

Adverse Selection in Central Bank Lending – An Empirical Analysis of the Federal Reserve’s Primary Credit Program*

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Abstract

Using a comprehensive, micro-level loan dataset, we study the primary credit program, the Federal Reserve’s main short-term lending program since 2003. Prior literature suggests that many eligible depository institutions are reluctant to participate out of concern that borrowing from the central bank signals financial weakness. Our analysis of primary credit loans from 2003 to 2019 reveals that borrowing does not negatively affect institutions in capital markets or by bank supervisors. A plausible explanation for the persistence of stigma among banks is the opacity surrounding the program, which hinders banks’ ability to verify that there are no adverse consequences associated with borrowing.

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[Silicon Valley Bank] did not test its capacity to borrow at the discount window in 2022 and did not have appropriate collateral and operational arrangements in place to obtain liquidity... While contingent funding may not have been able to prevent the failure of the bank after the historic run on the bank, the lack of preparedness may have contributed to how quickly it failed.

—Federal Reserve Report on Silicon Valley Bank

1 Introduction

Between its unsuccessful equity raise on March 8, 2023, and its failure on the morning of Friday, March 10, Silicon Valley Bank (SVB) could not borrow from the discount window—the Federal Reserve’s key lending facility for banks. The recent Federal Reserve report on the bank’s failure highlights the lack of preparedness, stemming in part from the absence of operational arrangement and insufficient prepositioned collateral for discount window borrowing (SVB Report (2023)). This situation, once again, underscores the significance of central bank borrowing as a critical tool for bank contingency funding. Despite theoretical models, our understanding of the extent of actual discount window borrowing by banks, borrower profiles, loan types, and historical trends remains limited. The first objective of our study is to address these questions by leveraging a comprehensive dataset that we compile from multiple sources within the Federal Reserve. As a second objective, we utilize the data to examine the assumptions and predictions of theoretical models that aim to explain borrower behavior, with particular attention given to the issue of discount window stigma.

Adverse selection problems in the bank funding market can affect the decisions of both lenders and borrowers. As a result of information asymmetry between banks and the market, lenders demand higher interest rates or decline lending to banks with private knowledge of their assets (Stiglitz and Weiss (1981)). In response, the government might want to intervene in the banking sector by offering debt or equity injection programs to ensure the supply of credit in the economy (Gorton and Huang (2004), Philippon and Schnabl (2013); Farhi and Tirole (2012)). However, the success of government intervention as a temporary measure also depends on adverse selection problems that influence borrowing banks’ decisions. Borrowers may avoid government lending programs out of concern that it signals financial weakness to the market. This form of adverse selection problems is discussed in the works of Philippon and Skreta (2012); Ennis and Weinberg (2013), and Armantier and Holt (2020). A key assumption in these theories is that stakeholders

can observe bank borrowing from the government and act on this information. This concern led policymakers to revamp the discount window regime in 2003, implementing a “no questions asked” policy and safeguarding borrower identities. Despite these changes, regulators remain worried about the ongoing stigma that discourages some banks from borrowing. Whether stigma has persisted after 2003 and whether there is evidence of information leakage from discount window borrowing that explains the stigma are other empirical questions we investigate in this study.

Our dataset includes data on *all* primary credit loans—the main type of discount window credit since 2003. The primary credit program provides short-term collateralized funding to fundamentally sound depository institutions including banks. During our sample period, the rates offered for the primary credit program were above the fed funds target rate.¹ Despite concerns about discount window stigma and rates higher than the fed funds target rate, the data show that many banks borrowed from the primary credit program. From 2003 through 2019, the Federal Reserve extended 42,726 primary credit loans to 2,958 unique borrowers. Of these borrowers, 2,336 (79%) were domestic banks; 526 (18%) were domestic non-bank depository institutions such as credit unions, and 92 (3%) were domestic branches of foreign banking organizations. Borrowing has been prevalent in all years during the sample period even outside of the global financial crisis, with an average of 513 unique institutions borrowing each year (See Figure 1). These findings partially address our first research question showing that despite claims in industry publications, discount window is frequently used by banks.² Furthermore, our study primarily examines domestic banks, but we find that nonbank domestic depository institutions and foreign banking organizations also benefit from discount window borrowing. Foreign banking institutions, in particular, obtain larger and longer-term loans compared to domestic institutions, especially during financial crises.

Further, focusing on the second research question (whether information leakages explains stigma after 2003), we show that there is no significant stock market reaction to primary credit borrowing,

¹At its inception in 2003, the rate on primary credit loans (also known as the discount rate) exceeded the fed funds target rate by 100 basis points. On August 17, 2007 the Federal Reserve reduced this amount to 50 basis points and reduced this further to 25 basis points on March 16, 2008. On February 19, 2010, the amount was increased to 50 basis points and remained there until the end of the sample period in 2019.

²As an example, an August 10, 2021 blog post by the Bank Policy Institute quotes a bank treasurer who, at the beginning of his job, “was told that if he borrowed from the Discount Window, there would be two phone calls: one to the CEO of the New York Federal Reserve asking why the bank borrowed, and one to him from Human Resources instructing him to clear out his desk.” Although it is not clear when the treasurer started his job or what evidence he has to support his claim with respect to the New York Federal Reserve phone call, the statement verifies the concern that bankers have about borrowing from the Federal Reserve. Source: <https://bpi.com/discount-window-stigma-we-have-met-the-enemy-and-he-is-us/>.

nor is there a negative reaction on the part of banking supervisors. The fact that depository institutions that borrow from the primary credit program appear to face no negative consequences from borrowing raises the question of why discount window stigma persists. We elaborate more on this later below. However, here we provide a more detailed explanation on how we address the second research question in this study.

