

Incentives and Tradeoffs in Designing a Crisis Liquidity Facility with Nonbank Counterparties: Lessons from the Term Asset-Backed Securities Loan Facility¹

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Abstract

In response to immense strains in the asset-backed securities market—a key funding source for loans to consumers and businesses—in 2008 and 2020, the Federal Reserve and the U.S. Treasury launched the Term Asset-Backed Securities Loan Facility (TALF). TALF differed from traditional central bank interventions because it provided loans to a wide variety of non-bank institutions that are not typically Federal Reserve counterparties. Using detailed and unique loan-level data, we analyze how the institutional constraints of these different types of nonbanks interacted with the TALF objectives. We show that TALF take-up depends on the extent of the strains in both the asset-backed securities (ABS) market and in the funding markets of ABS investors. We also find a key tradeoff between protecting the government from losses and providing broad-based liquidity support, a tradeoff that became particularly acute in TALF 1.0 as market conditions normalized.

Keywords: Non-Bank Financial Institutions, Securitization, Lender of Last Resort, Term Asset-Backed Securities Loan Facility, TALF

JEL Codes: E52, E53, G12, G23

¹ This paper stems from an earlier project with Sean Campbell and Bill Nelson that was started when both were still employed at the Federal Reserve Board. Clara Fried and Mark Wicks provided invaluable research assistance patching together the data from TALF 1.0. Jeremy Brizzi, Kathy Hsu, Jeffrey Miller, and Sarah Reber also provided crucial data assistance. Pinchas Becker, Ira Selig, and Alessandro Zori provided data from TALF 1.0 and spent many hours answering our questions. TALF was a team effort that drew upon the expertise of many staff at the Federal Reserve Bank of New York, the Federal Reserve Bank of Philadelphia, the Board, other parts of the Federal Reserve System, and the U.S. Treasury. We extend our thanks to all of these staff for their tireless work in designing and implementing TALF during two crises. The views expressed here are those of the authors and do not necessarily reflect the views of the Federal Reserve Board, Federal Reserve Bank of Chicago, or staff of the Federal Reserve.

1. Introduction

The 2007-08 great financial crisis and the 2020 financial market dislocations during the COVID-19 pandemic led to unprecedented lender-of-last-resort interventions by central banks into financial markets. When designing such crisis liquidity facilities, central banks face a design trade-off between speed and preserving the existing market infrastructure. On the one hand, outright purchases might be implemented quickly, but potentially displace private investors, and so may reduce market discipline that would otherwise occur through investor pricing of risk. On the other hand, crisis programs that lend funds to investors to induce them to return to a distressed financial market have the potential to retain market discipline but take time to design and implement, particularly when the participating investors are non-banks, and so not traditional central bank counterparties.

We examine a key example of the second type of program—the Term Asset-Backed Securities Loan Facility (TALF)—and assess how the institutional constraints of TALF borrowers interacted with the program objectives. Our analysis relies on detailed loan-level data on all loans extended by TALF in 2009-10 and 2020. The Federal Reserve Board and the U.S. Treasury introduced TALF 1.0 in 2009 and TALF 2.0 in 2020 to address the severe dislocations that emerged in the asset-backed securities (ABS) market in both periods.² Consistent with the principles first articulated by Bagehot (1873), both TALF programs offered loans at above-market interest rates for the purchase of triple-A rated asset-backed securities.³ TALF borrower were required to post a haircut that was calibrated to exceed the typical historical loss on triple-A ABS. In the event of default, the borrower lost the haircut, and the Federal Reserve took possession of the ABS collateral.

TALF is a close-to-ideal case study to understand the interaction of facility design with investor institutional constraints for two reasons. First, a wide range of investors borrowed from the program—including hedge funds, insurance companies, pension funds, mutual funds, private equity firms, real estate investment trusts (REITs), and private capital funds designed solely to invest in TALF—and so there is wide variation in institutional considerations among the participating TALF borrowers. Second, the designers of TALF likely could not have fully anticipated how program features would interact with institutional differences of all potential investors, as the facility did not restrict the types of investors, and many turned out not to be traditional investors in asset backed securities. Thus, the program is, in some sense, a pseudo experiment to study how facility design choices interact with investor institutional constraints and, in doing so, affect the program’s success.

We evaluate the design choices through the lens of four intuitive central bank objectives: (1) quickly restoring the ability of ABS issuers to access the market; (2) protecting taxpayers from losses; (3) providing liquidity support to a broad range of asset-backed securities; and (4) facilitating an orderly exit by ending the intervention and winding down the commitment on the central bank balance sheet when the market stabilizes.

² Unlike the commercial paper facility established in both crises, and the corporate credit and municipal bond facilities established in 2020, TALF provided loans to intermediaries instead of purchasing assets directly. But unlike the mutual fund facility introduced in both crises, TALF provided loans to nonbank entities instead of banks.

³ Although we cite Bagehot’s influential writing on central banking, we disavow the racist views outlined in some of his other writings. See Beasley (2010).

Our analysis generates four main insights. First, investors' pre-existing investment parameters and the stability of their own funding are important determinants of how soon they participate in the program, how much risk they take, and how quickly they repay their loans. Second, relatedly, take-up in TALF depended on strains in both the ABS market itself and in the funding markets of ABS investors. Third, central banks face a tradeoff between providing broad liquidity to the market and preventing investors from exposing the government to the risk of substantial loss. If the central bank reserves the right to reject loan requests based on internal credit risk criteria, then the government is better protected from loss but the uncertainty surrounding which collateral will be rejected may limit investor participation. Fourth, as market conditions normalize, investors' incentives to internalize risk erode, so central banks may need to increase the stringency of their collateral review and counterparty monitoring in the latter stages of a program.

Our more detailed findings by central bank objective are as follows. For the first objective, quickly restoring the ability of ABS issuers to access the market, we show that hedge funds, which have broad flexibility to adjust their investments in response to changing market conditions and whose lenders tightened terms in both crises, responded quickly to the TALF announcement and were significant participants in the early subscriptions in both programs. Traditional ABS buy-and-hold investors such as pension funds and insurance companies also participated early in TALF 1.0 when their other sources of funding were more expensive. Traditional investors did not participate in TALF 2.0, likely because they did not experience the same sustained funding pressures in 2020 as they did in 2009. Other types of investors, most notably newly formed private capital funds with a mandate to invest only in TALF-eligible assets ("TALF-only funds"), took longer to participate in the program because of delays associated with setting up new funds. Nonetheless, the TALF-only funds ultimately accounted for 40 percent of TALF 1.0 loans, and almost 90 percent of TALF 2.0 loans. Hence, this new class of opportunistic investors was instrumental in replacing traditional ABS investors that had exited the ABS market during the respective crises.

For the second objective, protecting the government from losses, we show that participation in the legacy CMBS program was surprisingly low—legacy CMBS collateralized only 18 percent of loan requests in TALF 1.0 despite the fact that many more legacy CMBS than new-issue ABS were eligible collateral for TALF loans.⁴ We tie this low participation to rejection risk. To mitigate the government's exposure to losses, the programs reserved the right to reject loan requests based on the collateral's expected performance in a variety of stressed scenarios. For new-issue ABS, the review was performed before the security was issued, but for legacy CMBS, the review was performed after the investor had purchased the security. If the security was rejected, the investor had to line up alternative, more costly financing or sell the security, possibly at a loss. In TALF 1.0, rejection was a real possibility because the dramatic erosion of CMBS underwriting practices in the mid-2000s meant that even some triple-A CMBS were at risk of experiencing a credit loss by 2009-10.

Rejection risk, while reducing the government's risk of loss, was a strong deterrent for program participation because investors were only partially able to anticipate in TALF 1.0 which CMBS would be rejected. We document that rejection of CMBS introduced uncertainty in the market and show that prices of rejected CMBS dropped after rejection announcements. In response, TALF investors tried to reduce

⁴ Legacy CMBS are close substitutes to new-issue CMBS and hence in this market support for legacy CMBS was necessary to facilitate the flow of credit to new commercial real estate loans.

their risk by primarily purchasing and seeking financing for CMBS that had been accepted at earlier subscriptions. As a result, although the possibility of rejection protected the central bank balance sheet and gave investors a strong incentive to conduct their own due diligence, it came at a cost of reducing TALF's liquidity support for the CMBS market.

We also show that this relationship shifted over the course of the TALF 1.0 program. As hedge funds and REITs, in particular, became less dependent on TALF 1.0 as their main source of funding for adding CMBS to their holdings, they appeared to be less worried about rejection risk and so submitted riskier CMBS as collateral. This finding suggests that central banks may need to increase their risk monitoring in the later stages of a program.

For the third objective, providing liquidity support for a broad range of asset-backed securities, we show a relationship between the stability of an investor's funding and the types of CMBS chosen as collateral for TALF loan requests.⁵ We find that opportunistic investors with the most stable funding (fixed-life partnerships and TALF-only funds) purchased the CMBS with the longest weighted average lives (WAL), while opportunistic and traditional investors who can lose their funding at times of stress (hedge funds, REITs, mutual funds) focused on CMBS with shorter WALs. Insurance companies, traditional investors that experienced funding pressures in the 2008 financial crisis (Foley-Fisher, Narajabad, and Verani, 2020), also chose to purchase short WAL CMBS, on average. CMBS with longer WALs are riskier since as fixed-rate securities they are subject to more price volatility. In addition, in TALF 1.0 the stock of longer-WAL securities had been issued in lax-underwriting regimes and so were more likely to fail the credit review. We also find that fixed-life partnerships were more likely to submit loan requests collateralized by CMBS with higher yields, controlling for subscription date and WAL. These findings highlight that at a time of crisis, even investors such as hedge funds who are compensated for taking risk will prioritize their own liquidity. This finding implies that investors with stable funding may be more natural counterparties for crisis lending programs if the objective is to provide liquidity to longer-WAL or otherwise risky securities.

For the fourth objective, orderly exit, we analyze the length of time investors held on to their TALF loans to assess which type of investors behave in a way consistent with the Fed's objective of ending its facilities when market conditions normalize. We find that traditional buy-and-hold investors—pension funds, insurance companies, and REITs—held on to TALF loans longest. Opportunistic investors including hedge funds, fixed life partnerships, and TALF-only funds tended to prepay their loans earlier. This finding is consistent with opportunistic investors exiting the market when ABS prices normalized, thus maximizing capital gains. These patterns suggest that opportunistic investors are better counterparties if the Federal Reserve's objective is to wind down the program soon after stress in the market subsides.

Our paper contributes to the literature on central bank lender-of-last-resort policies. Several papers have studied the liquidity provision and lender-of-last-resort programs by the Federal Reserve during the great financial crisis (see, e.g., Campbell et al., 2011, Covitz et al., 2013, Duygan-Bump et al., 2013, Fleming, 2012). We extend this literature by analyzing novel micro data on the TALF program to understand how the program design interacted with investor incentives and constraints. So far, empirical studies of program design and efficacy have focused on programs targeting one specific type of financial intermediary, most prominently broker-dealers (Acharya et al., 2017, Carlson and Macchiavelli, 2020) and

⁵ We focus on legacy CMBS because this category of TALF-eligible securities encompassed more variation in weighted average life and yield than new-issue ABS.

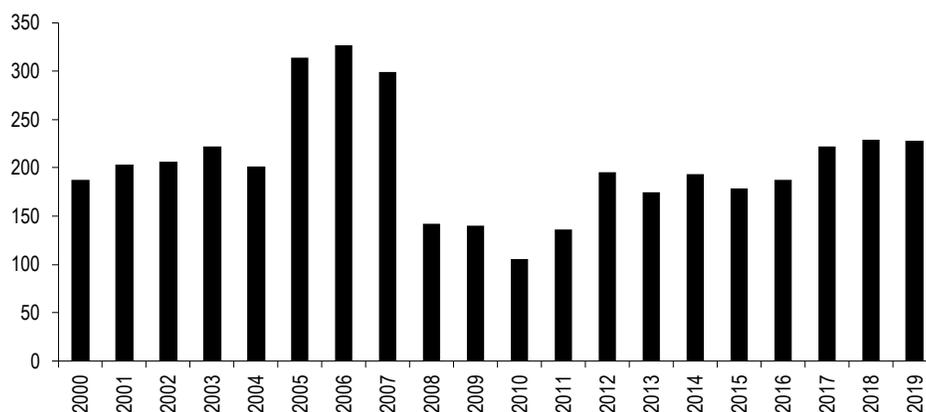
money market mutual funds (Duygan-Bump et al., 2013). In contrast, the TALF programs attracted a diverse set of investors with different incentives to participate in the programs. More recent literature has examined the consequences of uncertainty in central bank programs. Jasova, Mendicino, and Supera (2020) document that a reduction in lender-of-last resort policy uncertainty leads to more bank lending. This result echoes our findings about the limited take-up in the CMBS program due to rejection risk.

