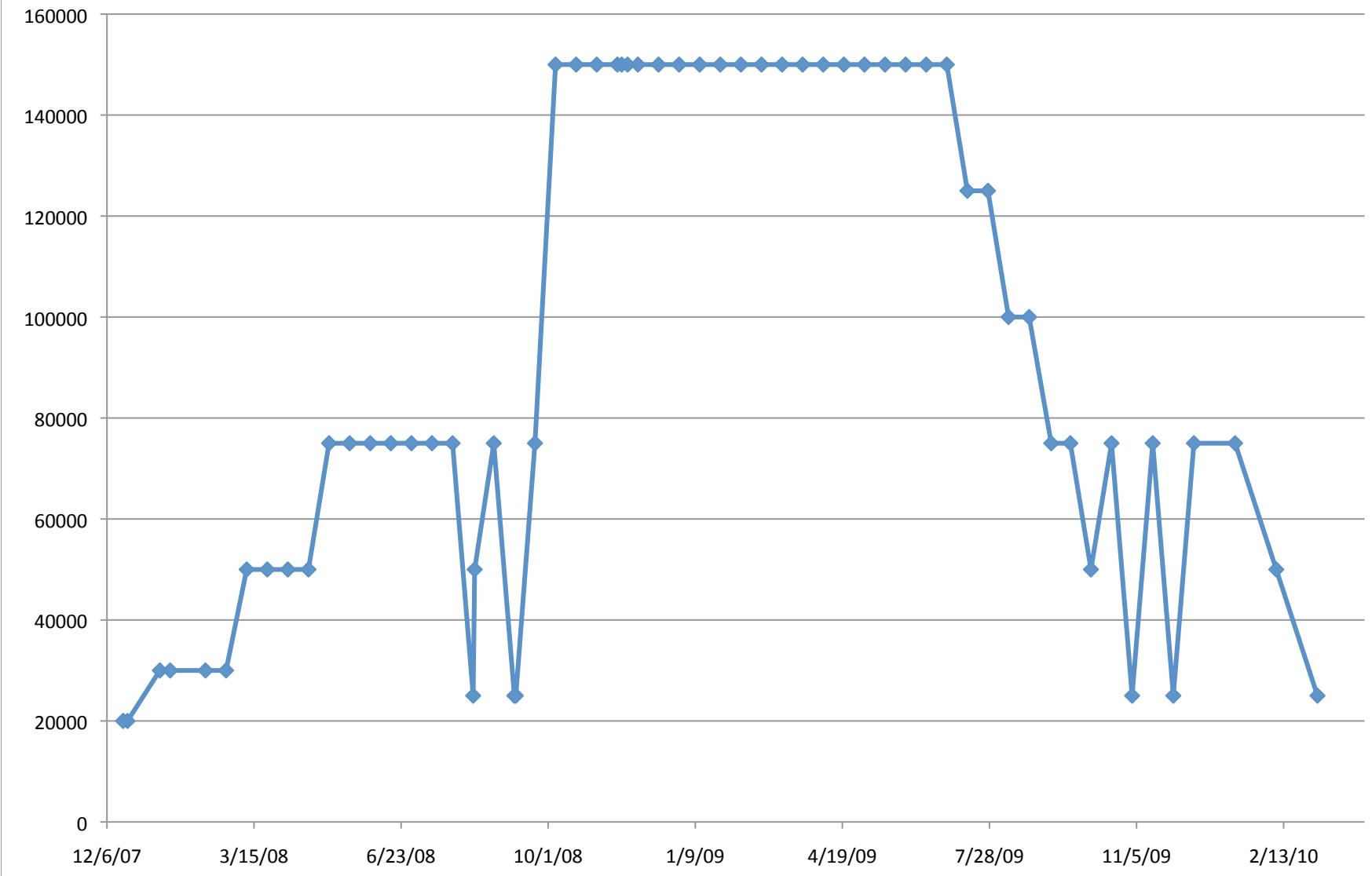


Figure 2: Total proposition submitted and amount awarded

