How Effective Was the Federal Reserve's Commercial Paper Funding Facility? Evidence from Stock Performance and Loan Provisions*

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Abstract

This paper investigates the effectiveness of the Federal Reserve Bank's Commercial Paper Funding Facility (CPFF) in restoring the stability of large and complex financial institutions. Rollover risk became a critical issue when the commercial paper market experienced a shortage of liquidity during the financial crisis of 2007-2009. Using hand-collected data from the Federal Reserve Board, I evaluate the consequences of the Fed's intervention in the short-term credit market. This paper first shows that (recipient) banks with access to the Commercial Paper Funding Facility earned significantly higher abnormal returns than those without this access. Second, this liquidity backstop creates a positive spill-over effect by facilitating lending from recipient banks to their relationship borrowers. In terms of bank loans, CPFF lenders increased the quantity of loans provided and charged lower yields for firms with which they had strong past relationships. Therefore, the short-term funding facility generates positive spill-over effects from financial institutions with access to the CPFF to non-financial institutions.

Keywords: Explicit Guarantees, Government Bailout, Liquidity Provision, Rollover Risk

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1 Introduction

After Lehman's bankruptcy, the Federal Reserve created several liquidity facilities to alleviate the freezes in the short-term credit markets. In this paper, I evaluate how a particular emergency liquidity facility (the Commercial Paper Funding Facility) helped stabilize the financial system. In particular, I study the channels through which the liquidity backstop mitigated rollover risk in the commercial paper market and reduced runs in the money market mutual funds (MMMF) during the credit crunch.[1]

There are several programs that were created by the Federal Reserve System during the periods when the financial market experienced significant turmoil, following Lehman's bankruptcy. On September 16, 2008, the Federal Reserve announced the Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility (AMLF) to address runs on money market mutual funds. Bump, Parkinson, Rosengren, Suarez, and Willen (2013) study the ways that AMLF helped to stabilize outflows from money market funds and reduced asset-backed commercial paper yields substantially. Details of the Commercial Paper Funding Facility and the AMLF program will be discussed in a later section.

The goal of the Commercial Paper Funding Facility (CPFF) was to provide short-term financing to large and complex financial institutions in need of refinancing commercial paper near maturity. After Lehman's bankruptcy, money market mutual funds faced significant redemptions as money market investors exit these funds (especially when they suspect a fund may "break the buck"). As a result, the shortage in the supply of short-term credit is further exacerbated by investors' decrease in demand for the money market instruments. For example, the prices of 7-day AA financial and non-financial commercial paper jumped substantially as of August 2008. With the specific goal of increasing the liquidity of asset-backed commercial paper (ABCP) markets, the Federal Reserve initiated the CPFF to promote the stability of the entire financial sector and prevent systemic default risk.

This paper tests the effectiveness of the Commercial Paper Funding Facility (CPFF) in providing timely short-term financing to financial institutions and mitigating rollover risk in the asset-backed commercial paper market. I first analyze the impact of the Commercial Paper Funding Facility on the performance of CPFF recipient banks and the CPFF banks' borrowers. event study results demonstrate the effectiveness of the CPFF program: banks with access to CPFF earned 2.0% abnormal returns against the standard market model. In particular, by using various estimation windows and event windows, the positive effect of liquidity backstop on banks' performance remains robust. These results suggest that investors view government guarantees favorably in terms of reducing panic in short-term credit markets and preventing systemic defaults of large financial institutions. However, banks without access to the CPFF earned -0.7% model adjusted returns due to

[1]Since the U.S. money market mutual funds (MMMF) industry is not protected by the deposit insurance from the Federal Reserve, these funds are vulnerable to runs by investors, especially when they suspect the value of these funds will drop below zero ("break the buck").

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shortages of short-term financing.[2]

In addition, using the propensity score matching method, I test whether the results on stock performance are driven by various bank fundamentals and the possibility of selection bias by the Federal Reserve. Based on matching banks with similar characteristics and focusing on high rated groups, my results indicate that the effect of the liquidity backstop is positive and significant. Therefore, the facility serves its intended purpose in alleviating runs on money market funds by investors when there exists sudden financial market disruptions. The evidence is consistent with the results in Bump, Parkinson, Rosengren, Suarez, and Willen (2013) on the effectiveness of another emergency liquidity facility (AMLF): AMLF helped stabilize the outflows from money market mutual funds and reduced the asset-backed commercial paper (ABCP) spreads.

Second, to explore the additional impacts of the CPFF program beyond stock performance, I investigate the lending behavior of CPFF banks both prior to and ex-post of the 2007-2009 crisis. I exploit the variation in CPFF banks' willingness to increase lending during a time of credit crunch. In particular, I study the amount of new syndicated loans provided by CPFF banks to their relationship borrowers, by examining loan terms (spread over LIBOR and the amount of loans). My regression results indicate that an average firm experienced a 13% increase in bank loans issued by a CPFF lender after the third quarter of 2008. The increases in lending by CPFF banks indicate that government explicit guarantees generate positive spill-over effects to non-eligible firms in the real sector indirectly. Furthermore, during periods of financial distress, borrowers with repeated past relationship with CPFF banks are able to obtain cheaper financing. For example, these new loans are charged at lower spread, despite the supply of credit is limited at the beginning of the crisis. The evidence on bank loans is also consistent with the credit rationing literature: information asymmetry between banks and firms plays an important role, especially in periods with disruptions in the short-term credit and higher probability of default.

Third, as CPFF lenders extend more loans to their relationship borrowers, I further study the changes in the covenant strictness imposed by these banks. This allows us to explore the implications of government interventions in the context of corporate governance. In particular, I follow Murfin (2012)'s approach by constructing the measuring covenant strictness index. My analysis indicates that the borrowers of CPFF recipient banks are less likely to breach their debt covenants. The lower probability of covenant violations is consistent with the evidence on the improved performance of the borrowers of CPFF lenders. The increases in slackness between accounting variables and covenant thresholds suggest firms can easily access short-term financing to overcome financial distress.

On one hand, this paper highlights the effectiveness of the Commercial Paper Funding

[2]One possible reason for the negative abnormal returns for banks without access to the CPFF program is the welfare losses in the liquidation process. Without the liquidity backstop from the Federal Reserve, the money market mutual funds can suffer from substantial amounts of fire sale costs when rolling over maturing commercial paper.

Facility in providing timely short-term financing to financial institutions that face severe shortage of liquidity. On the other hand, this facility is associated with increased lending from recipient banks to clients of these banks, which is referred to as the positive spill-over effect (or the indirect channel). Through both the direct and the indirect channel, the program lowers the cost of financing (in terms of yield on asset-backed commercial paper), especially when financial institutions are vulnerable to panics in the short-term credit market.

As an extension, I discuss the effectiveness of the Commercial Paper Funding Facility in reducing the credit risk of both its recipients and the recipients' borrowers. That is, we need to learn about the idiosyncratic risk and systemic risk of recipient banks with access to the facility. In order to address this question coherently, we need to use the Markit data on credit default spreads (CDS) and construct different measures of systemic risk according to the recent survey paper by Bisias, Flood, Lo, and Stavros (2012). In addition, I can build alternative measure of each bank's access to the CPFF as the percentage of the amount of loans near maturity (within one year) that get purchased by the government. In this way, access to funding facility is a continuous variable, instead of dummy variable, that links the supply of credit to demand for financing (debt maturity obligation).

At a broader level, the findings from testing the effectiveness of CPFF reveal that government interventions through commercial paper purchases serve to reduce panic in financial markets arising from rollover risk. These results have implications for the public debate on the usage of government guarantees. One potential concern is whether implementation of emergency lending facilities leads to moral hazard problems. Results on cumulative abnormal returns suggest that higher shareholders value could reduce the incentive for risk taking. Evidence from debt covenant violations indicates that the CPFF program is associated with a lower probability of breaching debt covenants and technical default. This suggests that firms with the access to the CPFF are less likely to engage in risk-shifting behavior and there is less potential moral hazard problem.[3]

1.1 Literature

In a broader context, this paper is related to research and recent discussions on the government guarantees to financial institutions. Historically, the Federal Reserve acts as lender of last resort has been addressed by numerous papers in economics and finance. However, with respect to the most recent financial crisis, the challenge is to alleviate rollover risk in the commercial paper market by providing liquidity backstop to systemically important financial institutions, especially given the complexity of their business and products (such as off-balance sheet financing). For example, how to effectively reduce systemic risk and prevent ex-ante moral hazard problems still become challenging tasks for regulators with

[3]In this context, moral hazard refers to whether the Federal Reserve's emergency liquidity facility leads issuers to engage in riskier behavior than they would have otherwise.

securitization activities.[4]

There is a growing literature that studies the relationship between securitization and financial crisis, such as Mian and Sufi (2009) and Keys, Mukherjee, Seru, and Vikrant (2010). The issue of over-leverage and securitization has been discussed in depth by Adrian and Shin (2009) and Acharya, Schnabl, and Suarez (2013).

First, my empirical study contributes to the existing literature on rollover risk and maturity-mismatch problems in the money market. For example, commercial paper issuers face rollover risk when they have insufficient cash stocks to retire the debt near maturity. Various work by Schnabl and Acharya explores the fragility of the commercial paper market following Lehman's bankruptcy. It further triggers panics in short-term credit markets and runs in the money market funds. Recently, there is a growing number of theoretical works that examine the relationship between rollover risk and credit risk, such as He and Xiong (2012).

Given the problem of maturity mismatch faced by commercial paper issuers, this paper analyzes whether the CPFF program can serve its goal to restore financial stability and mitigated rollover risk since its implementation. My paper fits into the literature on bank bailouts and strategic restructuring. One of the most related empirical papers is that by Duygan-Bump, Parkinson, Rosengren, Suarez, and Willen (2013), which examines the effectiveness of emergency liquidity facility. In particular, they focus on the implications of the AMLF program in preventing runs on the money market funds: the AMLF facility reduced the outflows from money market funds and lowered yields on asset-backed commercial paper. To explore the issue further, Covitz, Liang, and Suarez (2013) study the factors that cause runs on the asset-backed commercial paper market. Their results indicate that runs happen more frequently for programs with weak fundamental characteristics, such as those with insufficient liquidity support from providers. Therefore, the sponsoring institutions play an important role in determining the survival of their conduits. Kacperczyk and Schnabl (2013) examine the relationship between implicit guarantees and risk taking by conduits. Their regression results suggest that funds sponsored by financial institutions are associated with higher equity value and have less incentive to take risk. In addition, implicit guarantees can serve to reduce risk taking according to different measures. Thus, their findings provide insights on the effectiveness of guarantees from sponsors, which complements my analysis on the positive implications of explicit government guarantees.