The remainder of the paper is structured as follows. Section 2 provides the motivation for the TALF programs and aggregate evidence on their effectiveness. Section 3 describes the TALF programs and how they interacted with the incentives and constraints of the ABS investor base. Section 4 provides empirical analysis based on loan-level data. Section 5 discusses the implications of the results for liquidity facilities with nontraditional counterparties.

2. TALF – Motivation and Aggregate Evidence

In this section, we first briefly review market conditions that led the Federal Reserve and U.S. Treasury to establish the TALF programs. We then provide aggregate evidence on the effect of TALF on ABS market liquidity and new ABS issuance.

Figure 1. Total ABS issuances (in \$ billion)



Source. Courtesy J.P. Morgan Chase & Co., Copyright 2021.

Program Motivation

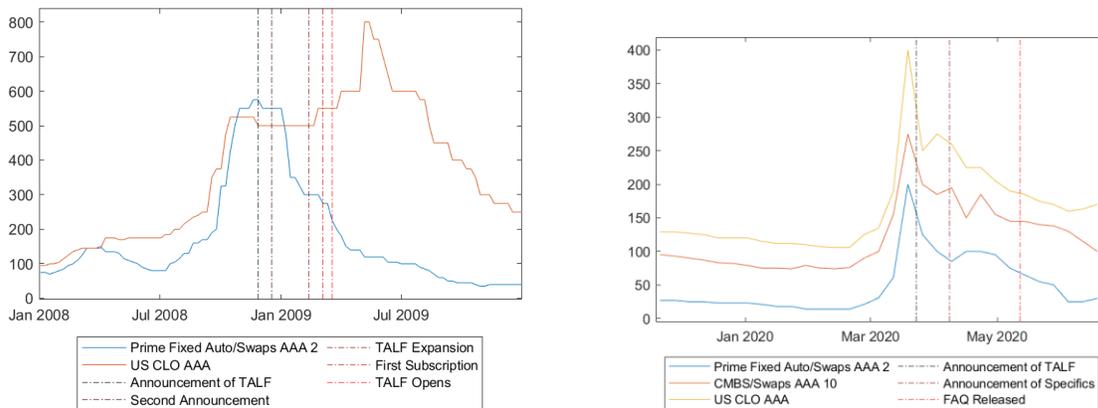
Asset-backed securitizations are a crucial link in the nonbank credit intermediation chain. Nonbank financial institutions, which lack the balance sheet capacity to retain loans on their balance sheets, originate a substantial share of consumer and business loans. To raise funding for new loans, nonbank financial institutions turn to the securitization markets, which over the last 20 years saw ABS issuances excluding CMBS and RMBS of about \$200bn annually (Figure 1). In the securitization process, issuers of asset-backed securities pool loans or other receivables and then fund these pools with debt securities. To lower the average funding cost, the securities are issued in tranches. The highly rated, low risk tranches,

which have higher payment priority and therefore can be placed with low spreads, account for the majority of the debt securities funding a pool.

In 2007, \$241 billion in non-agency CMBS and \$306 billion of non-mortgage ABS were issued.⁶ Issuance in 2019 was somewhat smaller, with \$105 billion in CMBS issuance and \$234 billion in non-mortgage ABS. The majority of non-mortgage ABS issuance securitized auto and floorplan loans (50 percent), followed by equipment loans (14 percent), credit card receivables (8 percent), and student loans (7 percent).⁷

Securitization allows nonbank financial intermediaries, such as finance companies, to access low-cost funding.⁸ This access increases overall credit supply to consumers and businesses and lowers the cost of credit by increasing competition between bank and nonbank lenders in credit markets. Securitization funded around 45 percent of both credit card and auto loans in September 2008, and so the subsequent disruption of the securitization market had significant consequences for the real economy.⁹

Figure 2. ABS Spreads around TALF events



Source. Courtesy J.P. Morgan Chase & Co., Copyright 2021.

Over the past 15 years, securitization markets were adversely affected by two broader financial market disruptions. The two broader financial market disruptions began with a large shock to aggregate market

⁶ Source. SIFMA. \$788 billion in private-label RMBS was also issued in 2007, down from \$1.3 trillion the previous year, and \$490 billion was issued in CLOs and CDOs.

⁷ Smaller assets classes include securities collateralized by receivables associated with the financing of unsecured consumer loans, device payment plans, airplanes, time shares, solar panels, railcars, insurance premiums, containers, and taxes.

⁸ Banks also engage in securitization activities but are less dependent on this source of funding.

⁹ On September 30, 2008, \$460 billion of \$971 billion in outstanding credit card receivables were held in securitized pools. See Consumer Credit, G.19 statistical release, November 7, 2008. <https://www.federalreserve.gov/releases/g19/20081107/>. In the third quarter of 2008, \$314 billion of \$701 billion of outstanding auto loans were held by finance companies; we assume that these were funded entirely by securitization. See Experian Automotive, "State of the Auto Finance Market Third Quarter 2009" http://www.experian.com/assets/automotive/white-papers/2009_3Q_Automotive_Financing_Trends.pdf.

liquidity and skyrocketing uncertainty about future economic developments. The first shock was the bankruptcy of Lehman Brothers on September 15, 2008 amid a collapsing domestic housing market, and the second shock was the announcement of lockdown measures to fight the COVID-19 pandemic in mid-March 2020. In both cases, ABS spreads shot up (Figure 2). Auto ABS spreads rose by 500 percentage points in 2008 and 180 percentage points in 2020; CMBS spreads rose by around 1200 percentage points in 2008 and 235 percentage points in 2020.¹⁰ ABS issuance came to a near-halt in both episodes.

The disruption was more severe in 2008 because investors in that crisis lost confidence in a range of securitized products and the reliability of their ratings as highly rated mortgage backed securities began to default. In addition, structured investment vehicles and asset-backed commercial paper (ABCP) programs, which were big buyers of ABS, collapsed in 2007, as short-term investors in ABCP lost confidence in the ability of the programs to roll maturing paper and so “ran” from that market.¹¹ As a result, in 2008, lenders had difficulty funding new loans, and hence, many households and businesses experienced a contraction in credit availability. For instance, Benmelech, Meisenzahl, and Ramcharan (2017) show that the collapse of the securitization markets in 2008 led to a significant drop in auto sales.

The pressures in 2020 were somewhat different. In March 2020, demand for central bank reserves by a wide range of market participants skyrocketed amid a broader dash for cash sparked by fears about the COVID-19 pandemic. Foreign central banks responded to these pressures by selling massive amounts of U.S. Treasuries; hedge funds, bond mutual funds, and mortgage REITs also unloaded fixed-income securities.¹² Although the 2020 dislocations, unlike the 2008 dislocations, were not rooted in structured-finance products, highly rated asset-backed securities were subject to the same selling pressures as other fixed-income securities, causing ABS spreads to widen markedly across a variety collateral classes.

Effects of TALF Programs on Market Functioning

After both shocks, the Federal Reserve and U.S. Treasury established a TALF program to restore the flow of credit to households and businesses by providing a backstop for securitization markets. The Federal Reserve’s initial announcement of TALF 1.0 on November 25. However, the left panel of Figure 2 shows that ABS spreads did not react to the November announcement. The first TALF 1.0 announcement that resulted in a statistically significant drop in spreads was the March 3, 2009 announcement of the first subscription date, as the timing and details of the program became clear.¹³ Spreads on CLOs, which are a good comparison group because CLOs were not identified in the March announcement TALF-eligible collateral (or ever included in TALF 1.0), did not respond to any TALF 1.0 announcements.

New ABS issuance picked up after the first subscription date. For example, figure 3, left panel shows that by late summer 2009 spreads on auto ABS had returned to their January 2008 levels and auto ABS issuance

¹⁰ Source: Courtesy J.P. Morgan Chase & Co, copyright 2021. Auto ABS spreads are the spreads of three-year triple-A prime auto ABS to swaps. CMBS spreads are the spreads of five-year triple-A CMBS to swaps. Spread increases are measured from July 1, 2008 to December 31, 2008 and from February 6, 2020 to March 19, 2020.

¹¹ See Ashcraft, Malz, and Pozsar (2012) and Covitz, Liang, and Suarez (2013).

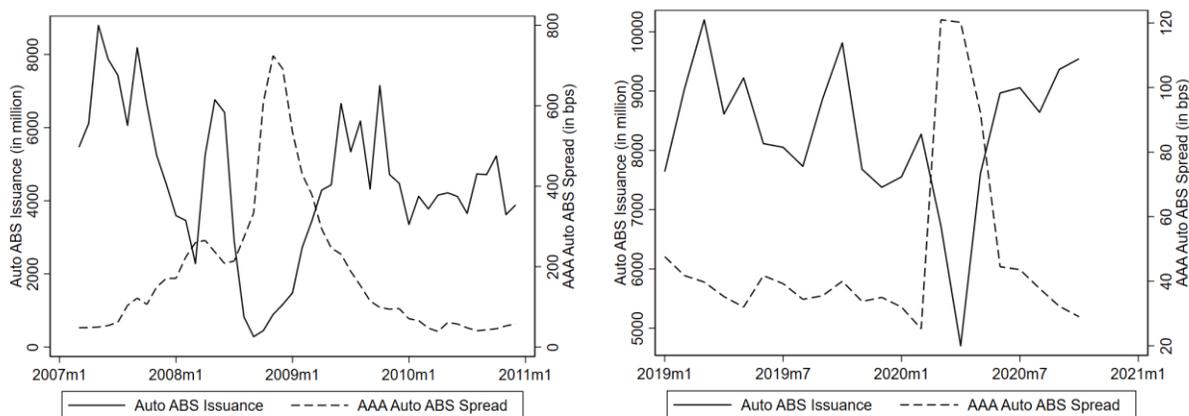
¹² See “A Retrospective on the March 2020 Turmoil in Treasury and Mortgage-Backed Securities Markets,” in Board of Governors of the Federal Reserve System (2020), and Vissing-Jorgensen (2020).

¹³ These results are shown formally in Campbell et al. (2011). The January drop in auto ABS spreads stems in part from the bailout of the “Big 3” domestic automakers. The March 3 announcement can be found at <https://www.federalreserve.gov/newsevents/pressreleases/monetary20090303a.htm>.

had returned to at a robust pace, indicating that the TALF 1.0 program was effective in restoring liquidity in the securitization markets.

The success of TALF 1.0 in providing liquidity in the securitization market is also reflected in the market response to the March 23, 2020 announcement that TALF was being re-established as part of a suite of measures to stabilize markets.¹⁴ In contrast to TALF 1.0, spreads on ABS began dropping immediately after the announcement of TALF 2.0 (the right panel of Figure 2). Spreads on CMBS, auto ABS, and credit card ABS fell by about 100 basis points in the three weeks after the initial announcement, and CMBS spreads fell another 50 basis points after the April 9 announcement that certain types of CMBS and CLOs were also eligible collateral for TALF loans.¹⁵ These earlier announcement effects indicate that market participants judged the TALF program as a credible and effective policy measure to support the securitization markets, even before they knew the date of the first subscription, and TALF 1.0 took almost five months to open. Of course, the other interventions announced on March 23, as well as investors' anticipation that fiscal support would be forthcoming, also helped calm structured-finance markets. However, real-time market commentary noted the TALF announcement as an important factor in the spread tightening.¹⁶

Figure 3. Auto ABS Issuance and Spreads 2007-10 and 2019-20



Source. Courtesy J.P. Morgan Chase & Co., Copyright 2021, and Bloomberg.

It is notable that both CMBS and CLO spreads dropped after the March 23 announcement, even though neither asset class was designated as TALF-eligible collateral in that announcement. Market participants might have anticipated that CMBS would be eventually included as it was in TALF 1.0, but CLOs had not been eligible previously. The drop in triple-A CLO spreads suggests that the TALF announcement appears to have had wider spillover effects for at least the safest tranches of all securitizations.¹⁷

¹⁴ <https://www.federalreserve.gov/newsevents/pressreleases/monetary20200323b.htm>.

¹⁵ <https://www.federalreserve.gov/newsevents/pressreleases/monetary20200409a.htm>.

¹⁶ For example, one industry newsletter noted on March 27, 2020: “Credit spreads, including ABS, tightened on the week after more Fed intervention, with TALF 2.0 for new issue ABS, and Congress delivered an unprecedented stimulus package” (JP Morgan, 2020).

¹⁷ However, the effect is confined to the highest rated tranches. While spreads on all tranches of auto ABS dropped after the TALF announcement in March 2020, the lower rated tranches of CLOs were not affected by the announcement.

Corroborating evidence for the effectiveness of the credible TALF 2.0 announcement comes from auto ABS issuances. Auto ABS issuances recovered within three months after the announcement of TALF 2.0 and before the first subscription of TALF 2.0 (figure 3, right panel).