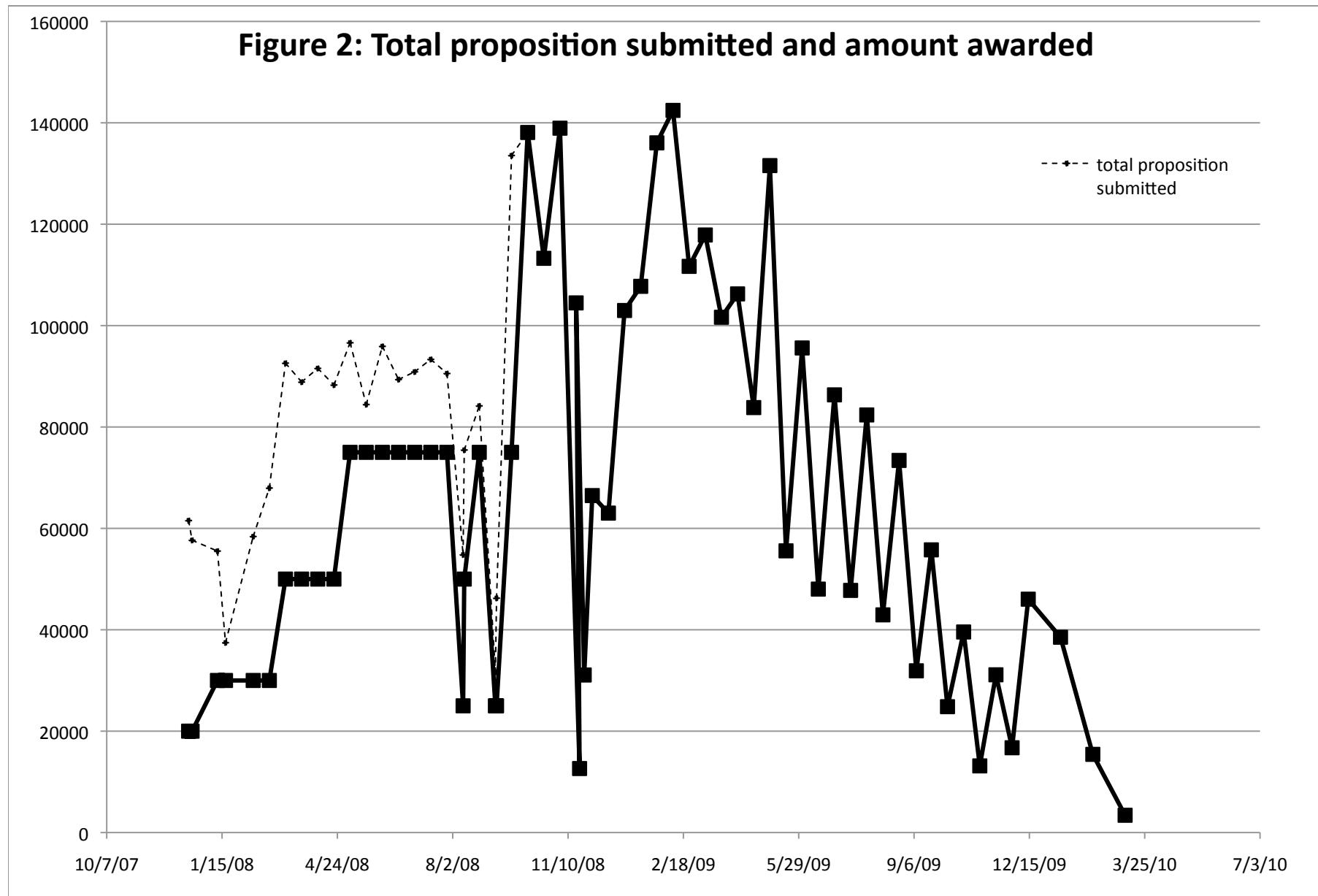


Figure 3: Largest TAF borrowers