This paper is related to Chava and Purnanandam (2011) in terms of loan provision. In particular, they use the Russian crisis in the fall of 1998 as a natural experiment to examine the implications of the Russian crisis on bank-dependent borrowers. The crisis can be used as an experiment to separate the effect of borrower demand for loans and the supply of credit by banks. Furthermore, Gao and Yun (2012) explore the real effects of the

[4]Since the financial crisis of 2007-2009, the goal and priority of government intervention is to limit banks' excessive risk taking, especially those that rely on issuing short-term commercial paper to finance long-term projects.

CPFF program and demonstrate that this facility reduces borrowing costs and generates more profits. There are several differences between Gao and Yun (2012)'s work and this paper: first, they use commercial paper eligibility based on ratings as the indicator for the CPFF access, while analysis here uses the actual purchase of commercial paper by the CPFF as the access indicator. Second, this paper studies the covenant strictness imposed by CPFF banks to study the changes in agency conflicts between creditors and shareholders.

In terms of theoretical work, Philippon and Schnabl (2013) examine the mechanisms through which government interventions can recapitalize a banking sector due to debt overhang. This paper also relates to the literature in bank restructuring and reorganization in case of insolvency. Ayotte and Skeel Jr. (2010) argue that Chapter 11 proceedings are adequate if managed properly by the government. The key issue is how asset purchase programs can support the price discovery of risky assets and resolve illiquidity in the commercial paper market. Furthermore, the concern on opportunistic participation (i.e., the possibility that some banks might participate but not actually increase their lending) was debated in the implementation of the TARP (Troubled Asset Relief Program). Following their work, it would be interesting to examine how government interventions generate informational and macroeconomic rents for banks.

The primary objective of the following sections of this paper is to provide a thorough examination of the effectiveness of the CPFF program in stabilizing the financial sector. Adrian, Adrian, Kimbrough, and Marchioni (2010) show that the expansion of the CPFF was accompanied by a narrowing of the spread between commercial paper rates and comparable OIS (overnight index swap) rates. My contribution is to study how the CPFF's liquidity backstop facilitates lending from CPFF recipients to their clients with whom they have past relationships. In particular, the effectiveness of the facility in increasing bank lending is an important channel to evaluate the program, in addition to the earnings performance.

The organization of this paper is as follows: Section II provides the institutional background on the CPFF as well as a description of other emergency liquidity facilities. Section III describes the details on the data construction and summary statistics. Section IV conducts the main regression analysis to evaluate the effectiveness of the CPFF in terms of stock returns for CPFF recipient banks and their relationship borrowers. In addition, I analyze the implications of this liquidity backstop through the channel of loan provision by CPFF lenders. Section V discusses extensions that can be done to evaluate the program through other dimensions, such as risk taking. Section VI concludes.

2 Motivation: Creation of the CPFF

As studied by Adrian, Kimbrough, and Marchioni (2010), in the decade prior to the crisis, ABCP increased from 250 billion in 1997 to more than 1 trillion by 2007 (that is, from

roughly 20% to as much as 50% of outstanding commercial paper). This was mostly fueled by the considerable amount of residential mortgage exposure through structured finance products.

Following the bankruptcy of Lehman Brothers on September 15, 2008, the U.S. money markets experienced severe disruptions. For example, Reserve Primary Fund, a prime money market mutual fund, "broke the buck" on September 16. This event was followed by significant redemptions by investors and trigged a "flight to quality" by investing in treasury bonds. Consequently, withdraws by money market investors caused rollover risk (the inability to retire short-term obligations near maturity) to commercial paper issuers. Moreover, panics in the commercial paper market also created a shortage of liquidity in the short-term credit markets to the commercial paper issuers, which could lead to negative consequences on the financing and investment decisions of these firms. In addition, given the widespread of securitization activities by both commercial and non-commercial banks, maturity mismatch problems become a pronounced issue, especially when there exists severe disruptions in the supply of short-term liquidity in the money market.

In order to alleviate the maturity mismatch problem for commercial paper issuers and to avoid further disruptions to the entire financial sector, the Federal Reserve announced the Commercial Paper Funding Facility on October 7, 2008.[5] The goal of this program was to create a liquidity backstop to reduce the freezing of short-term credit markets after Lehman's bankruptcy. Importantly, the commercial paper market is a key source of funding for various financial intermediaries. Figure 1 demonstrates the amounts of commercial paper purchased by the Federal Reserve under the CPFF program. Note that there are three peaks in loans extended: the first peak is at the initiation of the program at the end of October 2008; the second peak is at the end of January 2009 three months after the first peak (the maturity of most loans is 90 days); the third peak is around the end of April 2009 (another three months later). Therefore, there exists a pattern in the commercial paper purchase amounts, which indicates that same group of recipients accessed the facility and repeatedly rollover their commercial paper during this entire period.

In essence, the CPFF serves as a lender of last resort to prevent systemic defaults by large and important financial institutions. However, there is unique feature to this program: the Federal Reserve offers discount windows not only to issuers of commercial paper but also to issuers that are not chartered as commercial banks. This is due to the fact that large financial institutions become more complex after the moderation and the grow rapidly especially related to investment banking activity and off-balance sheet financing. One of the major distinctions between the CPFF and the AMLF is that the latter program extends non-recourse loans to banks that purchased ABCP from the money market funds indirectly. However, under the CPFF program, all the commercial paper

[5]The facility became operational on October 27,2008 and expired February 1, 2010.

issuers are able to obtain financing through a special vehicle, called "CPFF LLC".

2.1 Timeline of Other Programs

There were other policy responses implemented in the 2008 by the Federal Reserve following the liquidity disruption.

1) The Primary Dealer Credit Facility (PDCF) and the Term Securities Lending Facility (TSLF) were implemented on September 14, 2008.

2) The foreign exchange swap lines with foreign central banks was expanded on September 19, 2008.

3) The Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility (AMLF) was implemented on September 19, 2008. It extended "nonrecourse loans" at the primary credit rate to U.S. depository institutions and bank holding companies to finance their purchases of high-quality ABCP from money market mutual funds.

4) The Money Market Investor Funding Facility (MMIFF) was announced on October 21, 2008.

5) On October 14, the Federal Deposit Insurance Corporation (FDIC) announced the creation of the Temporary Liquidity Guarantee Program (TLGP) to guarantee the senior debt of all FDIC-insured institutions and their holding companies as well as deposits in non-interest-bearing deposit transactions.

6) On November 25, the Federal Reserve announced the creation of the Term Asset-Backed Securities Lending Facility (TALF). With this program, the Federal Reserve Bank of New York was authorized to lend up to $200 billion on a nonrecourse basis to holders of AAA-rated asset-backed securities (ABS) and originated consumer and small-business loans.

2.2 Users of the CPFF

The Commercial Paper Funding Facility was designed to stabilize short-term financing markets by providing an additional source of funding to institutions to help them reduce liquidity driven defaults. Various institutions have been active in the commercial paper market, such as commercial banks, finance companies, ABS issuers, and foreign issuers. The Federal Reserve purchased eligible top-tier paper that is rated A-1/P-1/F1 or higher in order to avoid credit risk not related to market disruptions.

Another issue related to the fragility of the financial system is the monitoring of the loans, especially those related to unsecured commercial paper. This is because when financial and nonfinancial commercial paper is unsecured, the Federal Reserve charges a credit enhancement fee, which is a 100 basis points per annum fee paid up front on each sale of commercial paper to the CPFF LLC in cases without any collateral. As a result, this surcharge can help to secure the loans or exercise extensive monitoring. Note that the CPFF program offers a quasi-experimental exercise to examine whether

the liquidity backstop benefits commercial paper issuers given the increases in the supply of credit. Therefore, this liquidity backstop serves to increase a bank's capital and leads to an outward shift in the supply curve.

Table 1 provides an overview of the ten largest CPFF recipients, ranked by the amount of commercial paper purchase. The main instruments purchased are commercial paper and asset-backed commercial paper (ABCP). In particular, ABCP purchase is associated with a higher discount rate and credit enhancement surcharge to compensate for the possibility of liquidation in the case of fire-sales. The largest CPFF recipient is UBS (at sponsor level) with a total amount of $74531.102 million commercial paper being purchased. In addition, American International Group had the most frequent usage of the CPFF program, with a total of 90 transactions during the period of October 27, 2008 and February 1, 2010. Therefore, this liquidity backstop features a high concentration of usage by certain issuers, as the top 10 recipients account for more than half of the total recipients by the total amount of commercial paper purchased during this entire period. The total amount of commercial paper purchased from the top 10 sponsors/issuers is near $474 billion. Furthermore, the Federal Reserve had purchased $738 billion of either commercial paper or asset-backed commercial through the CPFF program during this period.

It is important to note that since the Federal Reserve only purchases top-tier commercial paper rated A-1/P-1/F1 or higher, the quality of the underlying commercial paper serves as an indicator for access to the CPFF program. Therefore, the CPFF provides liquidity to financially healthy issuers as opposed to a set of financially distressed institutions. This offers a novel experiment exercise to examine how liquidity backstop can serve as a capital buffer for any sudden shortage of credit in the money market. As a result, the CPFF program focuses on a particular asset class, with less stringent requirements for the types of institutions that can borrow. Therefore, there is less of an endogeneity problem regarding validation of the empirical methodology due to the selection issue, which will be discussed in detail in later sections. In particular, I show how propensity-score matching can address the possibility of selection problem.

3 Data

3.1 Source

I use several different data sources for the stock performance and loan provision analysis in this paper. From the Federal Reserve Board, I collect all 1157 transactions made by the CPFF LLC, a specially created limited liability company that used the funds to purchase commercial paper directly from eligible issuers. The Federal Reserve Bank of New York (FRBNY) provided three-month loans to the CPFF LLC. This sample includes both financial and nonfinancial institutions that had access to the Commercial Paper Funding Facility (CPFF) from October 7, 2008 to February 1, 2010. According to the

Federal Reserve, the commercial paper that was eligible for purchase was highly rated, U.S. dollar-denominated, unsecured, and asset-backed commercial paper with a three-month maturity.

To identify the bank names of the CPFF recipients, the CPFF transactions is merged with the Loan Pricing Corporation's (LPC) Dealscan database (this merged dataset is called "Dealscan-CPFF"). In order to do so, manually match each recipient[6] of the CPFF with the lender names in the Dealscan data is required. If a lender had access to the facility, a dummy variable ("CPFF dummy") equals one and otherwise it equals zero.

Furthermore, the accounting and return data are obtained from Compustat and CRSP, respectively. Stock return information is obtained at the intersection of these two databases during the year 2008. The utilities firms (SIC codes between 4910 and 4940) are excluded from the sample of firms. I do not remove the financial firms as I will conduct analyses separately for CPFF lenders and borrowers. Analysis based on both financial and nonfinancial firms offers a comprehensive understanding of the implication of CPFF in restoring financial sector stability. First, I construct the lender dataset by merging the CRSP/Compustat with the bank names as identified in "Dealscan-CPFF" (discussed previously). Second, to prevent outliers that may affect the result, I winsorize the stock returns at 1% and 99% in my analysis. This yields 410,154 observations in daily frequency at the intersection of the CRSP/Compustat and Dealscan lender files.