3. TALF Program Design and Investor Incentives

Under TALF, the Federal Reserve extended loans to nonbank institutions that were not its traditional counterparties. In this section, we summarize the design features of TALF, and then describe the types of entities that participated in TALF and the incentives and constraints that may have affected whether their behavior in the program was aligned with the central bank's objectives. Ashcraft et al (2012) provides a detailed description of the TALF 1.0 design.

Key TALF Design Features

Given the size and importance of the ABS market to the US economy, the Federal Reserve wanted to provide liquidity quickly and in substantial volume to a variety of types of ABS. At the same time, the Federal Reserve needed to satisfy its obligations under its authorizing legislation, section 13(3) of the Federal Reserve Act, to ensure that taxpayers were protected from losses. The main features of TALF were designed to achieve these objectives.

TALF offered three- or five-year non-recourse loans to market participants to fund the purchase of new issue (ABS or CMBS) or legacy (CMBS) triple A-rated tranches of asset-backed securities.¹⁸ The Fed focused on triple-A tranches for two reasons. First, they are the largest tranches in securitizations, and so stabilizing the spreads on these tranches improves the economics of the entire deal. Second, they have the lowest credit risk within a securitization structure and so best satisfy the section 13(3) requirements.

The purchased security served as collateral for the loan. The loan amount was set to the purchase price minus a risk-based haircut that was calibrated to protect the government from loss outside of extremely severe scenarios. By putting the TALF borrower in the first-loss position, the borrower was incentivized to conduct her own due diligence on the underlying security.

When TALF 1.0 was expanded to include new and legacy CMBS several months after the initial TALF 1.0 announcement, the Federal Reserve changed the program for this asset class by reserving the right to reject CMBS that despite, being currently triple-A rated, were deemed too risky as collateral. In the new-issue ABS program, there was no independent credit review of the ABS collateral in place until the November 2009 subscription.¹⁹ The rejection risk in the CMBS program was borne by the borrower who had to purchase the security before applying for a TALF loan.²⁰

¹⁸ TALF 2.0 accepted only legacy CMBS, and not new-issue CMBS, as eligible collateral. TALF 2.0 also only offered three-year loans. The program term sheets are available at https://www.newyorkfed.org/markets/talf_terms.html (2009-10) and <https://www.federalreserve.gov/newsevents/pressreleases/files/monetary20200728a6.pdf> (2020).

¹⁹ All securities were required to have at least two triple-A ratings, and no ratings below triple-A, to be TALF-eligible collateral. The announcement of the independent review of new-issue ABS is available here: <https://www.federalreserve.gov/newsevents/pressreleases/monetary20091005b.htm>

²⁰ In contrast, the rejection risk in the new-issue ABS program, once the review process was in place, was borne by the issuer.

The interest rates on TALF loans varied by the type and maturity of the collateral, and they were set well above the rate on equivalent ABS in normal market conditions and below the rate in times of acute stress. The above-market interest rate ensured that borrowers would exit the program once market conditions normalized. The haircut, collateral requirements (triple-A tranches only), and the potential for rejection of collateral ensured that the Federal Reserve satisfied its obligations under section 13(3).

Since the Federal Reserve's approach required investors to take first-loss positions in securities funded through the program, and TALF loan interest rates were set well above rates in normal market conditions, it is natural to wonder why TALF loans were attractive to investors. Five key features explain the demand for TALF loans. First, the interest rates on TALF loans, while higher than rates in normal conditions, were lower than ABS rates during stressed times. Second, TALF loans provided term financing at times when market lenders shortened terms considerably. For example, much of market lending went to an overnight basis in late 2008 and early 2009. Third, unlike loans made by private lenders, TALF loans were not subject to margin calls and, as a result, investors were not subject to having to post more collateral if spreads widened. Fourth, the TALF loans could be prepaid early without penalty. Fifth, because the loans were non-recourse, should the value of the security fall precipitously, investors had the option of paying off the loan with the security rather than cash, providing them with insurance against very large drops in ABS prices.

Borrowers from the TALF Programs

TALF borrowers can be broadly divided into two groups: 1) traditional ABS investors—those who were already active ABS investors before the TALF program started and 2) opportunistic ABS investors—those who were induced to invest in ABS because they thought TALF was an attractive opportunity. In TALF 1.0, both traditional and opportunistic investors borrowed from the program; in TALF 2.0, only opportunistic investors borrowed.

Table 1 describes each type of investor and their ABS investment incentives as well as their TALF-relevant institutional constraints, which we discuss in more detail below. Appendix A provides more detail on how we classified borrowers.

Traditional ABS Investors

Insurance companies. Insurance companies purchase ABS and other fixed-income securities because the duration and cash flow of fixed-income securities match their liabilities, which are primarily the required payments on the variable annuities that they issue. As a result, insurance companies tend to be buy-and-hold ABS investors who hold their investments until maturity and rely primarily on their ABS for steady interest income rather than speculating on capital gains. In times of stress insurance companies can be exposed to funding pressures and so alternative stable funding sources may be attractive. Four of the six largest insurance companies, as measured by their net assets in 2009, borrowed directly from TALF 1.0.²¹ A few smaller companies also participated in TALF 1.0, either as direct borrowers or as material investors in a hedge fund or TALF-only fund that borrowed from TALF.

²² Some mutual funds take on leverage through their derivatives activity; for a discussion, see Deli et al. (2015).

Table 1. TALF Borrower Base

TALF Borrowers	Eligible Investors	Funding	Economic Incentives	TALF-Relevant Regulatory Constraints
<i>Traditional ABS Investors</i>				
Insurance companies	Business purposes	Mostly long-term policyholder liabilities, funding agreement-backed securities, FHLB advances, repo	Tend to buy and hold ABS because they want assets with cash flows that match their liabilities.	
Pension funds	Business purposes	Mostly long-term pension liabilities, limited leverage	Tend to buy and hold ABS because they want assets with cash flows that match their liabilities.	
Mutual funds	All investors	Open-end funds are dependent on fund flows; typically limited leverage ²²	Over-riding objective of broad diversification limits their ability to overweight any particular asset. Funds can face redemption pressure.	Limited ability to use leverage (Investment Company Act of 1940)
REITs	All investors	Equity capital, securitization proceeds, high leverage (repo, bank lines of credit and term lending facilities)	Investor base prefers high dividend yield; REITs tend to emphasize income over capital gains in their investment behavior.	Can only invest in assets related to real estate
Banks	Business purposes	Mix of stable deposits and short-term funding, high leverage		

²² Some mutual funds take on leverage through their derivatives activity; for a discussion, see Deli et al. (2015).

Opportunistic ABS Investors

TALF-only investment vehicles (established by hedge funds or other asset managers)	Accredited investors	Locked-in long-term capital (limited partnership interests), limited leverage	Investors cannot withdraw funds. Governing documents describe investment parameters of the fund. The general partner must return the investors' capital if she cannot find investment opportunities consistent with the fund parameters. Compensation incentivizes seeking outsized gains rather than long-term income.
Fixed-life partnerships	Accredited investors	Locked-in long-term capital (limited partnership interests), limited leverage	Investors cannot withdraw funds. Governing documents describe investment parameters of the fund. The general partner must return the investors' capital if she cannot find investment opportunities consistent with the fund parameters. Compensation incentivizes seeking outsized gains rather than long-term income.
Hedge funds	Accredited investors	Locked-in long-term capital (limited partnership interests), high leverage (repo, margin, and bank credit facilities)	Investors' ability to withdraw money means that funds face redemption pressures. Compensation incentivizes seeking outsized gains rather than long-term income.
Wealthy individuals	Family members	Personal wealth, limited leverage	Seeking high Sharpe-ratio investments.

Pension funds. Like insurance companies, pension funds purchase ABS in order to match the duration of their assets and liabilities, and tend to be buy-and-hold investors that focus on the income that they receive from the securities. Only two of the largest pension funds and four very small pension funds borrowed directly from TALF 1.0. Many other pension funds, however, borrowed indirectly from TALF by investing in TALF-only funds. Thirty-seven such pension funds, representing state, local, other governmental, union, and corporate pension funds, were listed as material investors in a TALF borrower in the TALF 1.0 disclosures, and another fifteen were listed as material investors in TALF 2.0.²³

Mutual funds. Mutual funds provide exposure to fixed-income assets for retail investors who do not have the means or desire to invest in bonds directly. The investment guidelines of the funds tend to encourage broad diversification and discourage large positions in any given asset. The Investment Company Act of 1940 imposes several restrictions on mutual funds in order to protect retail investors. These include a prohibition on incurring debt in excess of one-third of their assets, as well as provisions on safekeeping of assets that turned out to be salient for TALF. Open-end funds can be subject to redemption pressures. Twenty-five open-end and closed-end funds from six large fund families borrowed from TALF 1.0.

REITs. REITs receive favorable tax treatment in exchange for investing almost entirely in real-estate related assets, including CMBS. To maintain this tax treatment, they must pay out 90 percent of income in investor dividends. Their investor base tends to purchase REITs because they like the high dividend payments, and so REITs tend to invest with an eye more toward generating income than capital gains. Four of the five largest REITs that focused on commercial mortgages borrowed from TALF 1.0.²⁴

The REITs that borrowed from TALF 1.0 were mostly entities that were newly formed in the summer or fall of 2009 to capitalize on the dislocations in the commercial real estate market, as many pre-existing REITs cratered during the financial crisis.²⁵ The REITs that borrowed from TALF were initially heavily focused on TALF-eligible investments and expanded their operations over time.²⁶ Although the timing of the launch of these REITs was somewhat opportunistic, the sector overall is a traditional investor in CMBS.

Banks. The three participating banks in TALF 1.0 appear to have idiosyncratic reasons for participating in TALF and are a very small part of aggregate TALF activity. We exclude them from the analysis in the paper.

²³ A material investor is defined as an entity or individual with a 10 percent or greater beneficial ownership interest in any class of securities of a TALF borrower. The material investor data are available here for TALF 1.0: <https://www.federalreserve.gov/regreform/files/talf.borrower.xls>.

²⁴ Data are from December 31, 2009, as reported in REIT Watch (2010). We use data from that date because some REITs that participated in TALF came into existence in fall 2009. We count hybrid REITs as commercial mortgage REITs for this purpose. <https://www.reit.com/sites/default/files/reitwatch/RW1001.pdf>

²⁵ Seven out of the 14 commercial mortgage REITs that were listed in REIT Watch in September 2007 were no longer listed in September 2009. A news article in 2008 opened, "In the world of mortgage REITs, the game being played is no longer *Who Wants to be a Millionaire?* Instead, it's turned into a vicious and bloody game of *Survivor*." Harden (2008).

²⁶ Commercial Mortgage Alert, August 7, 2009, "Ex Goldman Exec Huang Lands at Starwood."

Opportunistic ABS Investors

TALF-only funds sponsored by hedge funds and other asset managers. TALF-only funds were likely created to meet demand from institutional investors that did not have the scale or sophistication to borrow directly from TALF themselves. Investors could also have satisfied that demand by investing, for example, in hedge funds that used TALF along with other strategies, but they may have wanted exposure only to TALF's unique risk-reward profile. Fund managers were likely happy to comply. Because managers of private capital funds take a share of the gains but not the losses, it is more profitable to create a series of small, specialized funds than a broad, diversified fund in which some of the gains may be offset by losses.²⁷ In addition, managers of smaller funds face fewer registration and reporting requirements.²⁸

The funds were usually structured as fixed-life partnerships, typically with terms that matched the maximum maturity loan under the TALF program. The compensation of managers was standard for a private capital fund: a management fee plus a share of profits in excess of a hurdle rate. A review of private placement memorandums (PPMs) for these funds indicates that management fees ranged from 0.25 to 2 percent, with most firms near 1 percent; hurdle rates ranged from 0 to 10 percent, with most around 8 percent; and the excess profit share ranged from 10 to 40 percent, with most between 10 and 20 percent. Investors faced strict limits on their ability to withdraw their capital before the end of the term. The partnerships had narrow investment parameters—in this case, typically assets eligible for TALF funding—and the general partner had to return the investors' capital if she could not find investment opportunities consistent with the fund parameters. The vehicles were open only to accredited investors, although some of these investors—such as pension funds and state 529 plans—were investing on behalf of a much larger group of beneficiaries. Forty-four such funds borrowed from TALF 1.0, and eleven borrowed from TALF 2.0.

Fixed-life partnerships. These partnerships generally had structures similar to the TALF-only funds, in that they had carefully delineated investment parameters and a fixed end date. However, their investment parameters allowed for investment strategies beyond TALF. Some of these partnerships were created in 2008 to invest in opportunities created by financial-crisis market dislocations. Others were more classic private equity funds with a mandate to invest in real estate related assets. The managers of these funds had compensation structures similar to that of the TALF-only funds. Eight of these funds borrowed from TALF 1.0 and four borrowed from TALF 2.0.