The potential adverse selection problem associated with discount window lending requires that stakeholders (1) observe a bank borrowing from the Federal Reserve, (2) interpret borrowing as a negative signal about the financial condition of the bank, and (3) take action that is detrimental to the bank. As part of its effort to ensure that discount window borrowers are not negatively impacted by borrowing, the Federal Reserve does not reveal the identity of borrowers at the time they borrow.³ Additionally, discount window loans are typically very short-term, often overnight, and therefore not typically reported on banks' quarterly balance sheets unless outstanding on the last day of a quarter. Bank managers also do not have an incentive to publicize their borrowing voluntarily, nor are they required by law to do so. While it remains unclear how stakeholders can detect real-time discount window borrowing, there is convincing empirical and anecdotal evidence that there is a perception that discount window stigma exists.

Our first set of empirical tests focuses on whether publicly traded banks experience a negative stock market reaction after borrowing from the discount window. Using standard event study methodology, we find no evidence of a general negative abnormal stock market return associated with discount window borrowing. This finding is robust to the choice of market model and the choice of event study window. Contrary to the idea that banks may be negatively impacted if they borrow from the Federal Reserve, we find that discount window borrowing is followed by significant stock price gains during the financial crisis. On average, borrowing banks experience total stock price gains of approximately 1% to 1.1% over a three-day period. We conjecture that while market participants may not directly observe borrowing, they can witness the positive effects of increased liquidity resulting from borrowing. For example, the market observes that the borrowing bank

³Following the 2003 reforms (see Section 3 for more detail) the Federal Reserve's actions made it clear that the details on individual discount window loans would be kept confidential. From 2003 to 2010, the Federal Reserve only released aggregated information on discount window borrowing at the district and system levels. In 2010, the Dodd-Frank Wall Street Reform and Consumer Protection Act mandated the publication of individual discount window borrowing information after approximately two years. This two-year lag was intended to mitigate potential stigma by ensuring that outdated information would have limited impact on market perceptions. Excluding data from 2010 onwards, we conducted a robustness check and obtained similar results.

was able to meet its immediate liabilities, which is particularly important during crisis times as uncertainty around banks' liquidity and survival is high.

We also explore whether market participants can deduce the identity of discount window borrowers from publicly available aggregate weekly statistics published by the Federal Reserve. While borrower identities are not disclosed at the time of borrowing, the Federal Reserve publishes weekly aggregate data on discount window lending, including the total amount loaned by each of the 12 Federal Reserve districts. These statistics are the only publicly available information related to discount window borrowing around the time of borrowing.⁴ Some argue that market participants can infer which banks have borrowed based on these statistics. In particular, if a district with only a few large banks experiences a significant increase in its aggregate discount window balance, the market might infer from the statistics that these large banks are likely the borrowers. Our findings are as follows: First, we find no evidence of the stock price of an average bank in a district with abnormal activity being affected by the release. Second, we do not find any evidence that results are different when we focus on the largest banks in such a district. Third, focusing on districts with a few exceptionally large banks, we do not find that these large banks experience any abnormal stock price movements around release dates either.

Banking supervisors may provide another channel for the existence of discount window stigma.⁵ While banks are not obligated to report their discount window borrowing to supervisors, they may be reluctant to borrow if they believe that regulators view such borrowing negatively.⁶ This channel is particularly important because confidential ratings assigned by regulators, such as CAMELS ratings, play a crucial role in regulatory decisions.⁷ However, the challenge lies in identifying whether a rating downgrade following a bank's borrowing is a result of supervisors observing deteriorating bank conditions—the same reason banks might need to borrow from the discount window—or if

⁴The H.4.1 statistical release, "Factors Affecting Reserve Balances of Depository Institutions and Condition Statement of Federal Reserve Banks," is typically published on Thursday every week and covers the activities in a district from the Thursday of last week until the end of Wednesday before the statistical release. The release presents several aggregate statistics including a balance sheet for each FRB and a consolidated balance sheet for all 12 FRBs. Figure 7 shows the last H.4.1 release of 2018.

⁵See Appendix 1 for more information on bank supervision in the United States.

⁶This channel, which remains largely unexplored in the literature, has been discussed in a few studies, including Peristiani (1998), Furfine (2003), and Armantier, Ghysels, Sarkar, and Shrader (2015).

⁷These include but are not limited to the cost of Federal Depository Insurance Corporation (FDIC) insurance premiums, and licensing, branching, and merger approvals (Peek, Rosengren, and Tootell (1999)). Moreover, as a bank supervisor, the Federal Reserve can engage with banks to improve their processes and financial conditions, impose restrictions on dividend distributions, business expansions, and take other enforcement actions.

it stems from examiners learning about the borrowing from discount window staff at the Federal Reserve, making it difficult to distinguish correlation from causation.