Moreover, to test the effectiveness of the liquidity backstop on new loan contracts provided, I obtain the list of loans for each CPFF bank for the period prior to and after the initiation of the program. Borrower-lender relationship information is collected from the Dealscan data, which contains detailed loan information from both syndicated and bilateral loans from SEC filings from January 2005 to December 2010. Therefore, Dealscan data is used to compute the new loan issued by CPFF lenders prior to and after the initiation of the program in October 2008. The variables of interests are spread (all-in drawn spread against LIBOR) and covenant strictness on new loans offered to relationship borrowers. The definition of borrower-lender relationship is as follows: in the sample of historical relationships between borrowers and lenders from 2004 to 2008, the lender provided the largest number of loan facilities is considered as the most dominant lender. For example, I search for the unique dominant lender for each borrower. In particular, I manually collect information of the recipients of the CPFF program by searching for the name under sponsor or headquarter banks. This data collection procedure yields 172 banks, which need to be match with Dealscan data to obtain information on new loans offered to each bank's borrower. by identifying each bank's relationship borrower, the ultimate sample consists of 1644 unique borrowers, which need to be merged with the

[6]I look for the name of parent or sponsor at the time of purchase, and therefore the institutions' names are based at the headquarter level. For example, "Barclays US Funding LLC" is matched with "Barclays PLC" as the CPFF recipient parent. In addition, this matching procedure is consistent with the work on explicit guarantees by Acharya, Schnabl, and Suarez (2013). Under their framework, each conduit is matched with its sponsor, which provides its guarantee.

CRSP/Compustat database for detailed firm characteristics and stock prices.

The result is robust upon alternative data filtering techniques, such as those based on facility amount, loan maturity, and seniority. This yields pairwise borrower-lender relationship from Dealscan data, with 5411 contracts available for the analysis. Finally, the CRSP/Compustat data is merged with the relationship borrower sample to test the stock performance of borrowers of CPFF banks.

As an alternative experiment, one can use Bankscope to construct a data set of all the commercial banks that had access to the Commercial Paper Funding Facility in the years 2005-2010. One important variable is a bank's Tier 1 ratio, which identifies the commercial banks' financial health and the ability to absorb losses due to credit market disruptions.

3.2 Summary Statistics

Event study uses stock returns at daily frequency through the year 2008. All accounting variables used in this study are based on the second quarter of 2008. This six-month lag allows for accounting information to be available to market participants. The main analysis focuses on borrowers' stock performance based on whether their dominant lenders have access to the CPFF program. Table 2 provides descriptive statistics for the borrower sample. In particular, Panel A reports the borrower characteristics when their lenders have the access to CPFF; and Panel B tabulates the firm's variables when lenders do not have the access to the CPFF program.

First, the average size is similar between borrowers with and without CPFF lenders. Second, borrowers with CPFF lenders are financially healthy firms: they have less leverage (0.604), higher return on assets (0.029), and large annual sales (6.043). Therefore, CPFF provides new loans to borrowers with better growth prospects as opposed to distressed borrowers. This helps to clarify the doubts about moral hazard issues and the adverse effects of government intervention: lenders only choose to offer loans to less risky firms.

However, borrowers with CPFF lenders indeed face severe liquidity constraints (with a cash flow ratio of -0.050) versus borrowers without CPFF lenders (with a cash flow ratio of 0.239). This suggests that banks provide liquidity backstop to firms that are cash constrained but have a high market-to-book ratio (1.521). Furthermore, there are significant differences between these two groups in terms of default risk. For example, regarding distance-to-default, the average borrower with CPFF lenders is less risky (3.020) than the firm without (2.742). In addition, these borrowers are more dependent on bank loans, which provides an important source of financing especially during crisis periods with a limited supply of market liquidity.

Thus, there are significant differences between firms with and without CPFF lenders across multiple dimensions. As a result, these fundamental characteristics can help to understand the channels through which liquidity backstop can generate better stock performance in the real economy. In an unreported analysis, I use the propensity-score

matching technique based on these important firm characteristics. This approach allows us to compare borrowers with similar fundamentals but with and without CPFF lenders. Table 3 shows the correlation among key variables.

4 Empirical Analysis

This section introduces the main results. First, using borrower's characteristics, I predict the probability that its relationship bank's access to the Commercial Paper Funding Facility (CPFF). This is because a bank's capital losses is significantly affected by the financial health of its major borrower. Second, I analyze the effect of the CPFF program on stock return performance, both through the direct channel on recipients (CPFF lenders) and through the indirect channel on borrowers of CPFF recipients. Finally, I examine whether new loans offered by CPFF lenders increased after the initiation of the liquidity backstop. Furthermore, this paper studies whether CPFF lenders impose tight covenants when banks' internal liquidity increases with acess to the facility.

My identification strategy is aimed at exploiting the positive effects of CPFF as a supply-side shock. In particular, for borrowers, whether their dominant lenders have access to the liquidity backstop is exogenous.

In addition, this paper analyzes whether government guarantees affect bank-dependent firms with limited alternative sources of financing (such as issuing commercial paper or public debt). I adopt the bank-dependent variable similar to that used in Chava and Purnanandam (2011), and Kashyap, Stein, and Wilcox (1993). They classify firms without public-debt rating as the proxy for bank-dependence.

4.1 The Determinants of CPFF Access

What factors determine a bank's access to the CPFF program? I first analyze the determinants of the Commercial Paper Funding Facility (CPFF) in a probit framework where the dependent variable equals one if a public bank has access to the liquidity backstop and is zero otherwise. Note that the analysis below focuses on borrower characteristics instead of lender profiles, as the analysis of the later requires further information from the Bankscope database.[7] In addition, the determinant of lender access may be subject to selection problems, which will be examined in depth latter (in the propensity score matching section). Furthermore, control variables are constructed from borrowers' can better predict banks' losses in the future. It provide richer information on a banks' business activity, beyond the current losses shown on banks' balance sheets.

Table 4 shows the marginal effects from the probit model. Column (1) displays results without industry dummies. Leverage enters negatively and is significant at the 1% level.

[7]In the propensity score matching analysis, a probit model is used to study the probability of a bank's CPFF access.

This indicates that banks have a low probability of receiving short-term funding when they have a strong connection with high-levered firms. This is because high-levered borrowers may have difficulty in repaying maturing loans during times of market distress. As a result, banks with excessive amounts of debt need to reduce the debt outstanding in order to be eligible for the program. Market-to-book and ROA both enter positively, which indicates that the program is available to firms with high current earning and investment opportunities. Similarly, the CPFF is available to banks when their clients have high cash flow and high past year returns (e.g., year 2007). The intuition is that the government would ensure that lenders have access to funding only if the probability that borrowers default on loans will be low. In this case, banks' balance sheets are composed of financially healthy borrowers. This is because non-performing loans from borrowers can trigger significant losses to lenders' portfolios, which can further cause difficulty in rolling over outstanding commercial paper during periods of financial distress.

Consistent with the importance of default risk, high distance-to-default of firms increases the likelihood that lenders have access to the CPFF. The coefficient is 0.016 and is also significant at the 1% level. Note that there is a positive relationship between equity volatility08 and CPFF access when controlling for industry fixed effects.[8] This suggests that government has incentive to provide liquidity backstop to the commercial paper issuers and to facilitate real lending when the equity prices are volatile. One possible explanation is that when there is a high level of uncertainty regarding the ability to rollover short-term obligations in the banking system, the government is willing to offer liquidity backstop to financial and nonfinancial institutions to avoid a high level of systemic risk. Another possible explanation is that the CPFF reduces shareholders' risk taking behavior, which can trigger systematic risk. The preliminary results from this probit model suggests that CPFF recipient banks indirectly issue new loans or lines of credit to the financial healthy firms in the real sector.

In essence, it is important to learn about the selection criteria that determines banks' access to CPFF facility. The important question is: does the emergency liquidity facility lead to higher value creation to these financial institutions? In the analysis below, I study the implications of liquidity backstop on the stock performance of both CPFF banks and their relationship borrowers separately.

4.2 Stock Returns for Lenders

Cumulative Abnormal Returns

The next two sections provide analysis on stock performance by exploiting the subsample of both banks and borrowers separately. This allows to exploit the effectiveness of the CPFF in increasing performance of banks and borrowers. In particular, within

[8]Industry fixed effects can have significant implications on CPFF access. This is because industry-wide defaults can cause substantial welfare losses due to fire sale, especially when there exists contagion among distressed financial institutions.

each of these subsamples, I examine the effect of Commercial Paper Funding Facility on earnings during the year 2008.

This study uses a standard event-study methodology to compute the cumulative abnormal returns (CAR) against the market model, as in Chava and Purnanandam (2011). For each bank in the sample, I first estimate the market-model beta using 150 trading days, ending 50 trading days prior to the financial crisis as of September 15, 2008. These 100 trading days constitute my estimation window. Based on the estimates of beta, I then calculate the cumulative abnormal returns for the event window. The event window spans from October 7, 2008, when the Federal Reserve Bank announced the CPFF, to the first date it started to purchase commercial paper (October 27, 2008). Therefore, this event study allows us to exploit whether there exists positive reactions to the market given the initiation of the short-term funding facility within the crisis periods.

Panel A of Table 5 illustrates the distribution of the abnormal returns for banks with and without CPFF access. In particular, I focus on the period of the 20 trading days after the first announcement on October 7. The mean (median) bank with access to CPFF earned 2.0% (11.7%) abnormal returns against the standard market model. However, the mean (median) bank without access to CPFF earned a model adjusted return of -0.7% (2.5%). The differences are significant, both economically and statistically.

Panel B of Table 5 presents the formal regression results on stock performance for lenders. Column (1) and Column (2) display the estimates for the whole sample of 172 banks, which can be merged with Dealscan. The coefficient on the "CPFF Dummy" is 0.040, which indicates that banks with access to the facility earned an average excess return of 4% compared with banks without. In addition, the fraction of short-term debt is associated with significantly higher abnormal returns, with a coefficient of 0.207. The positive sign suggests that banks experience higher earnings when their borrowers are able to obtain financing and roll over maturing short-term debt. The ability to meet short-term obligations lower the probability of default. However, in an unreported table, the coefficient on the interaction term between the CPFF dummy and the fraction of short-term debt is -0.710 and significant at the 1% level. This is consistent with the recent literature on rollover risk and high costs to retire maturing debt, especially if the amounts of short-term debt are substantial. The results Column (2) on the effectiveness of CPFF exclude the fraction of short-term debt in a bank's portfolio. Note that in both Columns (1) and (2), the rating dummy "Rated" is positive and significant at the 1% level. This means that banks experience average abnormal return of 10.2% if they have public ratings. This is consistent with the literature that ratings allows investors to update the credit risk of a bank, especially during periods with runs on the commercial paper market. There could be a concern that the results are driven by omitted variable bias from ratings, instead of the CPFF facility, as only financial institutions with A or higher ratings are eligible. To capture the effects of ratings on bank performance and the potential selection problem, I study the implications of liquidity backstop on returns for the sample of high rated banks only. In both Column (3) and (4), the coefficients on the

"CPFF dummy" are still positive, with a magnitude of 0.287 in Column (3) compared with 0.040 in Column (1). In an unreported table, I examine the effect of CPFF on the rollover risk, given by the interaction term between the CPFF dummy and the fraction of short-term debt. The coefficient on the interaction term is positive for the high rated banks, which indicates that liquidity backstop is associated with high earnings through the channel of reducing costly rollover of commercial paper. This indicates that high rated banks with access to the facility experienced better performance than high rated banks without access.