Hedge funds. In contrast with fixed-life partnerships, hedge funds are open-ended, with no fixed life, and have investment parameters that give their managers more flexibility in their investments. In return for this greater flexibility, investors are able to redeem their investments in hedge funds, although the funds can restrict these redemptions in time of stress. Hedge fund investment strategies also tend to rely heavily on leverage. Hedge funds are only open to accredited investors, although some of these investors are pension funds with a broader group of beneficiaries. The manager compensation structure for these funds was similar to that of the fixed-life partnerships and the TALF-only funds. Forty-one hedge funds borrowed from TALF 1.0 and six borrowed from TALF 2.0.

Private individuals. Individuals borrowed from TALF through either pre-existing or newly created investment vehicles. These individuals, or their families or family trusts, were the sole beneficiaries of

²⁷ We thank Andrea Rossi for this insight.

²⁸ https://www.americanbar.org/groups/business_law/publications/blt/2016/10/06_ross/

these vehicles. This category also includes some family foundations. Twenty one such investors borrowed from TALF 1.0.

Hypotheses about investor behavior

With this as background, we lay out some hypotheses about how investor behavior will be aligned with four central bank objectives.

Objective 1: Quickly restoring the ability of ABS issuers to access the market. We expect that investors with flexible investment parameters allowing them to purchase ABS using leverage will be among the early borrowers from TALF. Hedge funds, pension funds, and insurance companies are three such types of investors. Because hedge funds are heavily dependent on leverage and that leverage tends to evaporate in a crisis, they have particularly strong incentives to borrow from TALF. We expect that investors with tight investment parameters, such as fixed-income funds; investors that traditionally do not rely on leverage, such as mutual funds; or funds that need to be set up in order to participate in the program, such as TALF-only funds, may not be able to respond as nimbly.

Objective 2: Protecting taxpayers from losses. We expect investors with less stable sources of outside funding, such as hedge funds and REITs, to be more sensitive to the potential of rejection risk.

Objective 3: Providing liquidity support to a broad range of investments. We expect entities with stable, locked-in funding from investors, such as fixed-life partnerships and TALF-only funds, to be better positioned to take risk in the form of longer-dated securities during a crisis than entities with more fragile funding, such as hedge funds and REITs.

Objective 4: Orderly exit. We expect investors whose main motivation in investing in ABS is stable income, such as insurance companies, pension funds, and REITs, to hold onto their loans longer than investors whose main motivation is capital gains. In particular, the manager compensation schemes for hedge funds, fixed-income partnerships, and TALF-only funds give them a strong incentive to lock in outsized capital gains and repay their loans once markets stabilize.

4. Analysis

In this section we test the hypotheses related to the four central bank objectives using loan-level data from TALF.

Which Investors Respond Nimbly to a New Program?

To examine which investors will respond nimbly to a program such as TALF, we examine when different types of investors started borrowing from the program, and how often. Among other factors, these patterns likely reflect the extent to which different types of investors faced funding pressures of their own during the crisis period, and thus found TALF loans to be an attractive option. Looking at traditional ABS investors, for example, life insurance companies that had issued funding-agreement backed securities faced funding pressure in 2008 (Foley-Fisher, Narajabad, and Verani, 2020). Looking at opportunistic ABS

investors, hedge funds experienced funding stress in both crises (Ang, Gorovyy and van Inwegen, 2011, Aragon and Strahan, 2012).²⁹

Table 2. TALF Participation by Borrower Type

TALF Borrowers	Number of Borrowers	Percent	Requested Number of Loans	Percent	Loan Amount (in millions)	Percent
TALF 1.0						
<i>Traditional Investors</i>						
Insurance companies	10	6	119	6	5,068	7
Pension funds	6	3	49	3	6,114	8
Mutual funds	25	14	136	7	3,926	4
REITs	17	10	125	7	2,401	3
Banks	3	2	8	0	606	1
Total traditional	61	35	437	23	18,115	25
<i>Opportunistic Investors</i>						
Hedge fund TALF-only funds	18	10	341	18	8,536	12
Other asset manager TALF-only funds	26	15	420	22	19,855	28
Fixed-life partnerships	8	5	62	3	3,488	5
Hedge funds	41	23	536	28	20,628	29
Private individuals	21	12	123	6	2,399	3
Total opportunistic	114	65	1482	77	54,906	75
Total	175	100	1,919	100	72,021	100
TALF 2.0						
<i>Opportunistic Investors</i>						
Hedge fund TALF-only funds	6	29	138	63	2,969	67
Other asset manager TALF-only funds	5	24	43	20	1,008	23
Fixed-life partnerships	4	19	20	9	231	5
Hedge funds	6	29	19	9	241	5
Total	21	100	220	100	4,449	100

Note. The TALF 1.0 loan request numbers include about \$1 billion in loans denied by FRBNY because the CMBS collateral was determined too risky.

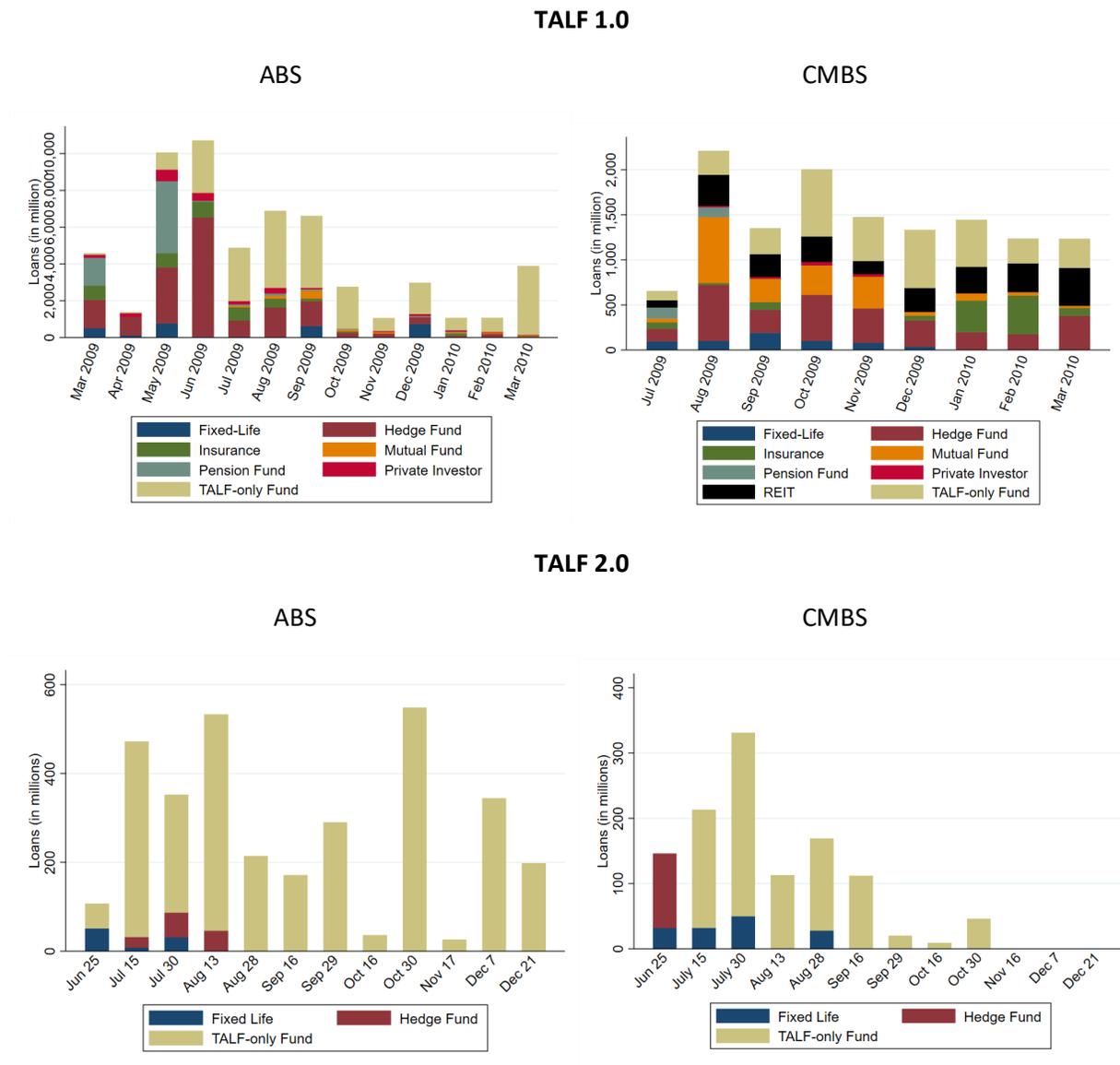
Source. Authors' calculations, public data disclosures on Federal Reserve website, and internal FRBNY data.

Looking first at the overall patterns, opportunistic investors accounted for more than half of TALF 1.0 borrowers and, more strikingly, for 77 percent of the loan amounts requested (Table 2, upper panel). TALF-only borrowers were the dominant type of opportunistic investors, accounting for 40 percent of

²⁹ For evidence that hedge funds faced funding pressures in 2020, see <https://www.federalreserve.gov/data/scoos/scoos-202009.htm>. Dealers report tightening price and non-price terms to hedge funds much more than to other investors in 2020:Q2.

TALF 1.0 take up. In TALF 2.0, opportunistic investors were 100 percent of borrowers and loan requests (Table 2, lower panel). While hedge funds and fixed-life partnerships also participated, TALF-only funds were again dominant, taking out 83 percent of loans. The lack of participation by traditional investors in TALF 2.0 suggests these investors were not constrained by funding pressures in 2020. The patterns in both years suggest that if TALF had provided funding only to traditional investors without also recruiting opportunistic investors into the ABS market, the program would have been considerably less successful in restarting securitization markets.

Figure 4. Take-up by subscription date and investor type in TALF 1.0 and TALF 2.0



Source. Authors' calculations, public data disclosures on Federal Reserve website, and internal FRBNY data.

We turn next to the monthly patterns (Figure 4, new-issue ABS on left, CMBS on right). During the first TALF 1.0 subscription in March 2009, traditional ABS investors—pension funds and insurance companies—represented more than half of the dollars of loan requests in the new issue ABS program. Hedge funds were a third of loan requests, and fixed-life partnerships were ten percent. Mutual funds did not participate due to regulatory obstacles described later. TALF-only funds had minimal participation at the beginning of the program, as these funds required time to draw up their governing documents and recruit investors.³⁰ Take up overall was low in March and April as investors wrestled with time-consuming due diligence processes and assessed the risk associated with having the government as a counterparty.³¹ These obstacles were largely resolved by May.

By summer 2009, TALF-only funds started borrowing from TALF at a significant scale, representing more than half of new-issue ABS loan requests. Consistent with reduced funding pressure at traditional investors, pension fund and insurance loan requests started decreasing in June, and were small and sporadic for the rest of the program. Hedge funds were active borrowers for the entire program, but their share of loan requests decreased after June 2009.

In July 2009, mutual funds borrowed from TALF for the first time after the SEC issued a no-action letter in June 2009 that resolved a conflict between the TALF operating procedures and the requirements of the Investment Company Act of 1940.³² Larger-scale participation by mutual funds occurred in August and September 2009, and trailed off thereafter.

As the program drew nearer to its end date, TALF-only funds made up most of the loan requests. The governing documents of these funds typically only allowed the managers to invest in TALF-related assets and required the managers to return to investors any capital that they could not invest. Managers of these funds thus had a strong incentive to deploy as much of their capital as possible as TALF drew to a close.

In the CMBS program, the pattern of loan requests by borrower type was similar to the ABS program. Insurance and pension funds played an outsized role in the first subscription in July, with 30 percent of loan requests, compared with 11 percent at all subscriptions combined. Hedge funds were about a quarter of loan requests at all subscriptions. The participation of TALF-only funds increased over time, rising from around 15 percent of loan requests in the first two subscriptions and peaking with almost 50 percent of loan requests in December 2009. Mutual funds participated heavily from August through

³⁰ In 2008, one industry participant estimated that it normally takes three months to launch a new private capital fund (Taub, 2008).

³¹ TALF borrowers take out loans through TALF agents—primary dealers who served as the conduit to the TALF program—rather than directly from the Federal Reserve Bank of New York. Contract negotiations between the TALF agents and borrowers proved to be a bottleneck in TALF 1.0. Some investors were also reportedly worried that the government was an unreliable counterparty that could, for example, “retroactively change the terms, exacting new limits on what investors can pay their executives, for example, or trying to claw back profits that firms make in the program” (Irwin, 2009).

³² Rule 17f of the Investment Company Act of 1940 governs the custody of mutual fund assets by a primary dealer. The TALF procedures require the TALF agent to hold the TALF loan collateral and the funds for the haircut for a short period of time, which is inconsistent with Rule 17f without SEC relief. The no-action letter also allowed TALF loans to be treated equivalently to reverse repurchase agreements under the asset coverage test, thereby allowing mutual funds to hold more leverage against TALF-eligible assets. In TALF 2.0, these issues were not impediments because the SEC affirmed its earlier no-action letters before the program launched.