To overcome this empirical challenge, we leverage two key characteristics of the regulatory structure in U.S. banking for state-chartered banks, which comprise the majority of commercial banks in the country. The first characteristic is the heterogeneity in bank regulators that conduct bank examinations—namely the Federal Reserve, the FDIC, and state supervisors. Among these regulators, only the Federal Reserve manages the discount window and has complete access to its information.⁸ The second characteristic is a legally determined rotation policy that assigns federal agency and state supervisors to banks at exogenously predetermined time intervals (Agarwal, Lucca, Seru, and Trebbi (2014)). Of the two types of state-chartered banks, state member banks—banks that are a member of the Federal Reserve System—are supervised in turn by the Federal Reserve and state supervisors, and state nonmember banks—banks that are not a member of the Federal Reserve System—are supervised in turn by the FDIC and state supervisors.⁹ That means a typical member bank that is examined by the Federal Reserve in one supervisory cycle (typically a year) is examined by its respective state supervisors in the next supervisory cycle and again by the Federal Reserve in the supervisory cycle after that. Because the assignment of regulators is exogenous to the financial condition of a bank and only Federal Reserve supervisors have access to discount window data, the alternate examination program with member banks allows us to exploit within-bank variation and identify average differences in supervisory rating actions following borrowing. Additionally, the rotation between the FDIC and state supervisors for nonmember banks serves as a placebo-type test, comparing the FDIC (with a similar supervisory approach and incentive structure as the Federal Reserve but not involved in discount window lending) to state supervisors in their supervisory actions after discount window borrowing.

Controlling for bank and time fixed effects as well as variations in bank risk over time, we find no evidence that Federal Reserve supervisors are more likely to downgrade a bank following borrowing relative to other regulators. This holds true for frequent and occasional borrowers, as well as when we focus on the financial crisis. We also examine whether our results are caused by

⁸The Federal Reserve is not required to share information about banks' discount window borrowing with other regulators. See the FAQ section at <https://www.frbdiscountwindow.org>. The Federal Reserve normally informs other regulators on the identities of banks eligible to borrow from the discount window but not the actual borrowing. The majority of the banks in the United States are eligible to borrow, including all banks in our sample.

⁹Both types are eligible to borrow from the discount window.

heterogeneity in the organizational structure of the 12 Federal Reserve Banks (FRBs) that extend discount window loans. In some FRBs, discount window and supervision functions are not under one department. These empirical tests show that our results are not driven by FRBs with less organizational proximity between their discount window and supervision functions. Further, a textual analysis of exam reports produced by Federal Reserve Bank of Richmond examiners (one of the twelve FRBs with supervision and discount window functions under one department) confirms our regression analyses results. Focusing on banks that borrow from the discount window, we find that in less than 1% of reports, there is some mention of actual borrowing by examiners, and even in these cases there is no indication that the examiner perceived discount window borrowing negatively. This suggests that examiners either do not detect most borrowing or do not consider it significant enough to mention in their reports.

Our empirical results show that neither stock markets nor bank supervisors take actions detrimental to banks following discount window borrowing. Using future defaults and supervisory ratings downgrades, we also test whether borrowing conveys negative information about the borrowers beyond publicly available information. We find that, after controlling for observable bank characteristics, borrowers tend to perform worse compared to non-borrowers. They default at a rate about three times higher than non-borrowers and are significantly more likely to have their supervisory rating downgraded. Thus, discount window borrowing on average provides a negative signal, but banks do not experience any negative consequences from borrowing. We interpret the combined results to mean that stock markets do not observe the negative signal and that bank supervisors already have access to the private information conveyed by discount window borrowing.

Our results indicate that the Federal Reserve effectively conceals discount window borrowing from market participants. According to the adverse selection literature, in the absence of negative consequences banks should not be concerned about adverse selection from participating in a Federal Reserve lending program. While this suggests stigma should not be a serious problem, there is strong anecdotal and empirical evidence that stigma exists. There are two reasons for this. First, ruling out stigma assumes that banks have access to the same information we have to arrive at our conclusion, but the confidentiality of discount window data hinders this. We explain this point more below. Second, if some banks abstain from borrowing, as was the case for SVB, we (and other banks) cannot observe the consequences for them. It is possible that some banks avoid discount

window borrowing and instead obtain more expensive sources of short-term funding.¹⁰

Our study offers a compelling example of stigma during the global financial crisis. We observe that 13 eligible banks opted to avoid the discount window, instead choosing to pay higher rates to borrow from an alternative source with the exact loan terms. These borrowers were eligible to obtain the same amount of credit, on the same date, with the same maturity from discount window but chose to not do so. This serves as clear evidence that banks actively circumvent the discount window due to perceived stigma. Moreover, statements from policy makers and industry publications make it clear that the perception of stigma exists and it is affecting the economy.¹¹ So some banks avoid borrowing, but the lack of evidence on negative impacts for borrowers prompts us to propose the following explanation for the persistence of stigma.

One possible explanation is that the persistence of stigma is due to the information asymmetry effectively maintained by the Federal Reserve in the market. On the one hand, discount window borrowing, on average, conveys negative information about borrowers, which provides a strong rationale for the Federal Reserve to maintain borrower confidentiality at the time of borrowing. This confidentiality aims to prevent inefficient and risky behavior in financial markets, including the potential occurrence of bank runs in extreme cases. On the other hand, potential borrowers do not have access to comprehensive data on discount window borrowing by all banks. As a result, they are unable to observe that discount window borrowing does not systematically elicit negative reactions from stock markets and banking supervisors, at least since 2003. Consequently, banks are unable to sufficiently learn from this information, perpetuating the existence of stigma. These findings highlight the challenge that the Federal Reserve faces: what is the ideal mechanism design to remove stigma in an environment where the perception of stigma is institutionalized?

¹⁰If a bank chooses a cheaper contingency funding source, such as loans from the Federal Home Loan Banks (FHLBs), it does not necessarily indicate stigma. Opting for FHLB loans over discount window loans is an efficient decision due to their lower interest rates. Evidence of stigma arises when eligible banks actively avoid the discount window and secure funding from an alternative source at a higher rate. Additionally, as mentioned by Gissler, Narajabad, and Tarullo (2023), FHLBs cannot fulfill the lender of last resort role like the Federal Reserve, as was the case for SVB. On its final day, SVB attempted to transfer collateral from the FHLB to the discount window but failed to borrow due to insufficient operational arrangement in place. See SVB Report (2023) page 60, first paragraph.