It is important to capture the bank characteristics for those with and without access to CPFF funding. In order to compare banks with similar fundamentals except for the access to the liquidity backstop, I further analyze the question by using the propensity-score matching method. In the first stage, a probit model similar as that in the previous section is estimated, with additional control variables. In an unreported table, the results indicate that banks with access to the CPFF at the peak of the financial crisis experienced higher abnormal returns. This validates the importance of government explicit guarantees for stabilizing the commercial paper market.

Propensity Score Matching

To address the potential problem of selection bias, I use the propensity score matching method to compare the differences in cumulative abnormal returns between CPFF lenders and non-CPFF lenders with similar characteristics. In order to do so, I find pairs of CPFF lenders and non-CPFF lenders that are identical along various dimensions except for access to the liquidity backstop.

This propensity score matching method is based on Rosenbaum and Rubin (1993) and Heckman and Todd (2009). The procedure is as follows. In the first step, a probit model is estimated with the access to the CPFF facility as the dependent variable. In particular, I control for various characteristics, such as size (measured by log of sales), high rating (with rating A or above), market value of equity, market-to-book ratio, return on assets, cash flow, expenditure (at industry level), and profitability. After estimating the probit model, I obtain the probability of getting the CPFF facility for every lender in my sample. In the second step, based on the propensity score, I find a non-CPFF lender with the closest propensity score to be matched with each of the CPFF lenders. In particular, I use nearest neighborhood matching to find the closest propensity score.

The results on cumulative returns with matched sample are illustrated in Table 6. In Column (1), the average treatment effect of treated is 4%, which indicates that the CPFF lenders earned an average cumulative abnormal return of 4% higher than non-CPFF lenders. The difference is also significant at the 1% level. In addition, I extend the analysis on the abnormal returns based on different event windows. In Column (2), the event window spans from October 7, 2008 (the announcement date of the program) to December 26 (60 days after the first date of purchase of commercial paper on October 27, 2008). The average treatment effect of the treated is 5.6% and significant at the 1%

level. The magnitude is higher than the result of 4% in Column (1), which indicates that the liquidity backstop improves the performance of its recipients, as investors learn about its initiation. In Column (3) and Column (4), I used an alternative estimation window, from 30 trading days prior to 100 trading days ([-100, -30]) prior to the financial crisis on September 15, 2008. In Column (3), the average treatment effect of treated is 9.5% and statistically significant. For the event window from October 7 to December 26, 2008, the average return difference between CPFF lenders and non-CPFF lenders is 8.3%.

As a robustness analysis, I conduct a dimension-by-dimension matching approach besides the previous propensity score matching method. The relative size between CPFF banks and non-CPFF banks can be a concern, given that bank size plays an important role in determining market power in commercial banking literature. To address this potentia bias, I match each CPFF recipient bank with its closest non-CPFF bank of similar size, based on bank assets and bank equity. In addition, I also conduct propensity score matching based on various bank characteristics, such as Tier 1 ratio, share of short-term debt, share of deposits, and share of loans. I am also able to find similar positive and significant results on abnormal returns (unreported).

4.3 Stock Returns for Borrowers

In this section, I explore whether borrowers perform better once their relationship lender has access to the CPFF. This experiment offers a unique channel to investigate the transmission of liquidity from lenders to their clients. Since the ultimate goal of government explicit guarantees is to increase the supply of credits to the real sector, it is important to analyze whether borrowers indirectly benefit from the liquidity backstop.

Since the focus is to examine the spillover of liquidity from banks to borrowers, the key variable to track is "CPFFbank". This dummy variable equals one if the Federal Reserve had ever purchased commercial paper from a bank within the period of October 27, 2008 to February 1, 2010 and equals zero otherwise.[9]

Univariate Analysis

Panel A of Table 7 shows the distribution of returns across firms with and without "CPFFbank" by using an event study method after the announcement of the program. The mean (median) firm earns a -5.95% (-1.76%) market adjusted return if the government provides funding to its dominant bank. The cumulative abnormal rerun for a firm without "CPFFbank" has a mean (median) of -7.58% (-3.34%). Similar to previous results on high earnings for CPFF banks, liquidity backstop generates better stock performance of

[9]As an alternative exercise, I could potentially use a continuous variable to model the access to the liquidity backstop. For example, one can use the fraction of CPFF access as the total amount of commercial paper purchased by the Federal Reserve from each bank divided by all the commercial paper purchases.

borrowers once their major banks access the program comparing to borrowers without the access. In the regression below, I demonstrate the lending channels through which these firms perform better.

Regression Results

To explore whether firms in the real sector indirectly benefit from the CPFF program, I estimate the following model:

$$r_i = \alpha_0 + \alpha_1 CPFFbank_i + + \sum_{j=1}^{j=J} \delta_j X_i + \epsilon_{i,t} \quad (1)$$

where "CPFFbank" measures the existence of government guarantee for a firm's unique relationship bank.

The regression results are shown in Panel B of Table 7. In Column (1), the coefficient on "CPFFbank" is 0.007 and is significant at the 1% level. This positive relationship indicates that firms with "CPFFbank" experience higher earnings than those borrowers without. This confirms the previous conjecture that government explicit guarantees transmit liquidity from recipient banks to their relationship borrowers. The sign on leverage is negative, which suggests that high-levered firms earn less when rollover risk increases and refinancing costs raise. The coefficient on market-to-book ratio is 0.023, which means firms invest in projects with positive NPV rather than forgoing these opportunities. This suggests the agency conflict between managers and shareholders is not severe. In addition, asset volatility is associated with lower stock returns during this period. Another important finding is that distance-to-default is associated with higher abnormal returns with a coefficient of 0.017 and is significant at the 1% level. This positive relationship suggests that firms with less default risk experience better performance. Furthermore, the coefficient on bank-dependence is 0.007, which indicates that firms perform better despite they are restricted from public debt issuance and rely entirely on bank loans. The higher abnormal returns indicate that the CPFF program leads to spill-over effects to the real sector through the channel of loan provision. As will be shown in detail in the next section, bank loans or lines of credit serve as an important source of financing for unrated firms, as discussed in numerous papers.

In Column (2), I include the interaction of credit risk (distance-to-default) with the "CPFFbank" dummy. This yields similar results as in Column (1), with a slightly higher coefficient on the key variable "CPFFbank" dummy of 0.019. In Column (3), I further include the interaction of market-to-book ratio with the bank access to CPFF. The result on the positive relationship between explicit guarantee and stock returns is significant at the 1% level. To control for the heterogeneity across industries, I include industry fixed effects based on 2-digit SIC codes in Column (4). By controlling for size, leverage, growth opportunities, asset volatility, and credit risk, the regression results indicate that CPFF

banks' borrowers earned 3.66% higher returns than firms without CPFF lenders. From the identification perspective, the analysis of borrowers in the sample are less likely to be subject to selection problems. This is because I construct dominant lender-borrower relationships based on historical transactions, which has been fixed in the past. Using relationship between borrowers and lenders throughout the analysis leads reduces selection bias and the possibility of demand side considerations from borrowers. For example, the positive abnormal returns for borrowers are less likely driven by changes in demand when the financial market freezes.

In sum, the above analysis demonstrates the implications of liquidity backstop created by the Federal Reserve: it has not only reduced rollover risk in the commercial paper market based on the stock performance of CPFF banks, but has also generated positive spill-over effects to the real economy based on borrowers' earnings. The next question is: through which channel does the CPFF program generate higher abnormal returns to borrowers of CPFF recipient banks?

4.4 Loan Level Evidence

In this section, the objective is to investigate the channels through which the CPFF program generates positive spill-over effects for bank-dependent borrowers. In particular, I examine the new loans issued by "CPFFbank" before and after the financial crisis. Since the Federal Reserve's liquidity backstop provides short-term funding to eligible banks, this represents increases in the supply of credit to these recipient banks. However, a firm's demand for credit can also change at the peak of the financial crisis. As mentioned in Chava and Purnanandam (2011), clearly identifying the supply versus demand channel can be a challenging task, as they can both potentially shift at the same time. This question can be more complex if there exists credit rationing, where asymmetric information exists between borrowers and lenders.[10]

Here, I conduct the analysis by using the difference-in-difference approach. First, I focus on the subsample of firms with access to the facility ("CPFFbank") and examine a bank's provision of credit both before and after the financial crisis. Second, I investigate the lending behavior of banks solely in the post-crisis period and compare the amount and term of loans offered to borrowers with and without CPFF banks.

The CPFF Bank Sample

Since the key variable is the "CPFFbank" dummy, it is important to study the lending behavior of dominant banks in loan provision with and without access to the facility. Regression analysis using Difference-in-Differences estimation (DD) can remove time varying and bank fixed effects. This sample consists of detailed information on loan facility,

[10]In particular, I could extend the analysis in the paper by testing the joint effect of financial market distortions and credit rationing on the availability of bank lending. In addition, another question to be examined is that do non-relationship borrowers benefit from the emergency funding facility?

amount and term of loan, lenders for each borrower, as well as a bank's access to the CPFF program. In order to closely examine the changes in lending behavior around the financial crisis, the sample spans from January 2005 to December 2010 from the Dealscan database. Furthermore, loan-level data is merged with firm accounting variables from Compustat for each quarter.

In particular, I run the following regression to obtain estimates on outstanding loan amounts:

$$\begin{aligned} LOANAMOUNT_{i,t} &= \beta_0 + \beta_1 CPFFbank_i + \beta_2 CPFFbank_i * POSTCRISIS_{i,t} + \\ &+ \sum_{k=1}^{k=K} \gamma_k X_{i,t} + \epsilon_{i,t} \end{aligned} \tag{2}$$

where $LOANAMOUNT_{i,t}$ is the logarithm of loan amount received by firm i at quarter t. "CPFFbank" equals one if a bank had access to the Commercial Paper Funding Facility and equals zero otherwise. $POSTCRISIS_{i,t}$ equals one if any loan is issued after the financial crisis, defined as in or after the fourth quarter of 2008. The aim is to study the changes in loan issuance for borrowers with CPFF banks, before and after the disruption in the supply of credit arising from the financial crisis. In particular, the goal is to test whether the coefficient β_2 is economically and statistically significant from zero.