November and participated very little thereafter. REITs, which by virtue of their tax status could invest only in CMBS, were about 15 to 20 percent of loan requests throughout.

We look at these same patterns through a different lens by examining how many times each investor borrowed from TALF. In TALF 1.0, traditional ABS investors participated in the program for much shorter spells than opportunistic investors. Around 75 percent of mutual funds and around 80 percent of REITs, for example, requested TALF loans in only one or two months, and around 90 percent of mutual funds and REITs requested loans in four or fewer months. Likewise, all insurance companies requested loans in four or fewer months. The two giant California pension funds both requested loans in only two months, whereas the four small pension funds requested loans in four to seven months.

In contrast, among the opportunistic TALF investors, only about a quarter of TALF-only funds and about half of hedge funds requested loans in one or two months; around 45 percent of TALF-only funds and about two-thirds of hedge funds requested loans in four or fewer months. A handful of hedge funds and TALF-only funds requested loans in ten or more months. A similar, although less dramatic, pattern is apparent for fixed-life partnerships and private investors.

Turning to TALF 2.0, although total loan requests were much lower at \$4.5 billion, the patterns for opportunistic borrowers were similar to TALF 1.0 (figure 4, lower panel). Hedge funds and fixed-life partnerships participated in the first few subscriptions, and then dropped out of the program. TALF-only funds had minimal participation in the first subscription, and then were the dominant borrower type thereafter.

The investor participation patterns and lower overall take-up in TALF 2.0 stemmed from several factors. First, the disruption in the ABS markets and the funding strains on traditional ABS investors were much smaller and shorter-lived in 2020 than in 2008-09. Pension funds and insurance companies did not experience significant funding pressures, while the Federal Reserve's interventions appeared to arrest potential pressures on mutual funds and REITs. Without these investors exiting the market, there was less of a void for opportunistic investors to fill.

Second, as discussed earlier, based on the success of TALF 1.0, market participants priced in much of the expected effect of the program soon after its announcement. By the time the program opened, ABS spreads had contracted to such an extent that TALF loans were not a profitable means of financing for many types of ABS. In contrast, much of the spread tightening in TALF 1.0 did not occur until after the program had already launched. Investors likely had greater confidence in the Federal Reserve's ability to support the ABS market in 2020 than in 2009, when TALF was a new and untested idea.

Third, asset managers were able to set up TALF-only funds more quickly than in 2020 than in 2009. They already understood the legal and operational requirements of the program, and it was easy to recruit investors because of the success of TALF 1.0.

In sum, to achieve the central bank's first objective, quickly restoring ABS issuers' access to the market, attracting investors with flexible investment parameters is crucial. In the case of securitization markets, such investors are hedge funds, pension funds, and insurance companies.

Rejection Risk: An Illustration of the Tradeoff Between Liquidity Support and Protecting Taxpayers

Evidence from TALF Take-up

In TALF 1.0, the new-issue ABS program was more popular than the legacy CMBS program. Loan requests totaled \$58 billion across the 13 subscriptions for the ABS program, and \$32 billion for the nine months when both the ABS and CMBS programs were operational. CMBS loan requests were only \$13 billion in that same nine-month period. In addition, half of TALF borrowers invested only in new-issue ABS and eschewed the CMBS program altogether (Table 3).

Table 3. Borrowers by TALF 1.0 ABS and CMBS Program Participation

TALF Borrowers	ABS Only	CBMS Only	Both	Total
Insurance companies	6	2	2	10
Pension funds	5	-	1	6
Mutual funds	1	14	10	25
REITs	-	17	-	17
TALF-only funds	25	3	16	44
Fixed-life partnerships	4	1	3	8
Hedge funds	25	7	9	41
Wealthy Individuals	18	1	2	21
All	84	45	43	172

Source. Authors' calculations, public data disclosures on Federal Reserve website, and internal FRBNY data.

The low participation in the CMBS program is somewhat surprising. A large number of CMBS—around 1,350—were putatively eligible collateral for loans in TALF 1.0, compared with only 100 new-issue ABS. The significant spread between the CMBS yield and the TALF loan rate also suggested that financing a CMBS with TALF loan was a profitable investment.

One possible explanation is that investing in CMBS required more expertise. A triple-A rating was a meaningful indicator of high credit quality for new-issue ABS, given the significantly tighter standards that the rating agencies imposed after the great financial crisis, but was not for legacy CMBS.³³ Another explanation is timing: the funding pressures faced by some traditional investors, such as insurance companies, may have eased by the time the CMBS program launched in July 2009. However, even the majority of TALF-only funds—whose participation was concentrated in the months when the CMBS program was operational—eschewed the CMBS program.

Instead, the possibility that a loan request could be denied appears to have been the major reason why investors had less enthusiasm for the CMBS program. A rejection meant that the investor would have to line up less favorable long-term financing or sell the security at a potential loss. In the subsection "*Evidence from Repricing of Rejected Securities*" we demonstrate that, in fact, spreads increased on many securities after their rejection was announced in TALF 1.0.

Such rejections were particularly problematic for many of the TALF-only funds. The manager's investment options were governed by the fund's PPM. If the fund lost money on an investment because of a risk that was not disclosed in the PPM, the investment manager could be forced to obtain bridge financing and buy the investment out of the fund. Although a PPM can be modified, it requires obtaining the consent of all the investors in the fund. The PPMs for the first batch of TALF-only funds did not envision or disclose

³³ Stanton and Wallace (2018) show that rating agencies allowed the amount of subordination that protected the senior tranches of CMBS to deteriorate dramatically in the mid-2000s.

rejection risk, since the terms of the legacy CMBS program were not announced until May 19, 2009, well after many of the managers of the TALF-only funds had put together their governing documents and recruited investors.³⁴

Rejection risk was a particularly acute issue because TALF borrowers had difficulty predicting whether FRBNY would reject a CUSIP. About five days after each subscription date, FRBNY posted on its website the CUSIPS of accepted and rejected collateral. FRBNY provided broad guidance on its process, stating for example that “CMBS that represent interests in pools with high cumulative losses, a high percentage of delinquent loans, loans in special servicing or loans on servicer watch lists or a high percentage of subordinate-priority loans may be rejected. The New York Fed may consider in its decisions forecasts of pool level losses under various stress scenarios.”³⁵ The CMBS that FRBNY rejected were in line with that guidance: rejected CMBS had a larger share of loans that were 90 days delinquent or in special servicing (Table 4).³⁶ FRBNY’s forecasts also turned out to be accurate: nearly 14 percent of the CMBS that it rejected were ultimately downgraded, on average 16 months after the rejection. In contrast, only 3 percent of the accepted CMBS were downgraded, on average 30 months after the acceptance.

Table 4. TALF 1.0 CMBS Characteristics and Outcomes

	Accepted	Rejected
CUSIP Count	265	41
Average 90+ Days Delinquent at Subscription	2.36%	3.54%
Average Special Servicing at Subscription	7.81%	8.74%
% of Total Downgraded (life-time)	2.64%	14.63%
Average Months to First Downgrade	30	16
WAL, 25 th percentile	2.02	4.25
WAL, Median	2.80	5.68
WAL, 75 th percentile	5.19	6.51

Note. For CUSIPs that were accepted or rejected multiple times, statistics correspond to the first acceptance or rejection.

Source. Trepp (for WAL). Jeremy Brizzi at the Federal Reserve Bank of Philadelphia based on data from Intex Solutions (for delinquency statistics).

Investors also realized, early on, that loan requests collateralized by longer-maturity CMBS were more likely to be rejected.³⁷ As shown in Table 4, the median WAL for rejected CUSIPs was 5.7 years, compared with 2.8 years for accepted CUSIPs.

³⁴ We reviewed some PPMs that were obtained as part of the FRBNY’s counterparty risk assessment. That review indicated that only funds that were created in the late summer 2009 or later disclosed the risks associated with the CMBS program. The first wave of TALF funds also commonly described their investment parameters as encompassing TALF eligible securities, whereas at least one later PPM stated that the fund is allowed to invest in “assets that the Adviser *believes* are eligible to be financed through TALF” (emphasis added).

³⁵ TALF Frequently Asked Questions, June 23, 2009, available at https://www.newyorkfed.org/markets/talf_cmbs_faq_090623.html.

³⁶ We thank Jeremy Brizzi at the Federal Reserve Bank of Philadelphia for this analysis which is based on data from Intex Solutions, a leading provider of information and valuation software on structured finance securities.

³⁷ “Buyers Gripe About TALF Loans,” Commercial Mortgage Alert, September 25, 2009.

Nonetheless, uncertainty about whether bonds would be accepted weighed on participation at the first subscription.³⁸ After FRBNY rejected only one CUSIP at the July subscription, three at the August subscription, and none at the September subscription, investors became more confident that they understood FRBNY’s risk parameters (Table 5).³⁹ The subsequent October subscription had the largest number of participants (43 borrowers) of any month in the program.

Table 5. Loan Rejections

Date	Number of Loan Rejections (1)	Share of Loans Rejected (2)	Number Rejected CUSIPs (3)	Share of CUSIPs Rejected (4)	Number of rejected borrowers (5)	Share of borrowers rejected (6)	Earlier Accepted CUSIP (7)	Share of Earlier Accepted (8)
Jul 2009	1	2	1	3	1	7	-	-
Aug 2009	3	2	3	4	2	5	11	13
Sep 2009	0	0	0	0	0	0	24	41
Oct 2009	5	5	5	6	4	9	32	38
Nov 2009	4	5	3	5	4	14	40	63
Dec 2009	3	4	3	5	3	13	37	64
Jan 2010	7	10	5	10	5	29	34	67
Feb 2010	5	8	5	9	3	23	39	70
Mar 2010	19	32	19	35	6	38	32	58
Total	47	7	44	8	28	12	249	56

Note. Some rejected CUSIPs collateralized loan applications from more than one borrower.

Source. Authors’ calculations, public data disclosures on Federal Reserve website, and internal FRBNY data.

In the October subscription, however, FRBNY surprised the market by rejecting five CUSIPs, including the A3 tranche of a CMBS whose A4 tranche was accepted at both the August and September subscriptions. At the next subscription in November, only 30 borrowers participated. FRBNY deepened the confusion at that subscription by rejecting three CUSIPs that had been accepted in previous subscriptions; two of these had been accepted the previous month. This confusion was never resolved, and in fact in the remaining months of the program FRBNY rejected another nine CUSIPs that had been accepted at earlier subscriptions. In January, one news story was headlined “Fickle Fed Irking TALF Applicants”,⁴⁰ while a Financial Times columnist observed “The Fed’s Talf reasoning is always a bit mysterious... it looks like the Fed’s Talf-thinking doesn’t make much sense to bond investors either” (Alloway, 2010). The number of borrowers fell to a low of 13 in February and 16 in March.

The borrowers who remained in the program in the last couple months appeared to either have a greater tolerance for risk or found rejection to be relatively low cost. We see this by the share of borrowers who had at least one loan request rejected in a given month (column 6). In 2009, this share never exceeded 13 percent. In 2010, the share was 29 percent in January, 23 percent in February, and 38 percent in March.

³⁸ Commercial Mortgage Alert, July 10, 2009.

³⁹ “TALF Loan Rejections Befuddle Investors,” Commercial Mortgage Alert, October 30, 2009.

⁴⁰ “Fickle Fed Irking TALF Applicants,” Commercial Mortgage Alert, January 29, 2010

Investors appeared to try to manage rejection risk by submitting as collateral CUSIPs that were accepted at earlier subscriptions. In the second subscription in August 2009, 11 out of the 84 CUSIPs submitted had been accepted in the previous July subscription (column 7). Since 1,350 CUSIPs were putatively eligible, this share seems higher than chance alone would predict. The share of previously accepted CUSIPs was around 40 percent in the September and October subscriptions. After rejection became significantly more salient in the October subscription, the share was 63 to 70 percent in the next four subscriptions. It then dipped a bit in the March 2010 subscription, consistent with the notion that borrowers who remained in the program at the last subscription had an elevated tolerance for risk.

To explore whether rejection risk appeared to affect the behavior of some investors more than others, we examine patterns by type of investor both in the immediate aftermath of the October subscription, when rejection risk became particularly salient to borrowers, and at the end of the program, when risk appetite appeared to be higher. Across all types of borrowers, the share of loan requests collateralized by previously accepted CMBS increased between October and November 2009. However, some differences in participation are apparent. Participation in the CMBS program, as measured by the number of borrowers or loan requests, held steady or increased between October and November 2009 for mutual funds and private investors. In contrast, the number of hedge funds, fixed-life partnerships, REITs, and TALF-only funds participating in the program dropped, as did their loan requests.