¹¹See statements from Federal Reserve chairman, Ben Bernanke, and Bank of England governor, Mervyn King, in Section 3. Also see publications by Bank Policy Institute—an advocacy group representing large banks—available at <https://bpi.com/category/liquidity/discount-window/>. Also a February 25, 2020 article in Wall Street Journal suggests that “banks—scarred from the public beating they took during the financial crisis—have all but abandoned the window in recent years to avoid even a whiff of a government bailout.” (<https://www.wsj.com/articles/jpmorgan-wont-shun-the-feds-discount-window-anymore-11582662187>). The article reports that James Dimon, JPMorgan Chase & Co. Chief Executive Officer, volunteered to borrow from the discount window to lessen the discount window stigma for other banks.

The rest of this paper is organized as follows. Section 2 discusses relevant literature. Section 3 provides additional background on the history of discount window stigma. Section 4 describes the data. Section 5 provides an overview of participation in the primary credit program. Section 6 compares borrowing under the primary credit program to Term Auction Facility (TAF) borrowing—an auction-based lending facility available to banks during the global financial crisis. Section 7 compares discount window borrowers and nonborrowers. Section 8 examines the market channel of stigma and Section 9 examines the supervision channel of stigma. Section 10 provides a discussion of results and concludes. The paper also includes two appendices. Appendix 1 provides background on the structure of banking supervision in the United States and Appendix 2 explains additional data preparation steps.

2 Relevant Literature

Our study adds to the literature about central bank lending programs in several ways. First, we use a comprehensive and unique data set that contains all primary credit loans during the sample period, the first study that does so, and provide several new insights into the status of discount window borrowing, and the types and characteristics of borrowing institutions. The descriptive statistics and analyses provided in Section 4 are in themselves novel. Second, our paper is directly related to the theoretical literature on mechanism design and adverse selection that considers government intervention in response to market failures, including Gorton and Huang (2004), Diamond and Rajan (2011), Tirole (2012), and Bianchi (2016). Most directly related to our paper, Philippon and Skreta (2012) provide a general framework for how asymmetric information can create adverse selection and undermine market efficiency. Like the classical theories (starting with Akerlof (1978)) they consider the role of the government’s intervention in limiting market failures. However, they depart from this adverse selection literature in that in their model, government program participants’ options outside of the government programs are not exogenous. To that end, they provide a formal explanation for the existence of stigma. Moreover, the theoretical models in Ennis and Weinberg (2013) and Armantier and Holt (2020) specifically focus on the issue of stigma in the discount window market. They conclude that since discount window borrowing can be regarded as a negative signal about the quality of the borrower’s assets, banks may be willing to borrow

in the market at rates higher than the one offered by the Federal Reserve. The conclusion from our analysis is that neither stock markets nor banking supervisors negatively impact banks following discount window borrowing, which means that there is no obvious channel that explains why discount window stigma persists.

Our study also adds to the empirical literature showing direct evidence. Armantier et al. (2015) is the pioneering study that presents direct evidence of stigma in contemporary times. The authors compare the interest rates on TAF loan bids with concurrent discount window rates, particularly highlighting the period following the failure of Lehman Brothers when TAF rates exceeded discount window rates. As mentioned before this is particularly important since borrowers eligible for TAF could secure the same credit amount, on the same date, and for the same duration from the discount window. Armantier et al. (2015) provide evidence that banks frequently bid higher rates than discount window rates. They define the realized discount window stigma premium with respect to TAF as the difference between a bank's bid rate at a TAF auction and the DW rate, conditional on the bank bidding above the DW rate. The study by Armantier et al. (2015) shows that banks bid 866 times higher than the discount window rate (their Table 3) with an average realized discount window premium of 44.29 basis points. Like Armantier et al. (2015), we also utilize the concurrency of TAF lending and discount window lending to document stigma. However, by analyzing actual discount window and TAF loans (rather than bids) we demonstrate that not all higher bidders in TAF avoided the discount window due to stigma. Specifically, among the 71 banks that obtained TAF loans at rates higher than discount rate, 56 of them also accessed discount window loans either before or after TAF borrowing. Our findings reveal that 13 banks (18% of the banks paying higher TAF rates) refrained from discount window borrowing during the crisis. Thus our results confirm the existence of discount window stigma, although they suggest the magnitude of the problem may have been smaller than previous work indicates.

3 Institutional Background

3.1 The Discount Window and the History of the “Stigma Problem”

As Gorton and Metrick (2013) elucidate, credit cycles, bank runs, and financial crises can impose adverse externalities on any market economy. The extent to which banks can rely on the market for

short-term liquidity is limited, especially during crisis times. A substantial body of literature attests to the significant detrimental consequences on the real economy stemming from disruption in credit supply by strained banks, particularly when such disruptions are widespread.¹² The initial idea behind the establishment of the Federal Reserve System in 1913 was to create a credible emergency mechanism that would prevent banking panics.¹³

In its early years, the Federal Reserve’s discount window facility witnessed significant utilization by banks in the United States. This mechanism involved banks selling their eligible commercial or agricultural loans to a Federal Reserve bank in exchange for funds at a discounted value. Upon repayment, the borrower would receive the paper back (Mengle (1986)). The interest rates on the loans offered by the Federal Reserve remained below market rates from 1914 to 2003. As noted by Gorton and Metrick (2013), suspicions arose shortly after the introduction of the discount window that some borrowing banks were utilizing discount window credit for speculative security loans to inflate stock market values. Schwartz (1992) further suggests that a substantial portion of failed national member banks had been regular borrowers from the discount window. In response, the Federal Reserve implemented a policy of “reluctance to borrow,” emphasizing that discount window lending should only be temporary. Banks were required to demonstrate that they had exhausted private funding sources and had a genuine business need for the funds before accessing the discount window (Armantier et al. (2015)). According to Gorton and Metrick (2013) and Armantier et al. (2015), this policy shift marked the inception of the stigma problem, as it created a perception in the market that banks resorting to discount window borrowing were facing financial difficulties (Gorton and Metrick (2013) and Armantier et al. (2015)).