Detailed regression results are illustrated in Table 8. In Column (1), the coefficient on the key variable $CPFFbank_i * POSTCRISIS_{i,t}$ is 0.129 and significant at the 1% level. The interpretation of this result is as follows: the average firm experienced approximately a 13% increase in the bank loans issued by CPFF lenders, even after the third quarter of 2008. The increase in lending by a particular set of banks (CPFF recipients) indicates that government explicit guarantees generate a spillover effect of liquidity from lenders to borrowers, despite the financial market experienced sudden reductions in the supply of credit. Note that the coefficient on the CPFF dummy is 0.237, which suggests that lenders are willing to offer more loans in the pre-crisis period given access to the facility. I also include borrower characteristics that might affect loans provided by lenders, such as leverage, return on assets, the fraction of short-term debt (classified as short-term debt over total assets), market-to-book ratio, shareholder networth, and EBITDA to sales. Furthermore, to account for the borrower risk factors, I include the Altman Z-score, secure status of loans, and rating dummy. For example, financially healthy firms can obtain large amounts of loans from CPFF banks. If a loan is secured, lenders are willing to provide more credit. To capture the effect of default risk from unrated borrowers, I control for the rating dummy. The sign on the rating dummy is negative, which suggests that rated firms can easily access the public debt market instead of relying on bank loans.

In Column (2), the analysis is conducted by capturing any unobserved macroeconomic factors that can affect the lending behavior of banks. In particular, I include the credit spread between a BAA-rated bond and an AAA-rated bond, as well as the VIX index with

respect to volatility. The coefficient on credit spread is negative and is both economically and statistically significant. The negative sign means that widening of the credit spread causes banks to reduce loans offered in order to compensate for increases in default risk. In addition, I am able to obtain similar results after controlling for both various macro economic factors (such as VIX index) and borrower fixed effects.

In Columns (4) to (6), I extend the analysis by examining the spread on loans to understand the term of contracts, besides the amounts of loans offered. Prior to the crisis, financially banks charge a lower loan spread on borrowers, with a coefficient of -0.242. This indicates that borrowers could easily obtain funding prior to the financial crisis. The coefficient on the variable of interest ($CPFFbank_i * POSTCRISIS_{i,t}$) is 0.696, as shown in Column (4). Different from the quantity of bank loans supplied as illustrated in Column (1) to Column (3) , CPFF banks charge a higher premium on loans in the post-crisis period, as the supply of short-term funding is temporary.

The Post-crisis Sample

Having examined the implications of the CPFF on bank lending in periods both prior to and ex-post of the financial crisis, I further investigate the effect of the CPFF program on bank lending by focusing on the post-crisis period (from the fourth quarter of 2008 to the last quarter of 2010). This helps deepen understanding of banks' lending decisions after the financial shock and whether liquidity backstop can facilitate bank loan issuance.

Results are shown in Table 9. First, in Column (1), the coefficient on the interaction term $CPFFbank_i * POSTCRISIS_{i,t}$ is 0.286, which is positive and significant. The coefficient measures the increase in new loans offered by CPFF banks compared to those without in the post-crisis period. This is consistent with the previous analysis on CPFF banks only. Notice that, the lending volume increased by 10.3%, which suggests that banks are willing to extend more loans to relationship borrowers mostly in the years 2009 and 2010. All firm level control variables have the expected signs, as shown in Table 8, Columns (1) to (3).

I repeat the analysis on loan spread and the results are illustrated in Columns (4) to (6). In the post-crisis period, the average firm with and without access to CPFF bank experienced significant increases in loan spread, as lenders also faced a reduction in the supply of credit. However, different from Table 8, there is a disproportionate increase in loan premium: banks with access to government guarantees increase spread only slightly, which is not statistically significant. The coefficient on the key variable $CPFFbank_i * POSTCRISIS_{i,t}$ is merely 0.031, and is not statistically significant. This result on liquidity premium indicates that banks that had accessed the liquidity backstop experienced less rollover risk in the commercial paper market since the implementation of the facility as of October 2008. This demonstrates that the liquidity backstop can alleviate the financial constraints of recipient lenders by charging lower spread on bank loans. In sum, financial institutions with access to CPFF issued more new loans to the

real sector and charged lower premiums, despite the overall market supply of credit is limited in the post-crisis era.

Therefore, the Federal Reserve's explicit guarantees represent an increase in the supply of credit that reduces the default risk of banks that rely heavily on commercial paper market. These findings validate previous results on borrowers' positive abnormal returns. Furthermore, this paper establishes a particular channel through which liquidity backstop generates welfare gains to the real sector. Firms can benefit from the new loans offered if their dominant banks are the recipients of the program. This positive spill-over effect of liquidity backstop has important implications from the policy perspective, which will be discussed in later sections.

Monitoring on New Loans (Strictness of Covenant)

The main objective of the Commercial Paper Funding Facility was to increase the supply of credit to financial institutions and prevent systemic defaults at the peak of the crisis. This section examines how this positive shock affects debt contracts offered by lenders beyond the increases in loans supplied and decreases in spread on new loans. In particular, the focus is on how covenant strictness changes when banks have access to the emergency funding facility. This study helps to understand whether banks increase monitoring practices to prevent potential moral hazard problems. The potential questions are: 1) how do CPFF banks impose the contract strictness given that they receive explicit guarantees from the government? 2) In the post-crisis period, do firms experience a tightening of lending standard through covenant strictness?

In the analysis below, I adopt Murfin (2012)'s measure of covenant strictness, which is based on the probability of continent lender control as result of covenant violation. In particular, the analysis is conducted with the following regression:

$$\begin{aligned} STRICTNESS_{i,t} &= \theta_0 + \theta_1 CPFFbank_i + \theta_2 CPFFbank_i * POSTCRISIS_{i,t} + \\ &\quad + \lambda X_{i,t} + \epsilon_{i,t} \end{aligned} \tag{3}$$

where i represents the firm.

The goal is to properly capture the effect of liquidity backstop on covenant tightness through lender monitoring. The regression includes variables to control for borrower risk, such as leverage, log of debt to tangible net worth, log of fixed charge coverage, log of current ratio, and log of income. These firm-level controls are important factors as banks design covenant strictness contingent on borrowers' risk profiles. In addition, to alleviate the impact of time-varying unobservable factors at the firm level, I control for borrower fixed effects. The key question is: how lenders change the strictness of a loan contract when liquidity backstop becomes available?

The results are shown in Table 10. In Column (1), the coefficient on the interaction term between CPFF dummy and POST-CRISIS dummy is -0.034 and is significant at the

5% level. This negative sign suggests that lenders offer more slack covenants in response to government guarantees. The intuition is that as banks experience increases in the supply of credit externally, they will be less likely to offer stringent contracts. Consequently, given less tight covenant terms, the probability that borrowers breach covenant is reduced. In addition, creditors suffer fewer losses due to credit risk from borrowers, which can contribute to higher earnings and better stock performance. This is consistent with Murfin (2012)'s results, where lender-side defaults trigger a tightening of contracts as a result of capital depletion. The difference is, he uses a negative supply-side shock while the CPFF in my paper represents a positive shock to the supply of credit. In particular, liquidity backstop created by the government increases a bank's capital and leads to greater loan issuance, as shown in the previous section. More broadly, this result is consistent with the literature of financial contracting in the following way: borrowers experience less covenant violation with more slack contracts, which also leads to less reduction in investment spending, as shown in Chava and Roberts (2008). As a result, borrowers benefit from covenant slackness and earn higher stock returns, as shown in the previous analysis.

In Column (2), I also include controls for loan characteristics, such as the secure status of a facility, the log of deal maturity (in months), and the log of facility amount (in millions). The sign on these variables are all positive, which indicates that lenders have incentives to monitor the loans closely if a facility represents a significant portion of its portfolio. Again, the findings on reductions in covenant strictness remain valid once loan-level controls are taken into consideration. Column (3) examines whether lenders tightened their contracts in response to the announcement of the CPFF program in the post-crisis period. Similar to the results in Columns (1) and (2), the sign on the interaction term is still negative but it is not statistically significant. In addition, the coefficient on POST-CRISIS dummy is only significant at the 10% level. Furthermore, it is interesting to explore the changes in loan contract strictness due to renegotiations as in Roberts and Sufi (2009), by comparing the term of contract differentiation before and after the initiation of the CPFF facility.

Supply and Demand Issue

Given the objective of this chapter is to examine the positive implications of the Commercial Paper Funding Facility, the results could be biased due to reverse causality. On one hand, an adverse shock leads to a decrease in the supply of credit. On the other hand, poor economic conditions are associated with reductions in the demand of credit as investment opportunities deteriorate. From an econometrics perspective, demand side can lower stock returns. This is not the case in my analysis, as I use government guarantees as a quasi-experiment to identify and exploit the impact of positive shocks from the supply side only. The results on positive abnormal returns provide a conservative measure of the liquidity backstop if there exists any reverse causality.[11] For example, one can extend the

[11]If there exists any reverse causality problems, we should expect borrowers to experience worse stock

analysis to borrowers that are less affected by the financial crisis. This allows us to prevent demand-side considerations from affecting the results (e.g., international borrowers of CPFF recipient banks, as they are less likely affected by the financial market distortions in the U.S.). Moreover, exploiting whether there exists a positive spill-over effect of the U.S. government guarantees on international borrowers could be an interesting research topic in the future.

5 Extensions

5.1 Credit Risk Changes after the CPFF Program

Previous sections show the effectiveness of the Commercial Paper Funding Facility in providing liquidity to eligible financial institutions through direct repurchasing of commercial paper. This contributes to lower rollover risk, especially at the peak of the most recent financial crisis. Importantly, there exists a positive spill-over effect to borrowers from CPFF recipient banks when they had established, strong past relationships. For example, prior empirical evidence indicates that lenders with access to the liquidity backstop are willing to offer significantly more new loans even when the market supply of credit is limited. Through the increased lending channel, the event study results demonstrates that borrowers of CPFF banks earned higher stock returns in the year 2008 by using event-study methodology, as in the previous analysis.

The next question is: Did the CPFF program serve to reduce the default risk of financial institutions? This question has important implications, as the ultimate goal of the Federal Reserve is to prevent systemic defaults. If the answer is yes, can the program serve to decrease the probability of default of borrowers once their CPFF banks offer more new lines of credit? In a general context, whether government explicit guarantees help to prevent systemic risk of financial and nonfinancial institutions becomes a crucial question from the policy perspective. In particular, it is important to test whether the liquidity backstop is associated with more or less risk taking by both CPFF banks and their borrowers ex-post? Numerous theoretical and empirical works address the potential negative consequences of government intervention due to moral hazard when central banks act as the lender-of-last resort. Therefore, it is important to study whether there exists moral hazard upon receiving liquidity backstop, which leads to higher risk taking by both banks and firms.