For TALF-only funds, the drop off appears to be tied to whether their PPMs disclosed rejection risk. Overall, the number of TALF-only funds that participated fell from 16 in October to 11 in November. Of the 16 October participants, we have the PPMs for 11 and so can divide these funds into 3 whose PPMs disclosed rejection risk and 8 whose PPMs did not. All three of the funds that disclosed rejection risk continued participating in November, and their risk appetite was unchanged, as measured by the share of their loan requests that were collateralized by previously accepted CMBS. That share was about half throughout the entire October 2009 – March 2010 period.

In contrast, four of the eight TALF-only funds that did not disclose rejection risk stopped participating in the CMBS program entirely after the October subscription. The other four became conservative in their investment behavior. In September and October 2009, about half of their loan requests were collateralized by previously accepted CMBS; from November on, that share rose to about 80 percent.

The drop in REIT and hedge fund participation after the October subscription suggests that rejection was still very salient to them at that time. By the end of the program, though, they appeared to have gained a taste for risk. In a subsequent section, we show that the WALs of the CMBS that collateralized REIT and hedge funds loan requests were much higher in 2010 than in 2009. We also see their increased appetite for risk from their loan rejections. The share of submitted CUSIPs that were rejected rose sharply from 9 percent in February 2010 to 35 percent in March 2010 (Table 5, column 4). The spike was driven mainly by submissions from hedge funds and REITs, although other borrower types also submitted CUSIPs that were rejected. Although no REIT had a rejected loan request in 2009, six out of the nine REITs that ever borrowed from TALF had one or more request rejected in 2010. This share was considerably higher than for any other type of borrower. One of these REITs even submitted two loan requests during this period that were collateralized by CUSIPs that had been rejected in earlier subscriptions.

REITs may have become more comfortable with loan rejections as they became more confident in their outside market funding in 2010. In their year-end 2009 10-Ks, financing conditions were generally still depicted as tight; one REIT noted that “Currently, we have no repurchase agreements or bank credit

facilities in place, and there can be no assurance that we will be able to obtain one or more such facilities on favorable terms” and three noted that “Under current market conditions, structured financing arrangements are generally unavailable,” and that without this longer-term take-out financing in place, lenders were hesitant about extending short-term credit. The tone of the filings changed by their March 2010 10-Q, when two REITs reported having obtained repo facilities with money-center banks. The sustained recovery in REIT stock prices by early 2010 likely also contributed to their ability to obtain outside financing.⁴¹

In sum, the risk of rejection significantly reduced participation in TALF 1.0, illustrating a key tradeoff between the central bank objectives of injecting liquidity and protecting taxpayers from loss.⁴² For opportunistic investors, who by definition are not interested in holding the asset to maturity and have high opportunity cost of equity, potential rejection significantly reduces to expected rate of return. For investment vehicles with tight investment parameters, new risks that are introduced after the funds have drawn up their governing documents and recruited investors can weigh heavily on their participation.

Evidence from Repricing of Rejected Securities

We now turn to the re-pricing of rejected securities and the interpretation of the price effects of rejection. Although only triple-A tranches were eligible, the Federal Reserve reserved the right to reject loan requests collateralized by CUSIPs for which the credit risk was seen as higher than indicated by that credit rating. The rejection could affect the price of these securities for three potential reasons: 1) the purchaser of the rejected security faced legal or balance sheet constraints that precluded holding the security and so needed to sell it immediately at a time of low market liquidity, 2) the removal of the TALF financing option reduced the set of potential investors, and thus the demand for the security, and 3) the rejection provided new information to the market about the credit quality of the security. To shed light on the relative importance of these reasons, we study the effects over time as market liquidity improved and at the last subscription, when market liquidity had recovered and the option to obtain future TALF financing became irrelevant.

Campbell et al. (2011) show that in the aggregate spreads for rejected CUSIPs increased—that is, prices fell—around a short time window after rejection. Here we take a slightly different approach. Rather than an event study (or multiple stacked events), we construct a full panel with daily data of all CUSIPs submitted as collateral for TALF loan requests from July 2009 to March 2010. The key motivation for this setup is that spreads fell on average during the sample period and we want to isolate the “excess” price response due to rejection. The full panel setup allows us to control for trading-day fixed effects and CUSIP fixed characteristics. We also assess whether the repricing responses after loan request rejection differ by investor type. The rejection by investor type sheds light on which investors are likely to take more risk at different stages of the program and therefore where moral hazard is most likely to be a concern.

We estimate the following regression, first for all loan requests and then with interactions of rejection with each type of investor.

⁴¹ By March 2010, mortgage REIT prices had been rising for more than a year, after falling by 20 percent year-over-year in March 2009 and 47 percent in March 2008.

⁴² In TALF 2.0, investors seemed more sanguine about the risk, likely because the outstanding CMBS at that time was of much higher quality and because the investors had more stable outside funding.

$$\Delta Spread_{it} = \beta_1 Rejected_{it} + \theta_i + \alpha_t + \epsilon_{it}$$

where $\Delta Spread_{it}$ is the change in the spread of CUSIP i during a 5-day window centered on date t . $Rejected_{it}$ is an indicator variable that is equal to 1 on the trading day on which the CUSIP rejection was announced. We saturate the model with CUSIP θ_i and trading day α_t fixed effects in order to control for any pricing factors that are idiosyncratic to that CUSIP or that trading day. Our sample consists of daily spreads for 294 CMBS CUSIPs that were submitted to TALF 1.0 from July 1, 2009 to March 31, 2010 (191 trading days).

Table 6. Spread Change after Loan Rejection

	All (1)	First 5 Subscriptions (2)	Last 4 Subscriptions (3)	Drop Last Subscription (4)	Last Subscription (5)
Panel A: All					
Rejected	9.99** (4.24)	25.73*** (6.17)	5.04 (3.04)	13.68** (5.99)	8.74*** (2.81)
Time FE	Yes	Yes	Yes	Yes	Yes
CUSIP FE	Yes	Yes	Yes	Yes	Yes
Observations	53,542	30,224	23,318	47,115	6,387
R^2	0.40	0.41	0.32	0.41	0.35
Panel B: Investor Type					
	(1)	(2)	(3)	(4)	(5)
Rejected – Hedge Fund	1.07 (6.83)	18.39 (14.46)	-1.54 (3.64)	16.08** (8.83)	- -
Rejected – TALF-only	-4.42 (6.52)	-10.70*** (0.60)	-1.54 (8.48)	-9.78* (5.08)	10.61** (3.14)
Rejected – MF	35.26 (26.57)	71.69*** (0.93)	- -	73.05*** (0.96)	- -
Rejected – Insurance / Pension Fund	30.62* (20.62)	53.70** (19.65)	- -	44.07** (16.53)	- -
Rejected – REIT	22.65 (14.77)	- -	22.32 (14.01)	3.19 (1.94)	44.28*** (12.68)
Rejected – Fixed Life	31.56*** (2.35)	- -	- -	- -	- -
Time FE	Yes	Yes	Yes	Yes	Yes
CUSIP FE	Yes	Yes	Yes	Yes	Yes
Observations	53,542	30,224	23,318	47,115	6,387
R^2	0.40	0.41	0.32	0.41	0.35

Note. The dependent variable is $\Delta Spread_{it}$ ---the change in the spread of CUSIP i during a 5-day window centered on date t . Standard errors clustered are clustered on the CUSIP and Trading Day level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. If a cell contains a “dash” it means that fewer than five of that type of borrower participated in the TALF CMBS program during the relevant period. The only exception is the “rejected-fixed life” coefficient in column (1). Source. Trepp, authors’ calculations, public data disclosures on Federal Reserve website, and internal FRBNY data.

In the full sample, we find that spreads increased by 10 basis points within a 5-day window around the rejection (Table 6, Panel A, column 1).⁴³ In the first five subscriptions (column 2), we find that the price effect of rejection is almost 5 times as large as in the last four subscriptions (column 3). In fact, the coefficient on the last four subscriptions is both economically small and statistically insignificant.

We interpret the difference as reflecting illiquid conditions in the first period and more liquid conditions in the second. In an illiquid market, TALF financing is more valuable, and any forced selling associated with a loan request rejection will leave a larger imprint on the market. The fact that price reactions were smaller in the later subscriptions suggests that rejection risk is a deterrent to participation during stressed market conditions but not perhaps when markets are functioning more smoothly. A corollary of this observation is that with market liquidity recovering, the central bank trade-off between providing liquidity and protecting the taxpayer from losses shifts decidedly to the latter.⁴⁴

To assess whether rejection provides information on credit quality to the market, we split the sample into the first eight subscriptions (column 4) and the last subscription (column 5). By the last subscription in March 2010, market liquidity had recovered and the option of future TALF financing was gone. Thus, the estimated effect of 8.7 basis points shown in column 5 can be attributed to repricing of credit risk, indicating that part of the post-rejection price change in previous subscriptions may have stemmed from the Federal Reserve's credit analysis providing new information to the market.

In panel B of Table 6, we show the pricing changes by type of investor. These pricing changes reflect several factors that are correlated with investor type: (i) when the rejection occurred, since liquidity pressures were most acute in the early subscriptions, (ii) the WAL of the rejected security, since longer-WAL-securities tend to have more price volatility, and (iii) any balance sheet or legal constraints the investor faced that might require them to sell the security immediately after the rejection. The coefficient estimates are based on a small number of rejections by investor type, so we caution against over-generalizing from this discussion.

Insurance companies / pension funds, fixed-life partnerships, and mutual funds experienced large price changes for their CMBS collateral after rejection. These investors are not particularly constrained in a way that would force them to dump the collateral after rejection. Thus, we interpret the large price changes as reflecting the fact these investors either submitted collateral with a long WAL or submitted their loan request in months when the market overall was still illiquid.

In contrast, the price change after rejection was smaller for hedge funds, TALF-only funds, and REITs, even though these investors might have been forced to sell their holdings after rejection. Thus, we attribute the price change to the facts that these investors were more likely to submit collateral with a short WAL or submit their loan requests in the later months of the program when the market was more liquid.

This interpretation suggests that investors with relatively stable funding are the ones more likely to take risk, and pose the risk of moral hazard to the program, when market conditions are strained. As market conditions normalize, the risk of moral hazard from other types of investors increases. The market-wide

⁴³ Our results differ from Campbell et al (2011) because we include CUSIP and time fixed effects. In unreported results, we find a somewhat larger, statistically significant effect of 11.7 basis points when also controlling for CUSIP-specific time trends.

⁴⁴ Duygan-Bump et al (2013) find similar dynamics for the Asset-backed Commercial Paper Money Market Mutual Fund Liquidity Facility during the great financial crisis.

effects of rejection on CMBS prices might have been even larger in the early subscriptions if the behavior of constrained investors mirrored that of investors with stable funding. Our results also suggest that forced selling associated with rejection was not a material factor in CMBS price dynamics, at least in the short windows that we consider.

Which Investors Provided Liquidity Support for More Risky Assets?

We now turn to assessing the third central bank objective: providing liquidity to a broad range of asset-backed securities. We do this by studying how the WALs and yields of CMBS loan collateral varied by investor type. WAL and yield are both proxies for risk. Shorter-WAL CMBS were less risky for multiple reasons. First, since CMBS are fixed-rate securities, shorter WALs bear less interest rate risk. Second, since most CMBS have a ten-year WAL at origination, in TALF 1.0 shorter-WAL securities had less credit risk because they were more likely to have been issued in the early 2000s when commercial real estate underwriting standards were more conservative. Third, shorter WAL CMBS, as we showed earlier, were less likely to be rejected as loan collateral by FRBNY in TALF 1.0, likely because of their better credit quality. Meanwhile, yields are generally higher on more risky securities.

Table 7. Dollar-weighted Weighted Average Life of CMBS Collateral by Investor Type

TALF Borrower	N	WAL Mean	WAL Median	Less than 1 year	1-2 years	2-3 years	3-4 years	4-5 years	5-6 years	6 plus years
TALF 1.0										
Insurance	44	2.78	2.28	-	19.3	59.0	0.9	8.5	9.0	3.2
Mutual Fund	100	3.30	2.46	-	24.9	35.0	5.9	7.5	17.9	8.8
REIT	125	3.17	2.54	4.4	18.8	40.4	4.2	15.5	7.4	9.4
TALF-only Fund	193	4.20	4.48	2.4	6.9	33.5	4.7	10.4	16.1	25.9
Hedge Fund	173	3.15	2.49	13.1	22.3	27.7	6.6	7.3	6.3	16.7
Fixed-Life	33	5.00	6.21	7.8	6.8	19.3	-	2.7	6.8	56.7
All	668	3.54	2.66	5.0	16.5	35.2	4.7	9.7	11.3	17.7
TALF 2.0										
TALF-only Fund	67	5.10	5.38	2.7	3.4	7.9	13.7	13.0	25.2	34.2
Hedge Fund	13	4.54	4.61	-	-	15.9	13.0	32.8	15.8	22.5
Fixed-Life	17	8.46	8.64	-	-	-	-	-	-	100
All	97	5.23	5.72	2.1	2.6	7.7	11.9	13.4	21.0	41.3

Note. Sample includes loan requests that were rejected by FRBNY because the CMBS collateral did not pass FRBNY's risk screening process.