Anbil (2018) and Vossmeier (2019) also highlight the role of the lender-of-last-resort’s information management in exacerbating the stigma problem. During the Great Depression, the Clerk of the House of Representatives published partial lists of banks that had secretly borrowed from the Reconstruction Finance Corporation (RFC), a lender of last resort at the time. Anbil (2018) demonstrates that borrowing banks whose names were disclosed experienced higher rates of deposit withdrawal compared to those whose names remained undisclosed, supporting the existence

¹²The literature shows the effect of credit disruptions on aggregate output and investment, asset values, and employment (Bernanke (1983), Gan (2007), Almeida, Campello, Laranjeira, and Weisbenner (2009), Gilchrist and Zakrajšek (2011), Chodorow-Reich (2014)).

¹³The Federal Reserve Act was signed into law by President Woodrow Wilson on December 23, 1913.

of discount window stigma. Additionally, Vossmeier (2019) finds that this disclosure led to banks being reluctant to borrow further from the RFC, causing a contraction in credit supply.

The issue of discount window stigma and its negative consequences gained attention towards the end of the twentieth century, leading to calls for reform of the Federal Reserve’s lender of last resort policies. In response, the Federal Reserve implemented significant changes in 2003 to address the stigma problem and introduced a new lending program explicitly designed to reduce it. This new program, called the primary credit program, replaced the previous discount window system as the primary form of lending. Under the new system, the discount rate was set above the target rate, eliminating banks’ incentive for arbitrage between the discount window and other money markets. This change also reduced the need for administrative monitoring by the Federal Reserve to prevent arbitrage (Carlson, Rose, et al. (2017)). The primary credit program offered collateralized short-term loans with minimal administrative burden and no restrictions on borrowing purposes for depository institutions. The goal of the program, as stated in the Board of Governors Interagency Advisory, was “to reduce institutions’ reluctance to use the window as a source of back-up, short-term liquidity.” The Interagency Advisory emphasized that institutions were not required to seek alternative funding sources before requesting occasional short-term advances and that the Reserve Banks would generally not inquire about the reason for borrowing primary credit.

The Federal Reserve took an additional step to address the stigma problem by setting general eligibility criteria for borrowing from the primary credit program. Banks must be in sound financial condition based on supervisory ratings. The “secondary credit program” was established for institutions that do not meet these criteria. This separation aims to alleviate concerns about the financial condition of primary credit borrowers.¹⁴ Moreover, the Federal Reserve’s actions emphasized the importance of maintaining confidentiality regarding individual discount window loans, or as Gorton (2015) puts it, the secrecy of borrower identity is paramount. Despite significant reforms in 2003, including the adoption of a “no questions asked” policy and borrower identity secrecy, the existing literature unanimously acknowledges the persistent existence of the stigma problem. One of the first analyses of discount window borrowing during the implementation of the primary credit program, Furfine (2003), for example, reveals significantly lower borrowing levels

¹⁴In addition to primary credit and secondary credit, the Federal Reserve also lends under the “seasonal credit program.” This program offers funding for up to nine months to small depository institutions serving businesses with seasonal liquidity needs, such as farmers and resorts.

than anticipated without stigma, leading to the conclusion that “strong reluctance to borrow from the Federal Reserve remains.”

During the global financial crisis, the issue of stigma was perceived to be particularly severe. To encourage increased borrowing by banks, the Federal Reserve extended the allowable terms of discount window loans, initially up to 30 days and later up to 90 days. However, recognizing the need for unconventional measures, the Federal Reserve established the Term Auction Facility (TAF) as an alternative to the primary credit program. Under the TAF program, depository institutions in sound financial condition (same eligibility criteria for primary credit loans) could participate in auctions for 28- and 84-day term loans, using the same collateral as primary credit loans. These auctions occurred every two weeks between December 17, 2007, and March 8, 2010, totaling 58 auctions. The allocated credit amount started at \$20 billion and reached a peak of \$150 billion during the crisis. While the borrowing rate from the primary credit program is fixed by the Federal Reserve, the TAF borrowing rate was competitively set through the auction process. Borrowers’ rates were determined by the lowest accepted bid rate among the winning bidders. There were limits on TAF borrowing, with institutions restricted to 10% of the total amount supplied at the auction. Additionally, primary credit loans were credited on the same day and accessible by phone, whereas TAF loans were credited three days after the auction. While TAF loan terms were fixed, borrowers had flexibility in choosing the term of primary credit loans.

According to Wall (2016), TAF proved to be more successful than the primary credit program during the crisis, as the total borrowing amount from TAF exceeded that of the primary credit program during its implementation. However, it is important to note that many TAF borrowers obtained loans at a lower rate than the primary credit rate, indicating that the higher usage of TAF cannot be solely attributed to discount window stigma. Ashcraft, Bech, and Frame (2010) propose another explanation for the limited borrowing from the discount window, suggesting that the availability of a lower-cost alternative government-sponsored liquidity backstop, the Federal Home Loan Banks (FHLB), influenced banks’ borrowing decisions. Notably, the FHLB also witnessed increased borrowing during the latter half of 2007. On the other hand, studies by Armantier et al. (2015) and Hu and Zhang (2021) suggest that a portion of banks that participated in the TAF program submitted bids above the primary credit rate. These findings align with our own analysis using actual TAF borrowing rates throughout the global financial crisis period. These studies assert

that the willingness of some banks to pay a premium to avoid borrowing is conclusive evidence of stigma.