Although the previous analysis shows that the CPFF program facilitates new lending to the real sector, it is interesting to investigate how credit risk changes for both CPFF recipient banks as well as for their relationship borrowers. Therefore, the key variable to exploit is the risk taking of both lenders and borrowers before and after the liquidity pro-

performance due to demand side considerations. As a result, we should expect even more positive significant results.

vision. One measure of a firm's default risk is the distance-to-default, which captures asset volatility, equity volatility, and the fraction of long versus short-term debt. If there exists a negative relationship between liquidity provision and distance-to-default, the CPFF can serve to reduce moral hazard issues. There are also alternative measures of risk taking activity for structured investment vehicles, as described in another work by Kacperczyk and Schnabl (2013). They use holding risk and maturity risk to capture the changes in risk taking by the money market funds when there exists implicit recourse by sponsoring institutions.

Beyond exploring the idiosyncratic risk of financial institutions, it is equally important to address the implication of the funding facility in reducing systemic risk. This offers a unique channel to exploit the impact of liquidity provision by the government on the risk management of financial institutions. Markit CDS data offers a fruitful resource to test whether the CPFF program leads to lower individual default risk as well as systemic risk. In particular, it is important to recognize the financial networks between CPFF recipient banks and other banks with existing CDS contracts. The intuition is that when the Federal Reserve provides short-term funding to mitigate rollover risk for target banks, other banks with extensive connections can also benefit from the guarantees. My conjecture is that the liquidity facility can serve to reduce default risk for financial institutions within a given network. Testing the effect of the CPFF program on systemic risk has important implications from a policy perspective, as the ultimate goal is to prevent systemic risk and restore financial stability.

5.2 Explicit Guarantee versus Implicit Guarantee

The above analysis focuses on the role of explicit government guarantees in providing liquidity backstop to large and important financial institutions. Alternatively, there exists different types of mechanisms/guarantees that enable a financial institution to transform its losses in the balance sheet of sponsoring institution. One important type of recourse frequently used by financial intermediaries is implicit guarantees. For example, recent research by Kacperczyk and Schnabl (2013) provides insights as to how implicit guarantees can lead to increasing risk taking activity during the financial crisis of 2007-2010. They show that money market funds have incentives to search for yield by expanding risk-taking opportunities, which causes runs by investors. In particular, funds are more likely to take excessive risks when sponsored by institutions through implicit guarantees.

Therefore, it is an interesting experiment to examine whether implicit guarantees can work as close substitutes to government guarantees. The reason is that financial institutions that have access to the CPFF program are also the institutions that provide guarantees to the conduits. For example, the ten largest sponsors identified in Acharya, Schnabl and Suarez (2013) are also active in using the CPFF program, as documented in an unreported table. Acharya, Schnabl and Suarez (2013) find that losses from conduits remained within the bank balance sheets without risk transfer to investors. Therefore,

whether these sponsors utilize the government guarantees to provide implicit guarantees and recover the losses from conduits becomes an important question. By exploring this question, one can get a comprehensive understanding of the substitutability between explicit guarantees by the government and implicit guarantees by sponsoring institutions. In addition, whether explicit or implicit guarantee is more effective in discouraging risk-taking behavior has important implications. This comparison can be made by matching the CPFF recipient banks with the sponsors of implicit guarantees as in Schnabl's data set.

Previous results indicate that the liquidity backstop offered by the government can transmit from the financial sector to the real economy. One can use the CPFF program as a quasi-experiment to explore its implications in an international context. This is because, my hand-collected dataset on the recipient banks indicated that a significant portion of these large financial institutions have operations in both domestic and international markets. With this in mind, it is important to identify whether these commercial banks have an incentive to increase lending volume to international borrowers. Therefore, we can compare the changes in new loans issued to domestic firms versus those issued to international firms. This helps us to better understand the changes in the operations of banks in an international context as a result of U.S. government guarantees. From a methodology perspective, using the data on banks operating in international markets ensures that the results are purely driven by supply-side considerations, as mentioned earlier. For example, it is unlikely that the Federal Reserve's policy is affected by the demand for credit by international firms.

6 Conclusion

Given the disruption in the short-term lending following Lehman Brothers' bankruptcy, the Federal Reserve announced the initiation of the Commercial Paper Funding Facility (CPFF) on October 7, 2008 to mitigate the rollover risk in the commercial paper market for systemically important financial institutions. Through repurchasing commercial paper from eligible banks, the objective of the CPFF program is to increase the supply of credit and reduce the systemic risk of financial institutions. In this context, the CPFF offers a unique opportunity to explore the effectiveness of government explicit guarantees in restoring financial stability.

In this paper, the empirical analysis shows that the program is associated with value creation as a result of liquidity backstop from both stock performance and loan provision. First, the CPFF recipient banks experienced significant positive abnormal returns from the announcement date on October 7, 2008 to the closing date on February 1, 2010. Investors interpret government liquidity provision as a signal to mitigate rollover risk in the ABCP market. Second, beyond investigating the positive effects of the CPFF on recipient banks' capital, I explore the indirect implications of the emergency facility on

their borrowers' performance. The analysis is conducted by using quasi-experimental design and hand-collected data sets relying on the relationship between CPFF lenders and borrowers. this paper show that borrowers earn higher stock returns and obtain greater amounts of loans when their lenders have access to the liquidity backstop. In particular, the results strongly support the hypothesis that CPFF bank-dependent borrowers gain from the liquidity backstop, despite the exists of severe disruption in the supply of credit during the financial crisis. The increases in earnings are significant, especially for borrowers with greater growth opportunities. In terms of bank loans, CPFF lenders increase the quantity of loans provided and decrease the yield for firms with which they have strong past relationships. Therefore, the results suggest that the CPFF program became an important source of liquidity to eligible financial institutions, but it has generated a multiplied positive effects on bank-dependent borrowers in the real sector by increasing the supply of capital.

This paper is related to various strands of literature in banking, corporate finance, and financial regulation. The regression analysis highlights the positive effect of liquidity backstop in providing timely short-term credits to systemically important institutions. Moreover, the results support the view that guarantees increase the performance of both target lenders and borrowers, which facilitates lending from financial institutions to non-financial institutions. From a broader perspective, this bridges the gap between the literature in banking and government intervention.

Because they provide liquidity backstop, government interventions have been debated frequently since the most recent financial crisis. One of the questions related to guarantees is the moral hazard problem. For example, it is important to explore the implications of this liquidity backstop in mitigating risk-taking behavior by various market participants, such as money market funds and asset-backed commercial paper conduits. Another important question to be explored is: can explicit guarantees decrease risk taking by CPFF banks, as conduits (funds) can potentially recourse back the losses from conduits to the CPFF recipient banks? In addition, how should a government design and adjust capital requirements for CPFF recipient banks to prevent excessive risk taking based on various measures? The regulations can be made across the various dimensions of liquidity, credit risk, asset maturity structure, and disclosure rules. In this context, a comprehensive evaluation of the CPFF program and its implications for the market participants can serve to guide future policy discussions, especially for designing the Dodd-Frank Act and future financial regulations on the commercial paper market.

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Appendix A

- Asset ret07 measures the annual past one year (year 2007) stock return.
- Bankdep (Rated) is a dummy variable that takes the value of one for firms with a S&P long-term credit rating and zero for firms without such rating.
- Debt-to-tanworth is calculated as: (long-term debt +debt in current liabilities)/(total assets-total liabilities - intangible assets)
- Distance-to-default (D2D) is a measure of a firm's default risk. It is computed as $\frac{log(E+F/F)+(r_{it}-(\sigma_V^2)/2)T}{\sigma_V\sqrt{T}}$. This is also consistent with Bharath and Shumway 2008. In the expression above, E is the market value of equity; F is the value of debt, calculated as short-term debt plus half of long-term debt; and σ_V is the asset volatility and equals to $\frac{E}{E+F}\sigma_E + \frac{F}{E+F}(0.05 + 0.25 * \sigma_E)$.
- Ebitda-to-sales is the ratio of earnings from EBITDA divided by the sales of the firm.
- Equity vol08 (σ_E) is the equity volatility of a firm over the past one year (year 2007 in my analysis).
- Exdep measures the dependence of a firm on external financing. It is calculated as the difference between total investments and cash flow from operations, scaled by cash flow from operations. This variable is constructed at four-digit SIC industry level and obtained by taking the median value at each industry.
- Fixed charge coverage is defined as: operating income before depreciation/(interest expenses + debt in current liabilities)
- Log(amt) is the natural logarithm of the loan amount offered by a lender, as recorded in each facility level.
- Log(maturity) is the natural logarithm of the maturity offered by a lender, as recorded in each facility level.
- Log(sales) is the natural logarithm of sales measured in millions of U.S. dollars.
- Log(spread) is the natural logarithm of the all-in-drawn loan spread, which is measured as the spread over LIBOR at each facility.
- Secured dummy measures whether a facility in Dealscan is in secured status.
- Z-score is defined as: 3.3 *operating income/total assets + sales/total assets + 1.4*retained earnings/total assets + 1.2*(current assets-current labilities)/total assets +0.6*market value equity/total liabilities.

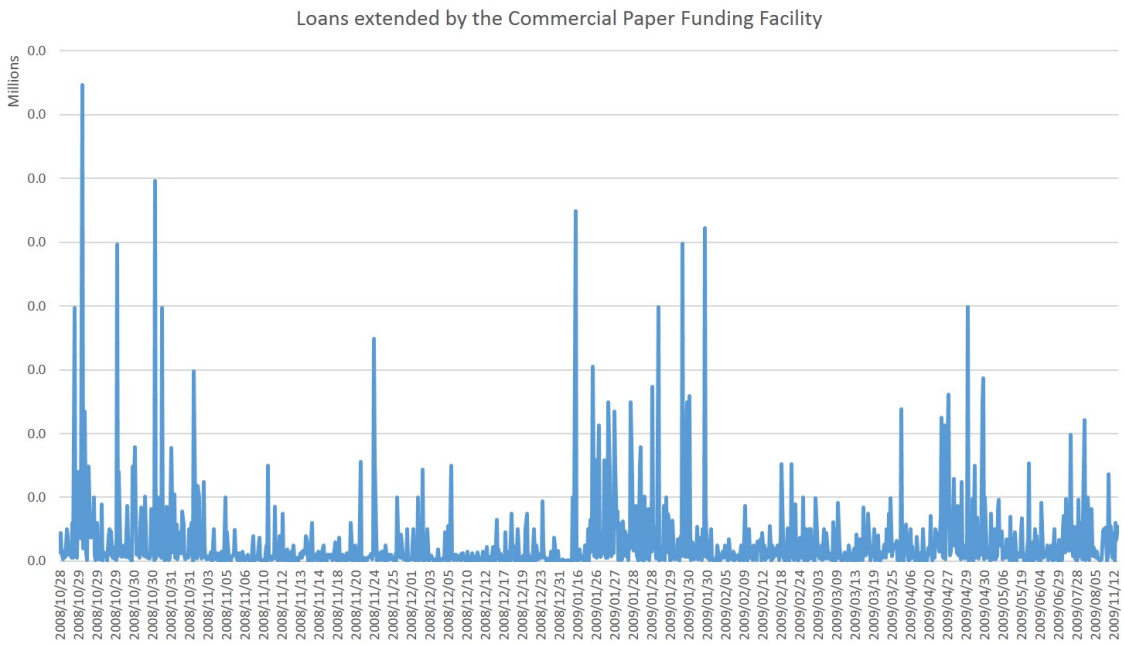

Figure 1: This figure shows the daily amount of loans extended in millions of dollars by the CPFF program, from the Federal Reserve Board.