Source. Trepp (WAL for TALF 1.0), Bloomberg (WAL for TALF 2.0), authors' calculations, public data disclosures on Federal Reserve website, and FRBNY internal data.

We focus on the CMBS program because in TALF 1.0 investors could choose from around 1,350 triple-A securities that met the program guidelines. There was also considerable heterogeneity among eligible CMBS: WALs ranged from 0.5 to 9.1 years with a median of 3.1 years, and yields ranged from 2.4 to 14.1 percent with a median of 6.9 percent.⁴⁵ We drop pension funds and private investors from the analysis,

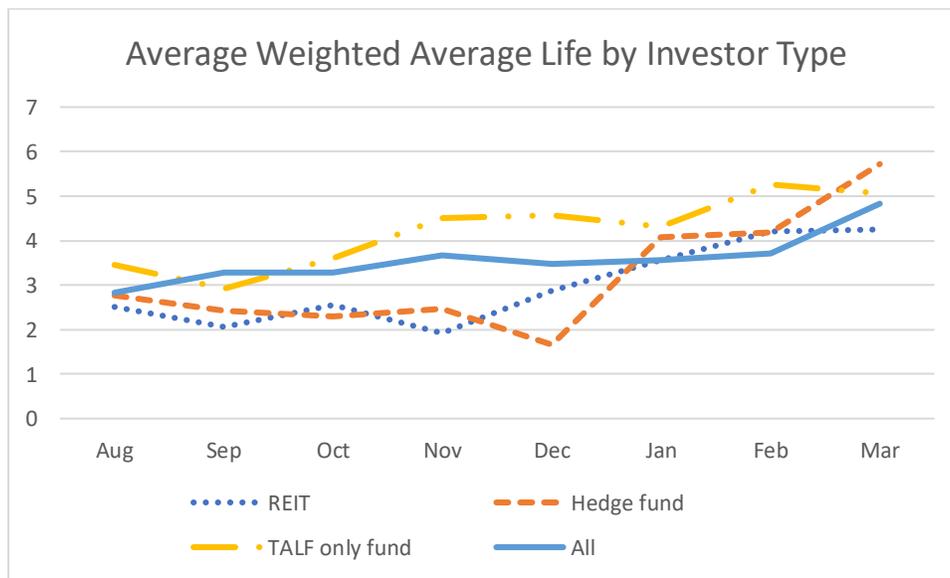
⁴⁵ Data are from Trepp and are measured as of June 1, 2009.

since these two groups did not participate in TALF 2.0 and took out only a few loans collateralized by CMBS in TALF 1.0 (14 and 7, respectively; sample sizes for the other investor types are shown in Table 5). We weight the observation by dollars. Dollar-weights place more emphasis on the larger investors in TALF and on the macroeconomic effects of the program.⁴⁶

Weighted average life results. Table 7 shows that fixed-life partnerships and TALF-only funds invested in the CMBS with the longest remaining WALs. In TALF 1.0, the median WAL of CMBS collateralizing loans taken out by fixed-life funds was 6.2 years and by TALF-only funds was close to 4.5 years, compared with 2.5 years for mutual funds, REITs, and hedge funds. Insurance companies chose the securities with the lowest WALs, with a median of 2.28. In TALF 2.0, the median WAL was again longest for fixed-life funds, at 8.5 years, followed by 5.4 years for TALF-only funds and 4.5 years for hedge funds.

This same pattern is apparent looking at the distribution across WAL buckets. In TALF 1.0, the loans taken out by hedge funds, mutual funds, and REITs were clustered toward low-WAL CMBS. For example, 35 percent of loans taken out by hedge funds, and almost 25 percent of loans taken out by REITs and mutual funds, had remaining WALs of two years or less. In contrast, the loans of TALF-only funds and fixed-life partnerships were more likely to be backed by CMBS with long WALs: 42 percent and nearly 65 percent, respectively, of loans taken out by these types of investors were collateralized by CMBS with WALs greater than 5 years. Similarly, in TALF 2.0, 60 percent of loans taken out by TALF-only funds, and all the loans taken out by fixed-life partnerships, were collateralized by CMBS with WALs greater than 5 years.

Figure 5. Risk-taking in the CMBS Market over Time



Note. Average WAL is weighted by the loan balance.

Source. Trepp, authors' calculations, public data disclosures on Federal Reserve website, and FRBNY internal data.

However, this pattern was not constant over time. Figure 5 plots the average WAL corresponding to the CMBS that collateralized loan requests for hedge funds, REITs, and TALF-only funds for August 2009 through March 2010.⁴⁷ These three types of investors had significant participation throughout the TALF

⁴⁶ Using the unweighted sample yields similar results.

⁴⁷ We drop July 2009 because loan requests overall were low in that month.

CMBS program. The average WAL for all investors is also shown. That WAL increased from 2.83 in August to 4.83 in March, suggesting that risk appetite overall increased over this period. Consistent with the earlier analysis, the average WAL for TALF-only funds was higher than for investors overall in almost all months. Likewise, for most of 2009, the WAL for hedge funds and REITs was much lower than for investors overall. But in 2010, these WALs shot up by 2 to 3 years. This finding is consistent with our earlier rejection risk analysis, which indicated that the share of REIT loan requests that were rejected was much higher in 2010 than in 2009.

These patterns, like our earlier results on loan rejection, suggest that in the early stages of crises, investors with less stable sources of funding, such as hedge funds and REITs, are likely to be conservative in their investments and uninterested in investing in more risky securities. Investors with locked-in funding, such as fixed-life funds and TALF-only funds, are more likely to invest in these riskier securities. However, when market funding sources stabilize, hedge fund and REIT risk appetite appears to return.

Yield results. The yields results mirror the WAL results (Table 8). In TALF 1.0, fixed-life partnerships chose the securities with the highest yields, with an average of 6.19 percent. TALF-only funds chose securities with an average yield of 5.26 percent, somewhat above the yields on CMBS chosen by REITs, hedge funds, and mutual funds. Insurance companies chose the CMBS with the lowest average yield, at 4.21 percent.⁴⁸ In TALF 2.0, yields were much lower, reflecting the low longer-term rates that had prevailed over the previous years. Average yields were a bit higher on the CMBS chosen by fixed-life partnerships, but the averages for all groups were around 1.5 percent.

Table 8: Dollar-weighted Yields on CMBS Collateral by Investor Type

TALF Borrower	25 th Percentile	Median	75 th Percentile	Mean	N
TALF 1.0					
Insurance	3.57	4.03	4.32	4.21	44
Mutual Fund	4.48	5.09	5.60	5.10	100
REIT	4.21	4.67	5.06	4.68	125
TALF-only Fund	4.43	5.30	6.06	5.26	193
Hedge Fund	4.14	4.85	5.89	4.94	173
Fixed-Life	5.69	6.29	7.27	6.19	33
All	4.24	4.90	5.86	5.01	668
TALF 2.0					
TALF-only Fund	1.32	1.44	1.59	1.45	67
Hedge Fund	1.45	1.56	1.59	1.57	13
Fixed-Life	1.54	1.67	1.73	1.65	17
All	1.37	1.49	1.65	1.48	97

Note. Sample includes loan requests that were rejected by FRBNY because the CMBS collateral did not pass FRBNY's risk screening process.

Source. Trepp (yield for TALF 1.0), Bloomberg (yield for TALF 2.0), authors' calculations, public data disclosures on Federal Reserve website, and FRBNY internal data.

⁴⁸ These estimates are weighted by the loan amount and are based on all CMBS loan requests, including those that were rejected by FRBNY.

To assess whether these differences in yields also indicate differences in risk appetite beyond that associated with investing in longer WAL securities, we estimate the following regression

$$CMBS\ Yield_{it} = \beta_1 Hedge\ Fund_i + \beta_2 TALF\ Only_i + \beta_3 Mutual\ Fund_i + \beta_4 REIT_i + \beta_5 Fixed\ Life_i + \alpha_t + \gamma_{WAL} + \epsilon_{it}$$

where α_t are subscription-date fixed effects and γ_{WAL} are indicator variables for weighted average life buckets. Subscription-date effects control for the potentially confounding factors that some types of investors participated in the program earlier than others and that yields tightened over the life of the program. Insurance companies are the omitted investor-type category.

As a benchmark, we first show the regression equivalent of the earlier unconditional comparison of means (Table 9, column 1). Fixed-life partnerships chose CMBS with yields almost 2 percentage points higher than insurance companies; TALF-only funds and mutual funds chose CMBS with yields almost 1 percentage point higher. These differences almost completely disappear, however, when we control for the weighted average life of the CMBS and the subscription date, although fixed-life partnerships continue to request CMBS with yields about 45 basis points higher than insurance companies. As robustness tests, we repeat the OLS regression with loan weights and run median regressions. The results in these specifications also suggest that fixed-life partnerships take a bit more risk than other investors.

Table 9. Yield on CMBS Loan Request, By Type of Borrower, Includes Rejections

	(1) OLS	(2) OLS	(3) OLS	(4) Median Regression
Hedge Fund	0.732 (0.512)	0.317* (0.179)	0.246 (0.174)	0.0800 (0.0856)
TALF-Only Fund	1.057*** (0.377)	0.166 (0.122)	0.181 (0.127)	0.0650 (0.0746)
Mutual Fund	0.897** (0.371)	0.124 (0.127)	0.0667 (0.129)	0.105 (0.0881)
Fixed Life Partnership	1.981*** (0.371)	0.452*** (0.145)	0.402*** (0.148)	0.470*** (0.0805)
REIT	0.475 (0.382)	0.108 (0.113)	0.0980 (0.122)	0.0250 (0.0660)
Date FE	No	Yes	No	Yes
WAL Bucket FE	No	No	Yes	Yes
Observations	895	895	895	895
R^2	0.122	0.785	0.792	

Notes. Includes CMBS loan requests that were rejected by FRBNY. Omitted borrower type is insurance companies. Loan requests submitted by pension companies and private investors are omitted from the regressions because of small sample size. Regressions are weighted by the dollar amount of each loan. Standard errors are robust, clustered by the borrower, and shown in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source. Trepp, authors' calculations, public data disclosures on Federal Reserve website, and FRBNY internal data.

These results are consistent with the earlier finding that investors with stable funding are more likely to invest in more risky securities. In the TALF 1.0 time period, however, much of the variation in risk appears to be captured by the security’s WAL. Since TALF-eligible CMBS were required to have at least two triple-A ratings, it may not be surprising that yields did not vary substantially independent of WAL.

Which Investors Paid Off their Loans Quickly and Helped Normalize Central Bank Balance Sheets?

The fourth central bank objective is an orderly exit, limiting the central bank footprint in the securitization market to the time of market distress. While offering long-maturity loans provides more certainty to market participants, it also means that central bank balance sheets may be encumbered long after the crisis has been resolved. Hence, when stress subsides, the central bank would prefer investors to raise funds on the private market and to repay the emergency facility loans. We therefore study how fast TALF loans were repaid by different types of investors.

The time a loan was held—measured from the day that the TALF loan closed to the day it was repaid—varied significantly by investor type. Insurance companies and pension funds, consistent with their business model of being buy-and-hold ABS investors, had the longest median holding times at 917 and 773 days, respectively. REITs also held for an extended time, with a median holding time of 441 days, consistent with their investor base’s preference for dividend income. The median holding time for TALF-only funds was also long at 396 days. Hedge funds, fixed life partnerships, and mutual funds had shorter hold times, with medians of 204, 308 and 306 days.⁴⁹

These summary statistics indicate that buy-and-hold investors held loans longest, while hedge funds and mutual funds tended to prepay the loans quickly. At first glance, the longer hold times for TALF-only funds than other private capital funds may seem surprising. Like the managers of hedge funds and fixed-life partnerships, managers of TALF-only funds receive a share of the excess profits, which gives them an incentive to sell more quickly and realize capital gains. On the other hand, TALF-only funds can only invest in TALF-eligible securities, and must return other funds to their investors. Since the managers’ fees are based on assets under management, this aspect of their compensation gives them an incentive to hold onto loans longer.

To ensure that the differences in unconditional medians are not driven by selection or sorting across securities markets, we estimate median and OLS regressions that control for the month of origination and the security WAL:

$$\begin{aligned} Days\ held_{it} = & \beta_1 Hedge\ Fund_i + \beta_2 TALF\ Only_i + \beta_3 Pension\ Fund_i + \beta_4 Insurance_i \\ & + \beta_5 Fixed\ Life_i + \beta_6 REIT_i + \beta_5 Private\ Investor_i + \alpha_t + \gamma_{WAL\ x\ floating\ rate} \\ & + \theta_{WAL\ x\ fixed\ rate} + \epsilon_{it} \end{aligned}$$

⁴⁹ The statistics in this section weight all loans equally, regardless of the loan balance, because we judged it preferable for this exercise to treat the decisions of small investors (which tend to take out small loans) equivalent to those of large investors (which tend to take out larger loans). The medians weighted by loan balance are similar but show less dispersion: the unweighted median is 707 days for pension funds and 331 days for hedge funds.