Nevertheless, while direct empirical evidence on stigma is limited, the prevailing belief that discount window stigma played a role in banks' reluctance to borrow from the primary credit program is widely held. For example, Ben Bernanke, the Federal Reserve chair at the time, stated:

The provision of short-term liquidity is, of course, a long-standing function of central banks. In August 2007, conditions in short-term bank funding markets deteriorated abruptly, and bank funding needs intensified sharply. In response to these developments, the Federal Reserve reduced the spread of the primary credit rate—the rate at which most institutions borrow at the discount window—relative to the target federal funds rate and made it easier for banks to borrow at term. However, as in some past episodes of financial distress, banks were reluctant to rely on discount window credit to address their funding needs. The banks' concern was that their recourse to the discount window, if it became known, might lead market participants to infer weakness—the so-called stigma problem. The perceived stigma of borrowing at the discount window threatened to prevent the Federal Reserve from getting much-needed liquidity into the system.¹⁵

Bank of England Governor Mervyn King expressed a similar view in an interview in 2016:

So, [banks] deliberately did not ask for the liquidity they needed for fear of damaging their reputation—the “stigma” problem. I don't think we were conscious of this before the crisis started . . . and I don't think central banks have a convincing answer to it. . . . This is, I think, still a challenge in how to manage the process of central bank provision of liquidity support. This is one of the big intellectual issues that hasn't been fully resolved.¹⁶

Consistent with these views, during periods of crisis, the Federal Reserve has often introduced new programs with eligibility criteria similar to the discount window, aiming to incentivize banks to borrow. As mentioned earlier, one such program is the Term Auction Facility. Another recent example is the Bank Term Funding Program (BTFFP), which was implemented after the failures of

¹⁵See Bernanke (2009).

¹⁶See <https://www.nysscpa.org/news/publications/the-trusted-professional/article/newsmaker>.

Signature Bank and SVB in 2023. Although empirical evidence of discount window stigma outside of crisis periods is currently lacking, there is a widespread consensus that stigma is not limited to such times. Industry insiders believe that banks also exhibit reluctance to use the discount window in response to idiosyncratic liquidity shocks. For instance, a Wall Street Journal article from February 25, 2020, suggests that banks hoard cash to avoid accessing the window, leading to liquidity drains and disruptions in overnight lending markets even prior to the pandemic.¹⁷

4 Data

Primary credit loans are the main source of data. The dataset starts in 2003, the year the Federal Reserve introduced the primary credit program. We consider all primary credit loans extended by the Federal Reserve to all types of institutions until the end of 2019. We drop test loans, defined as small loans (\$10,000 or less) that banks occasionally request to test their operational ability to borrow at the discount window. We drop these loans because they are not related to institutions' genuine funding needs.¹⁸

We also obtain TAF data from Federal Reserve internal sources, but note that the TAF data is also publicly available.¹⁹ Bank daily stock price information is from the Center for Research in Security Prices (CRSP). Details of how we match loan data with CRSP data are provided in Appendix 2. In addition, we obtain data on measures of bank balance sheet risk, bank performance (failures), confidential data on safety and soundness exams and supervisory ratings from the Federal Reserve's National Information Center (NIC). More details are provided in Appendix 2.

For our text analysis section in which we search exam reports for mentions of discount window borrowing, we use the Federal Reserve Bank of Richmond's central document repository that allows content searches of internal supervisory documents. The documents include but are not limited to examiners' overviews and detailed assessments of supervised banks as well as memoranda produced for Federal Reserve leadership. Lastly, we conduct interviews with several bank examiners and discount window specialists within the Federal Reserve.

¹⁷See www.wsj.com for details. Other sources are mentioned in the Introduction section.

¹⁸The choice of the \$10,000 threshold is based on the suggestion of Federal Reserve discount window staff. In our main analysis as robustness tests, we do not exclude these loans and obtain similar results.

¹⁹Data can be obtained from https://www.federalreserve.gov/newsevents/reform_taf.htm. We compared our data with the publicly available data and find less than 0.1% discrepancy.

Note that in the next sections where we provide an overview of primary credit and TAF loans, we consider all types of borrowers. In the sections that we compare borrowers and nonborrowers we mainly focus on state-chartered banks, the main type of banks in the United States. For the market analysis we consider all publicly traded U.S. banks.

5 An Overview of the Primary Credit Program

The aggregate statistics that we present in this section are the first of their kind to include loans before the Dodd-Frank Act required the Federal Reserve to release discount window lending information with a two-year lag, and they provide important insight into the magnitude and characteristics of the primary credit program. Table 1 provides descriptive statistics on the size of the market and basic information about primary credit loans. From 2003–2019, 2,958 unique institutions borrowed from the Federal Reserve’s primary credit program. Of this number about 79% are U.S. banks, 18% are other domestic depository institutions including credit unions and savings and loan institutions, and the remaining 3% are branches of foreign banking organizations.