Table 1: This table illustrates the ten largest sponsors by total amount that used the Commercial Paper Funding Facility during the period of October 27, 2008 to February 1, 2010. The names are shown at sponsor level instead of issuer level. This information is collected from the Federal Reserve Board. The "Amount (millions)" column indicates the total amount of CP/ABCP purchased by the Federal Reserve. The "Frequency" column shows the total numbers of transactions. The "Discount Rate" column denotes the fee for unsecured commercial paper, which is equal to a three-month overnight index swap (OIS) rate plus 100 basis points per annum. The discount rate imposed for asset-backed commercial paper was a three-month OIS plus 300 basis points. The "Credit Enhance" column indicates the surcharge of a 100 basis point per annum fee paid up front on each sale of commercial paper to the CPFF LLC in the cases without any collateral.

Parent/Sponsor Name	Amount (millions)	Frequency	CP Type	Discount Rate (%)	Credit Enhance (%)
UBS	74531.102	11	CP	1.452	1.000
American International Group	60230.602	90	CP	1.908	0.711
Dexia SA	53476.301	42	CP	1.370	1.000
Hudson Castle	53343.199	48	ABCP	3.320	0.000
BSN Holdings	42794.000	57	ABCP	3.326	0.000
The Liberty Hampshire Company	41379.801	36	ABCP	3.365	0.000
Barclays PLC	38774.898	7	CP	1.320	1.000
Royal Bank of Scotland Group	38517.000	67	ABCP	2.975	0.164
Fortis Bank SA/NV	38483.699	69	ABCP	3.173	0.072
Citigroup	32735.000	10	ABCP	2.711	0.000
Total	474265.602	437			

Table 2: This table reports summary statistics for key variables used in the analysis of on stock performance of non-financial firms (borrowers) at the intersection of CRSP/Compustat databases. All firm-level accounting information is obtained as of July 2008. This table tabulates the summary statistics for borrowers with and without CPFF banks (banks with access to the Commercial Paper Funding Facility) in Panel A and Panel B respectively. Size is the logarithm of total assets. Lev is the ratio of total debt (long-term debt plus short-term debt) to total assets. ROA is the ratio of operating income before depreciation to total assets. Market-to-book is the market value of assets to total assets. Distance-to-default measures the default risk of the firm, based on Bharath and Shumway (2008). The absence of long-term credit rating is taken as a proxy for the bank-dependence (Bankdep) dummy. Variable definitions appear in Appendix A.

Panel A: CPFF=1 for borrower sample (observation= 256658)					
	Mean	SD	25th Pctl	Median	75th Pctl
Size	7.791	1.780	6.580	7.659	8.960
Lev	0.604	0.229	0.462	0.604	0.730
ROA	0.029	0.064	0.017	0.030	0.046
Sales	6.043	1.750	4.926	5.913	7.219
Market-to-book	1.521	0.878	1.009	1.261	1.705
Cashflow	-0.050	1.940	0.024	0.074	0.197
Ebitda-to-sales	-6.799	2.961	0.072	0.151	0.270
Bankdep	0.247	0.432	0.000	0.000	0.000
Distance-to-default	3.020	2.807	1.297	2.674	4.172
Equity vol08	0.630	0.238	0.470	0.592	0.753
Asset ret07	0.001	0.487	-0.289	-0.058	0.187

Panel A: CPFF=0 for borrower sample (observation= 153496)					
	Mean	SD	25th Pctl	Median	75th Pctl
Size	7.975	2.173	6.483	7.816	9.256
Lev	0.635	0.360	0.469	0.611	0.766
ROA	0.025	0.089	0.016	0.030	0.045
Sales	6.022	2.025	4.759	5.891	7.377
Market-to-book	1.474	1.151	0.988	1.186	1.602
Cashflow	0.239	13.315	0.020	0.070	0.176
Ebitda-to-sales	-1.896	50.852	0.078	0.168	0.296
Bankdep	0.287	0.452	0.000	0.000	1.000
Distance-to-default	2.742	2.623	0.861	2.355	4.070
Equity vol08	0.621	0.242	0.451	0.573	0.744
Asset ret07	0.011	0.501	-0.259	-0.043	0.177

Table 3: This table provides the correlations between the main variables for the borrower sample during the year 2008. These variables are firm-level controls in the intersection of the CRSP/Compustat data set used for the calculation of cumulative abnormal returns (CAR).

	Size	Lev	ROA	Sales	Market-to-book	Cashflow	Bankdep	Distance-to-default	Equity vol08	Asset ret07
Size	1.000									
Lev	0.178	1.000								
ROA	0.123	-0.405	1.000							
Sales	0.859	0.102	0.255	1.000						
Market-to-book	-0.101	0.180	-0.110	-0.027	1.000					
Cashflow	0.030	-0.059	0.116	0.156	-0.004	1.000				
Bankdep	0.025	0.030	-0.018	-0.039	0.027	0.021	1.000			
Distance-to-default	0.049	-0.372	0.207	0.164	0.428	0.025	-0.066	1.000		
Equity vol08	-0.187	0.229	-0.260	-0.305	-0.140	-0.053	0.064	-0.564	1.000	
Asset ret07	0.075	-0.098	0.124	0.107	0.202	0.035	0.014	0.400	-0.112	1.000

Table 4: This table shows the probit regression that predicts the likelihood for a firm to have a CPFF lender. The dependent variable equals one if a firm has a lender that had access to the facility and zero otherwise. The sample contains all matched pairs between borrowers and lenders with both firm accounting information and daily stock returns in the year 2008. Detailed variable definitions appear in Appendix A.

	(1)	(2)
	Pr(CPFF=1)	Pr(CPFF=1)
Lev	-0.250***	-0.208***
	0.013	0.012
Size	-0.020***	-0.024***
	0.001	0.001
Market-to-book	0.014***	0.013***
	0.004	0.003
ROA	0.545***	0.494***
	0.047	0.043
Cashflow	-0.010***	-0.006***
	0.001	0.001
Asset ret07	-0.087***	-0.081***
	0.005	0.005
Equity vol08	-0.051***	0.056***
	0.013	0.012
Distance-to-default	0.016***	0.019***
	0.001	0.001
Bankdep	-0.029***	-0.040***
	0.006	0.005
Observations	323,963	327,188
Industry fixed effects	No	Yes

Table 5: Panel A of Table 5 reports the distribution of the cumulative abnormal returns for lender samples at the intersection of CRSP/Compustat and Dealscan in the year 2008. In particular, the cumulative abnormal returns are calculated using standard event study to compute the market model of adjusted return. For every bank in the sample, I first estimate the market-model beta using using 150 trading days, ending 50 trading days prior to the financial crisis, which occurs on September 15, 2008. Based on these estimates, I obtain the cumulative abnormal returns for the event window, which spans from October 7, 2008 to October 27, 2008. Panel B of Table 5 presents the regression results of lenders' CAR on their characteristics. The dependent variable is the market model adjusted CAR. In the first and second columns of Panel B, the regressions are based on the whole sample of 172 banks; in the third and fourth columns of Panel B, the estimates are obtained from the sample of banks with high rating (with ratings A or higher). Variable definitions appear in Appendix A.

Panel A: CPFF=1 for lender sample (observation= 3289)					
	Mean	SD	25th Pctl	Median	75th Pctl
CAR	0.02	0.23	-0.141	0.117	0.177
CPFF=0 for lender sample (observation= 39464)					
	Mean	SD	25th Pctl	Median	75th Pctl
CAR	-0.008	0.233	-0.152	0.025	0.13

	All banks		High rated banks only	
	(1) CAR	(2) CAR	(3) CAR	(4) CAR
CPFF dummy	0.040***	0.070***	0.287***	0.202***
	0.005	0.005	0.011	0.010
Lev	-0.115***	-0.143***	0.064***	-0.044***
	0.007	0.007	0.015	0.014
Size	0.001	0.002***	-0.035***	-0.048***
	0.001	0.001	0.002	0.001
ROA	0.512***	0.333***	-1.736***	-1.928***
	0.056	0.048	0.091	0.093
Short-term debt	0.207***		-0.421***	
	0.009		0.027	
Market equity	0.273***	0.302***	0.680***	0.728***
	0.028	0.028	0.025	0.026
Ebitda-to-sales	-0.003***	-0.003***	0.080***	0.080***
	0.000	0.000	0.008	0.008
EXDEP sic	0.000***	0.000***	0.000***	0.000***
	0.000	0.000	0.000	0.000
Rated	0.102***	0.119***		
	0.003	0.003		
Observations	31,136	33,657	5,249	5,249
R-squared	0.084	0.081	0.334	0.301

Table 6: This table illustrates the average treatment effect, which is given by the mean difference in abnormal returns between the matched CPFF banks and non-CPFF banks. Matching is done from the propensity score method. Column (1) and Column (3) use the baseline event window from October 7 to October 27, 2008 (the period between the announcement of the program to the first date of commercial paper purchase. Column (2) and (4) display the results with a longer event window (referred to as "60-Day Event Window", from October 7 to December 26, 2008 (60 days after the first purchase date). Column (1) and Column (2) are based on estimation window [-50, -150](50 trading days prior to the financial crisis on September 15, 2008 to 150 trading days prior); Column (3) and Column (4) are based on a closer estimation window [-30, -100](30 trading days prior to the financial crisis on September 15, 2008 to 100 trading days prior).