Table 10. Days TALF Loan Was Held, By Type of Borrower

	Median Regression (1)	OLS (2)	Fixed Effects (3)	Median Regression (4)	OLS (5)
Mutual Fund	103*** (17.42)	25.73 (48.03)	8.265 (52.74)	48.40* (28.73)	-3.247 (53.60)
Fixed Life Partnership	105*** (17.16)	51.00 (62.71)	67.29 (43.75)	126.8*** (16.56)	61.12 (62.01)
TALF-Only Fund	193*** (20.52)	166.1*** (60.65)	101.0* (51.83)	69.30*** (17.12)	94.05 (58.33)
Pension Fund	570*** (92.34)	394.2*** (94.28)	318.7*** (77.85)	337.3*** (78.82)	321.9*** (68.71)
Insurance Company	707*** (48.38)	418.9*** (118.0)	408.2*** (104.7)	605.2*** (44.01)	398.8*** (103.6)
REIT	230*** (16.75)	171.4** (76.20)	204.6** (80.77)	183.7*** (16.42)	133.4 (81.94)
Private Investor	8 (24.21)	58.35 (76.84)	62.93 (77.91)	19 (23.54)	78.81 (75.54)
Time FE	No	No	No	Yes	Yes
WAL Bucket * Rate Type FE	No	No	No	Yes	Yes
CUSIP FE	No	No	Yes	No	No
Observations	2338	2338	2190	2338	2338
R^2	0.13		0.51	0.29	

Notes. Omitted borrower type is hedge fund. WAL buckets are less than 1 year, 1-2 years, 2-3 years, 3-4 years, 4-5 years, 5-6 years and greater than 6 years. The buckets are interacted with indicators for fixed and floating rate ABS. Standard errors in parentheses are robust and clustered by borrower in the OLS and fixed-effect specifications. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source. Bloomberg (WAL for ABS), Trepp (WAL for CMBS), authors' calculations, public data disclosures on Federal Reserve website, and FRBNY internal data.

We control for the month of origination α_t because ABS spreads were extremely dislocated in the early months of the program and then narrowed rapidly. Borrowers in the first couple subscriptions tended to prepay their loans early to lock in the capital gains. We control for the WAL of the security because a TALF loan must be repaid when the collateral matures, and so loans extended against shorter-maturity ABS mechanically will be repaid more quickly.⁵⁰ The WAL bucket fixed effects are interacted with a fixed- or floating-rate dummy variable because investors realized much larger capital gains on long-maturity fixed rate securities over this period after long-term rates dropped after the Federal Reserve began quantitative easing in November 2010.

In the regression results (Table 10), we first replicate the unconditional median differences (column 1) and mean differences (in column 2) in how long investors held their loans. As before, the results show that insurance companies and pension funds held their loans for more than a year longer than hedge funds, whereas REITs and TALF-only funds held their loans for six months longer. We then control for confounding factors flexibly, by adding CUSIP fixed effects (column 3), and then by explicitly adding subscription date and WAL to the median and OLS regressions (columns 4 and 5). With these controls in place, the broad patterns remain intact, although the differences decrease somewhat, with TALF-only funds now holding their loans for about three months longer than hedge funds.

In sum, these results suggest that opportunistic investors, with the possible exception of TALF-only funds, tend to realize their capital gains and repay their loans once market conditions normalize. Traditional buy-and-hold investors, who prioritize interest income, are more likely to hold onto their loans, which can conflict with the Federal Reserve's goal of winding down the program. This dynamic might affect the central bank's choice of maximum loan term when designing the program.

5. Discussion and Concluding Remarks

We focus on the interaction between investors' institutional constraints and four program objectives that are likely important to designers of interventions such as TALF: (1) quickly restoring the ability of ABS issuers to access the market; (2) ensuring that taxpayers are protected from losses; (3) providing liquidity support to a broad range of asset-backed securities; and (4) orderly exit when the market stabilizes.

We find that in order to achieve the first objective, it is crucial in the early stages of the program to attract investors with flexible investment parameters and few restrictions on their use of leverage, such as hedge funds. Some nonbank investors, such as mutual funds, may require regulatory waivers or changes in their governing documents to participate. The most popular type of vehicle for borrowing from TALF turned out to be private capital funds designed solely for this purpose. These funds are not nimble in a crisis, though, because it is time consuming for asset managers to set up these funds and recruit investors.

We document a key tradeoff between the second and third objectives. TALF protected taxpayers from losses not only through features such as including haircuts in the pricing structure but also by retaining the option to reject loans collateralized by particularly risky CMBS to mitigate moral hazard. However, in the early months of TALF 1.0, rejection risk limited participation in the CMBS program and weighed on TALF's effectiveness in injecting liquidity into the markets. Hedge funds and REITs, which rely heavily on

⁵⁰ We drop the TALF loans collateralized by SBA securitizations for which WAL are not available. In unreported regressions we find that including SBA securitization does not change the results.

short-term funding sources that came under strain, appeared particularly sensitive to rejection risk. We can see this in the fact that they primarily submitted short-WAL CMBS as collateral for TALF loans, and by the drop in their program participation after some unexpected CUSIP rejections in October 2009.

This tradeoff will likely shift over time as both ABS and external funding markets heal. In TALF 1.0, the risk appetite of hedge funds and REITs appeared to rise sharply in the latter months of the program, perhaps as their external financing became more secure. The sharp rise in riskiness of CMBS submitted as collateral at the last subscription, as gauged by the share of loan requests that were rejected, shows why central banks may want to retain tools that allow them to contain their risk.

Attracting hedge funds and other private capital funds may be particularly important for the fourth objective of winding down the program when markets stabilize. These private capital funds faced a compensation structure that gave them an incentive to realize outsized gains, and so they closed out their positions when markets were mostly recovered. In contrast, traditional buy-and-hold ABS investors, such as pension funds, insurance companies, and REITs, held on to their TALF loans considerably longer than did other investors.

Looking ahead there are three more general lessons for lender-of-last-resort interventions. First, the strong and early TALF 2.0 announcement effects suggest a more general point about central bank interventions in times of reduced market liquidity. By credibly committing to provide a liquidity backstop for eligible ABS markets in the near future, particularly through a program that has been shown to be helpful in previous crises, central banks can quickly arrest the deterioration of market liquidity and promote market self-healing well before the intervention begins. Of course, central banks still have to deliver on the commitment in a timely fashion in order to maintain credibility. But by changing the expectations about future liquidity, the usage of the liquidity backstop and therefore the central banks' footprint in markets will be significantly reduced.

Second, market participants responded to the creation of TALF with financial innovation—TALF-only funds—for the sole purpose of interacting with the program. These funds had some unusual characteristics that proved to be important for the efficacy of TALF. They were inflexible—their tight investment guidelines made it difficult for many funds to participate in the TALF CMBS program when the rules for that program proved to be different than for the ABS program. And the fact that their capital could only be deployed for TALF-related investments gave them an incentive to keep participating even when the economics of TALF became less attractive. These findings underscore the general point that policymaker actions may spur financial innovations that have consequences that are difficult to predict.

Third, the TALF program was designed in response to disruptions in the ABS market. A recurring theme in our paper, though, is that investors' TALF decisions depended on conditions in both the ABS market and their own funding markets. Policymakers will need to keep an eye on both markets in considering the design of their interventions.

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Data Appendix

Borrower Type Classification

The TALF agents provided a classification for the type for each borrower. That classification was our starting point. For the 2020 TALF borrowers, we checked the TALF agent classification against publicly available SEC filings, and followed up with the TALF agent if the classification seemed erroneous. We did not have this option for the 2009 borrowers because we conducted the review several years after the program ended. Instead, we checked the classification against publicly available SEC filings, material investors listed in the public data disclosure, proprietary databases, news reports, and private placement memoranda and other “know your customer” materials collected by the New York Fed as part of its due diligence. This review resulted in changes to the classifications of about 20 percent of the borrowers for the 2009 TALF program.

The specific sources we consulted for different borrower types are:

Fixed-life partnerships: publicly available SEC Form D filings in which the TALF borrower or borrower’s parent company self-identifies as “private equity fund” or “other investment fund”; private placement memorandum that indicate that fund had a fixed end date and severely restricted redemption rights; references to the fund in other Know Your Customer materials or news reports that were not consistent with hedge funds.

Hedge funds: publicly available SEC Form D filings in which the TALF borrower or borrower’s parent company self-identifies as a hedge fund; fund is listed in the Refinitiv, Lipper TASS or Hedge Fund Research hedge fund databases; private placement memorandum that indicate that the fund is an ongoing entity and generally allows redemptions; references to the fund as a hedge fund in other Know Your Customer materials or news reports; material investors that are hedge funds.

Individual investors: news stories about material investors in the funds, and Know Your Customer materials.

Mutual funds and closed-end funds: publicly available shareholder reports, prospectuses, Morningstar write-ups, or fund family websites. This category also includes one vehicle set up by a fund family as a way for several mutual funds to participate in TALF.

REITs: publicly available 10Ks (for publicly listed REITs) or private placement memoranda (for private REITs), material investor listing in public data disclosure, news reports, and Nareit website.

Banks, insurance companies, and pension funds: company websites

Data Sets

Administrative data from the Federal Reserve Bank of New York

Data on TALF borrowers and on the characteristics of their loans and the securities that collateralize the loans are available on the Federal Reserve Board website at http://www.federalreserve.gov/newsevents/reform_talf.htm for TALF 2009 and at <https://www.federalreserve.gov/reports-to-congress-covid-19.htm> for TALF 2.0. We use the borrower name; the TALF loan amount; the day that the loan was originated; the day that the loan was repaid; the CUSIP of the ABS collateralizing the loan; and the ABS asset class. The list of CUSIPs that were accepted

or rejected at each TALF 1.0 CMBS subscription are available at https://www.newyorkfed.org/markets/talf_cusips.html. No CUSIPs were rejected in TALF 2.0.

For borrowers in the TALF 2009 program, we augment these data with internal data on the date of loan repayment, if that repayment occurred after September 30, 2010, and data on rejected CMBS loan requests. As described above, we also use internal data to classify the borrower type.

Weighted average life and yield

We obtain the weighted average life and yield from Trepp for CMBS and from Bloomberg for other ABS for the TALF 1.0 program, and from Bloomberg for the TALF 2.0 program. In a couple cases where these data were missing, we imputed them by looking up the securities on Structured Finance Portal, a product offered by Moody's Analytics that has information on individual ABS, or by looking at the values of the variables in the months before and after the month in which they are missing.

Calculation of Key Variables

Number and dollar amount of loans outstanding

Our total number and dollar of loan requests do not match the totals in the public-release data files for several reasons.

1. We include loan requests for CMBS that were rejected by FRBNY. In the 2009 program, 47 loan requests totaling \$940 million were rejected.
2. We combine loans that were refinanced in May 2009 into one record. In May 2009, FRBNY introduced two new interest rates--the one-year and two-year Libor swap rates plus 100 basis points (<http://www.federalreserve.gov/newsevents/press/monetary/20090421b.htm>)--that were intended to correspond more closely to the appropriate base rates for fixed-rate ABS with one-year and two-year weighted average lives. Sixty-three loans collateralized by short-WAL ABS that were taken out at the March or April subscriptions were refinanced into the lower interest rate at the May subscription. These loans each appear as two records in the publicly available data and one loan in our data.
3. We combine assigned loans into one loan if the loan was transferred within the same parent company. TALF borrowers had the option to sell their ABS and assign the TALF financing to the new owner during the period while TALF was still accepting new loan requests. Of the 159 loans in the TALF 2009 program that were assigned to a new borrower, 115 appear to have been assigned to another company within the same parent financial institution. We determine this by whether the first four letters of the names of the original borrower and the new borrower are the same. Most of these same-organization transfers appear to have happened within the same private-equity firm.
4. In 74 cases in the 2009 program, borrowers chose to break up their loans into smaller loans to provide more repayment flexibility. These 74 cases correspond to 341 loans. We weighted the data so that these loans sum to 74 loans in the total of loans.
5. In the TALF 2.0 program, some loan requests are split into two or more loans in the public-use database. These are loans collateralized by two or more portions of the same CUSIP; since the pieces of the underlying security were acquired separately, they represent more than one record in the database. We combine these into one record each.

Time TALF loan was held

We measure from the date that the TALF loan closed to the [date at which it was repaid]. In the case of loans that were refinanced in May 2009 or transferred within the same organization, we measure from the time that the original loan was taken out (pre-refinancing or pre-transfer) to when the final loan (post-refinancing or post-transfer) was repaid.