The table also shows that these institutions borrowed from the primary credit program over 42,000 times. The median size of a primary credit loan is \$3.13 million. The median term of a primary credit loan is one day—primary credit is typically extended overnight—and the median loan interest rate during the sample period is 0.75% (annual rate). Further details about the characteristics and distributions of primary credit are provided in Figures 1 and 2. The horizontal bar chart in Figure 1 demonstrates the distribution of the number of borrowers over time. The figure shows that at its inception in 2003, 344 borrowers used the primary credit program. Moreover, the figure shows that primary credit borrowing is prevalent in all years during the sample period, even outside the financial crisis. However, the number of institutions borrowing from the primary credit program peaked at the height of the global financial crisis, in 2009, with 1,145 unique borrowers, confirming that primary credit is primarily a source of emergency funding.

Figure 2 provides further details on the distribution of primary credit loans distinguished by institution type and across four dimensions: the number of unique borrowers (Panel (A)), the number of loans (Panel (b)), mean loan size (Panel (c)), and mean loan term (Panel (d)). As expected, banks constitute the majority of borrowers at the primary credit program (between 162

to 1,052 unique borrowers each year), followed by non-bank depository institutions (between 26 to 244 unique borrowers) as shown in Panel (a). Foreign banking organizations constitute the smallest group of borrowers, with number of unique borrowers ranging from 7 to 43 during the sample period. Panel (b) shows similar statistics but using the number of loans obtained by each institution type as the measure of borrowing activity. The panel shows that banks borrowed between 447 and 15,054 times in each year. Non-bank depository institutions borrowed 51 to 943 times and foreign banking organizations borrowed 9 to 554 times. Panel (c) shows that a typical primary credit loan for a bank during the sample period ranges from a low of \$3 million to \$63 million in 2008. A typical primary credit loan for a non-bank depository institution ranges from \$1 million to \$379 million. Federal credit unions are the largest borrowers in the non-bank depository institutions market, but perhaps the most notable are the foreign banking organizations. While these institutions constitute the smallest group of borrowers, their loans were on average significantly larger than the typical loan obtained by a domestic institution, especially during the financial crisis. For example, a typical loan in 2009 by a foreign banking organization was about \$12 billion dollars. In other years loans obtained by foreign banking organizations range from \$2 million to \$9 billion.²⁰ Similarly, the terms of primary credit loans were generally longer during the crisis. During non-crisis times a typical loan was overnight. However, loans that are obtained before weekends or bank holidays are paid back on the next available business day. Therefore, on average loan terms are between 1 and 2 days during non-crisis times. During the financial crisis, the Federal Reserve extended the maximum term on primary credit loans to 30 days in August 2007 and then to 90 days in March 2008. As of March 2010, the typical maximum term on discount window loans was reduced back to overnight. Panel (d) shows that the average annual term of primary credit loans for domestic banks, domestic non-bank financial institutions, and foreign banking organizations, respectively, are 1.24–8.76 days, 1.09–6.00, and 1.13–15.65 days during the sample period.

The key takeaways from Figure 2 are that: (1) primary credit borrowing is prevalent throughout

²⁰Goldberg, Skeie, et al. (2011) explain why U.S. branches of foreign banking organizations had a large need for dollars during the crisis. First, most U.S. branches of foreign banking organizations are not allowed to offer deposits insured by the Federal Deposit Insurance Corporation. Thus, they lack access to that stable source of funds. Second, the branches have funding and investment activities that are often closely tied to their parent banks outside the United States. In some cases, funds raised by these branches in the United States are channeled back to the parent bank. During the crisis, the wholesale dollar funding markets that the parent banks typically relied on—such as the money markets and the markets for currency swaps and brokered funds—were severely disrupted. Similarly, Benmelech (2012) finds that foreign banks had to borrow from the Federal Reserve to meet their dollar-denominated liabilities.

the sample period; (2) more institutions obtained loans during the global financial crisis; (3) loans during the financial crisis were on average larger, longer, and more frequent; and (4) some U.S. branches of foreign banks were among the most active users of the discount window especially during the crisis.

6 The Term Auction Facility and Evidence of Stigma

Despite the Federal Reserve's extension of allowable maturity on primary credit loans and encouraging institutions to borrow, some institutions remained reluctant to borrow from the primary credit program. As explained in Section 3, in an attempt to mitigate stigma, the Federal Reserve created the Term Auction Facility on December 12, 2007. Under TAF, the Federal Reserve auctioned 28-day loans, and, beginning in August 2008, 84-day loans to all institutions that were eligible to borrow from primary credit. TAF loans were less flexible in terms of the timing of borrowing, and the amount, the term, and the time to receive the funds when compared to primary credit loans. The main advantage of TAF over primary credit was by design the possibility that borrowers could bid on the interest rate.

Figure 3 provides a comparison of primary credit loans versus TAF loans during the global financial crisis. Panel (a) of Figure 3 shows that during the crisis, 88 domestic banks, one domestic non-bank depository institution, and 33 foreign banking organizations that never borrowed from the primary credit program during the sample period borrowed from TAF during the global financial crisis. Panel (a) also shows that there were 238 domestic banks, 11 non-bank depository institutions, and 38 foreign banking organizations that borrowed from both TAF and primary credit during this period. Panels (c) and (d) show that while TAF loans obtained by domestic banks were significantly fewer than the primary credit loans they obtained (2,747 versus 23,726), these loans were significantly larger (average \$555.24 million versus \$30.90 million), and longer in term (average 45.52 days versus 7.20 days). Results are similar for non-bank depository institutions. While the average TAF and primary credit loans are close in size, TAF loans have longer terms. Moreover, foreign banking organizations obtained slightly more TAF loans than primary credit loans (1,419 versus 944) but these loans were on average smaller than primary credit loans (\$1.55 billion versus \$11.09 billion). Note that, as mentioned in Section 3, there was a limit on how much institutions