	Estimation Window [-50, -150]		Estimation Window [-30, -100]	
	Baseline Event Window	60-Day Event Window	Baseline Event Window	60-Day Event Window
	(1)	(2)	(3)	(4)
Average treatment effect	0.040	0.056	0.095	0.083
t-stat	4.203	2.459	9.898	4.041
N controls	3289	3289	3289	3289
N treated	15997	15997	15997	15997

Table 7: Panel A reports the distribution of the cumulative abnormal returns for borrower sample at the intersection of CRSP/Compustat and Dealscan in the year 2008. In particular, the cumulative abnormal returns are calculated using standard event study to compute the market model of adjusted return. For every bank in the sample, I first estimate the market-model beta using 150 trading days, ending 50 trading days prior to the financial crisis as of September 15, 2008. Based on these estimates, I obtain the cumulative abnormal returns for the event window, which spans from October 7, 2008 to October 27, 2008. Panel B of Table 5 presents regression results relating borrowers' CAR to their characteristics. The dependent variable is the market model adjusted CAR. Variable definitions appear in Appendix A.

Panel A: CPFF=1 for borrower sample					
	Mean	SD	25th	Median	75th
CAR	-0.060	0.303	-0.167	-0.018	0.105
CPFF=0 for borrower sample					
	Mean	SD	25th	Median	75th
CAR	-0.076	0.295	-0.193	-0.033	0.106

Panel B: Regression results for stock performance of borrowers				
	(1)	(2)	(3)	(4)
	CAR	CAR	CAR	CAR
CPFF dummy	0.007***	0.009***	0.019***	0.037***
	0.001	0.002	0.002	0.002
Lev	-0.088***	-0.087***	-0.090***	-0.118***
	0.003	0.003	0.003	0.003
Size	0.017***	0.017***	0.017***	0.013***
	0.000	0.000	0.000	0.000
Market-to-book	0.023***	0.022***	0.027***	0.038***
	0.001	0.001	0.001	0.001
ROA	0.046***	0.046***	0.067***	0.130***
	0.009	0.009	0.010	0.009
Asset ret07	-0.013***	-0.013***	-0.013***	-0.012***
	0.001	0.001	0.001	0.001
Equity vol08	-0.137***	-0.136***	-0.137***	-0.092***
	0.003	0.003	0.003	0.003
Distance-to-default	0.017***	0.017***	0.017***	0.018***
	0.000	0.000	0.000	0.000
Distance-to-default*CPFF		-0.001		
		0.000		
Bankdep	0.007***	0.007***	0.007***	0.014***
	0.001	0.001	0.001	0.001
Market-to-book*CPFF			-0.008***	-0.020***
			0.001	0.001
Observations	333,810	333,810	333,810	333,810
R-squared	0.077	0.077	0.077	0.176
Industry fixed effects	No	No	No	Yes

Table 8: This table displays the implications of the Commercial Paper Funding Facility (CPFF) based on bank loans provided by CPFF recipient lenders. A bank is referred to as "CPFF bank" if it had access to the CPFF program with the purchase of commercial paper by the Federal Reserve. POSTCRISIS equals one if the loan is originated in the fourth quarter of 2008 or after and zero otherwise. The dependent variables in Columns (1) to (3) is the natural log of the facility amount. The dependent variable in Columns (4) to (6) is the log of all-in-drawn spread measured as the spread over LIBOR in Dealscan. This sample consists of lenders and borrowers with the most strong relationship (e.g., each borrower is matched with its dominant lender with the most frequent historical relationships, in terms of facility amounts, number of facilities offered, etc.) The results are robust to alternative matching methods based on other criteria. This sample is at the intersection of CRSP/Compustat and Dealscan from January 2005 to December 2010. Variable definitions appear in Appendix A.

	(1)	(2)	(3)	(4)	(5)	(6)
	Log(amt)	Log(amt)	Log(amt)	Log(spread)	Log(spread)	Log(spread)
CPFFbank	0.237***	0.224***	0.224***	-0.242***	-0.182***	-0.182***
	0.015	0.015	0.036	0.007	0.007	0.016
POSTCRISIS*CPFFbank	0.129***	0.167***	0.167***	0.696***	0.493***	0.493***
	0.023	0.025	0.064	0.011	0.012	0.032
Lev	0.200***	0.185***	0.185	0.263***	0.292***	0.292**
	0.047	0.047	0.287	0.022	0.022	0.137
ROA	4.849***	4.688***	4.688***	-2.232***	-1.825***	-1.825***
	0.209	0.209	1.042	0.105	0.102	0.575
Short-term debt	-2.214***	-2.159***	-2.159***	-0.103**	-0.122***	-0.122
	0.088	0.088	0.478	0.041	0.040	0.241
Market-to-book	-0.251***	-0.259***	-0.259***	-0.104***	-0.083***	-0.083***
	0.009	0.009	0.050	0.004	0.004	0.020
Shareholder worth	-0.803***	-0.812***	-0.812***	-0.056**	-0.046**	-0.046
	0.047	0.047	0.293	0.022	0.022	0.142
Ebitda-to-sales	0.000	0.000	0.000	0.000***	0.000***	0.000***
	0.000	0.000	0.000	0.000	0.000	0.000
Z-score	0.001	0.002	0.002	0.001	-0.001	-0.001
	0.003	0.003	0.021	0.001	0.001	0.007
Secured dummy	1.286***	1.284***	1.284***	-0.830***	-0.825***	-0.825***
	0.014	0.014	0.071	0.007	0.006	0.037
Rated	-0.035**	-0.036**	-0.036	-0.102***	-0.096***	-0.096**
	0.015	0.015	0.090	0.007	0.007	0.043
BaaAaa spread		-0.221***	-0.221*		-0.100***	-0.100**
		0.028	0.116		0.013	0.050
VIX		0.004**	0.004		0.023***	0.023***
		0.002	0.006		0.001	0.003
Observations	48,589	48,589	48,589	45,462	45,462	45,462
R-squared	0.206	0.209	0.209	0.397	0.435	0.435
Firm fixed effects	No	No	Yes	No	No	Yes

Table 9: In this table, I analyze the changes in bank loans provided by CPFF recipient lenders before and after the financial crisis. A bank is referred to as "CPFF bank" if it had access to the CPFF program with the purchase of commercial paper by the Federal Reserve. POSTCRISIS equals one if the loan is originated in the fourth quarter of 2008 or after and zero otherwise. The dependent variables in Columns (1) to (3) is the natural log of the facility amount. The dependent variable in Columns (4) to (6) is the log of all-in-drawn spread measured as the spread over LIBOR in Dealscan. This sample consists of lenders and borrowers with the most strong relationship (e.g., each borrower is matched with its dominant lender with the most frequent historical relationships, in terms of facility amounts, number of facilities offered, etc.) The results are robust to alternative matching methods based on other criteria. This sample is at the intersection of CRSP/Compustat and Dealscan from January 2005 to December 2010. Variable definitions appear in Appendix A.

	(1)	(2)	(3)	(4)	(5)	(6)
	Log(amt)	Log(amt)	Log(amt)	Log(spread)	Log(spread)	Log(spread)
POSTCRISIS	0.103***	0.0629***	0.199***	0.574***	0.716***	0.574***
	0.014	0.015	0.070	0.033	0.007	0.033
POSTCRISIS*CPFFbank	0.286***	0.265***	0.251***	0.031	-0.008	0.031
	0.020	0.023	0.046	0.024	0.011	0.024
Lev	-0.991***	0.210***	0.205	0.339**	1.103***	0.339**
	0.041	0.047	0.290	0.133	0.022	0.133
ROA	7.126***	4.950***	4.671***	-2.024***	-3.999***	-2.024***
	0.184	0.209	1.055	0.561	0.101	0.561
Shortdebt	-0.676***	-2.175***	-2.088***	-0.011	-0.813***	-0.011
	0.080	0.088	0.483	0.239	0.042	0.239
Market-to-book	-0.171***	-0.243***	-0.251***	-0.063***	-0.095***	-0.063***
	0.007	0.009	0.051	0.019	0.004	0.019
Shareholder worth	-1.368***	-0.805***	-0.799***	0.018	0.325***	0.018
	0.038	0.047	0.294	0.138	0.021	0.138
Ebitda-to-sales	0.000	0.000	0.000	-0.000***	-0.000***	-0.000***
	0.000	0.000	0.000	0.000	0.000	0.000
Z-score		0.001	0.002	-0.001		-0.001
		0.003	0.021	0.007		0.007
Secured dummy		1.287***	1.281***	-0.834***		-0.834***
		0.014	0.072	0.036		0.036
Rated		-0.028*	-0.026	-0.078*		-0.078*
		0.015	0.090	0.044		0.044
BaaAaa spread			-0.127	0.070		0.070
			0.121	0.049		0.050
VIX			-0.007	0.002		0.002
			0.007	0.003		0.003
Observations	72,504	48,589	48,589	45,462	64,371	45,462
R-squared	0.048	0.203	0.207	0.481	0.262	0.481
Firm fixed effects	No	No	Yes	No	No	Yes

Table 10: This table shows the regression results on the tightness of debt covenants imposed by lenders on bank loans. I include triple interaction terms to capture the effects of the CPFF program on debt covenant strictness, and the changes in the tightness of debt covenants before and after the financial crisis. A bank is referred to as "CPFF bank" if it had access to the CPFF program with purchase of commercial paper by the Federal Reserve. POSTCRISIS equals one if the loan is originated in the fourth quarter of 2008 or after and zero otherwise. The dependent variables in Columns (1) to (3) is the natural log of the facility amount. The dependent variable in Columns (4) to (6) is the log of all-in-drawn spread measured as the spread over LIBOR in Dealscan. This sample consists of lenders and borrowers with the most strong relationship (e.g., each borrower is matched with its dominant lender with the most frequent historical relationships, in terms of facility amounts, number of facilities offered, etc.) The results are robust to alternative matching methods based on other criteria. This sample is at the intersection of CRSP/Compustat and Dealscan from January 2005 to December 2010. Variable definitions appear in Appendix A.

	(1)	(2)	(3)
	Cov Tight	Cov Tight	Cov Tight
CPFFbank	-0.001	-0.002	
	0.009	0.009	
POSTCRISIS*CPFFbank	-0.034**	-0.036**	-0.017
	0.017	0.017	0.011
POSTCRISIS			-0.028*
			0.016
Lev	0.215***	0.205***	0.204**
	0.080	0.080	0.080
Debt-to-tanworth	0.016**	0.016**	0.015**
	0.007	0.007	0.007
Current ratio	-0.020	-0.016	-0.013
	0.017	0.017	0.017
Fix charge ratio	-0.014**	-0.015**	-0.015**
	0.006	0.006	0.006
Log(income)	-0.051***	-0.063***	-0.062***
	-0.005	-0.007	-0.007
Z-score	-0.006**	-0.006*	-0.007**
	0.003	0.003	0.003
Secured dummy	0.031*	0.029	0.028
	0.019	0.019	0.019
Rated	0.027	0.024	0.022
	0.022	0.022	0.022
Log(maturity)		0.012	0.008
		0.014	0.014
Log(amt)		0.020**	0.020**
		0.008	0.008
Observations	31,008	30,809	30,809
R-squared	0.122	0.128	0.129