could borrow from TAF in an auction (at most 10% of the total amount supplied by the Federal Reserve at the auction). Further, TAF loans are either 28-day or 84-day loans whereas primary credit loans can have a maturity between 1 and 90 days during this period. The results in Figure 3 also show that the size of a typical TAF loan obtained by a foreign banking organization is significantly larger than the size of a typical TAF loan obtained by a U.S. bank. TAF loans obtained by foreign banking organizations are on average 45.66 days as compared to 12.92 days under primary credit programs, consistent with what we see with other types of institutions. Panel (e) shows that on average domestic banks and nonbanks paid lower interest rates on TAF loans relative to the primary credit loans. This was not the case for foreign banking organizations. However, the average rate is calculated over the entire crisis period. As the next figure shows, there are periods of time during the financial crisis when banks paid a premium to borrow from TAF.

In Figure 4 we plot the interest rate paid by institutions on TAF loans (red color) against the discount rate (black color), the interest rate institutions paid on primary credit loans. The plot spans the December 12, 2007–March 8, 2010 period in which institutions could borrow from both TAF and primary credit program. As explained earlier, the interest rate on primary credit loans is determined and posted by the Federal Reserve and the interest rate on TAF loans was determined in an auction process. TAF bids were accepted in descending order of rates until the funds supplied at the auction were exhausted. The borrowing rate for all winning bidders was then set to the lowest accepted bid rate or the “stop-out rate.” That means all the institutions that borrow TAF in one day were expected to pay the same interest rates on TAF loans. On a few occasions we observe multiple rates in one day. In the plot we show both the minimum and maximum daily TAF rates that we observe.

Figure 4 provides important insights. Throughout most of the sample period, TAF rates paid by institutions were lower than contemporaneous primary credit rates. However, in the period of time starting immediately after the sale of Bear Stearns on March 16, 2008, banks started to voluntarily bid for and receive TAF loans with interest rates that were higher than the posted primary credit rates. This trend continues and intensifies after the bankruptcy of Lehman Brothers on September 15, 2008, at the apex of the crisis. On September 22, 2008, at the first TAF auction following the Lehman Brothers bankruptcy, 32 institutions including 23 foreign banking organizations and 9 domestic banks borrowed 0.5 to 7.7 billion dollars from TAF at an interest rate of 3.75% while

they could have paid 150 basis points less and received the same amount and the same term, using the same collateral, from the primary credit program on that day. The amounts auctioned on this date were credited on September 25, 2008, as shown by the peak of the red line in the plot.

Overall, in a time period that includes 11 of the 58 bi-weekly TAF auctions, 115 institutions (71 banks) obtained 485 (263) TAF loans at an interest rate that was higher than the prevailing primary credit rate. Focusing on domestic banks, this is equivalent to 3% of all banks that either participated in the primary credit program or borrowed from TAF. In terms of the total amount, 15% of TAF funds were borrowed at a premium relative to the concurrent primary credit rate. These statistics are shown in Figure 5. On overpaid loans the average loan term was 31 days, the average premium rate paid was 18.38 bps (annual), and total overpaid loans at origination were about \$274 billion. A back-of-the-envelope calculation (the one-month rate premium was roughly 1.53 bps) shows that the total amount lost in interest payments on overpaid loan was about \$42 million.

Table 2 presents mixed evidence in terms of how much stigma affected discount window borrowing during the crisis. On the one hand, borrowing from TAF at a premium relative to the primary credit rate, when banks could get the exact same loan terms with the same collateral through the primary credit program, seems a clear indication that at least some borrowers were concerned about stigma. However, as Table 2 shows, 82% (34 banks) of the banks that paid more for TAF funds than the primary credit rate borrowed from the primary credit program at least once during the Global Financial Crisis, and 48% borrowed from the primary credit program both before and after borrowing from TAF. Thus, most banks that overpaid for TAF loans were not sufficiently concerned with stigma to avoid completely the discount window.

The strongest evidence reported in Table 2 that indicates some banks were concerned about stigma is the 18% of over-payers (13 banks) that only borrowed from TAF. As explained above, both programs were available to the same banks and accepted the same collateral, but primary credit had more flexibility in terms of the timing, loan amount, and term than TAF. The fact that a segment of borrowers did not borrow from the primary credit program and were willing to voluntarily pay a higher rate for TAF loans is clear evidence of the stigma associated with the discount window.²¹

²¹Armantier et al. (2015) use data on TAF bids from the Federal Reserve Bank of New York for a part of the

7 Bank-Level Analysis—Characteristics of Borrowers vs. Non-borrowers

7.1 Descriptive Statistics

Table 3 reports summary statistics for bank-quarter-level variables for all state-chartered banks in the top panel and for bank exam-level variables in the bottom panel. CAMELS ratings do not change between the closing of an exam and the closing of the alternate regulator’s exam—that is, during an “examination spell.” However, bank characteristics change every quarter. There are a total of 244,912 bank-quarter observations and a total of 33,919 exams used in our analyses.

An average bank in the sample has a Tier 1 risk-based capital ratio of 17%, a leverage ratio (Tier 1 capital as a share of total risk-unweighted assets) of 10.95%, an expense or efficiency ratio (noninterest expense as a percentage of net operating revenue) of 65.48%, and a return on assets of 1.06%. The average delinquency rate of the loan portfolio (delinquent loans include loans that are 30-plus days past due and loans in nonaccrual status, and nonperforming loans that are 90-plus days delinquent and loans in nonaccrual status) is 0.18%, the average share of nonperforming loans to total loans is 1.11%, and the average annual loan growth rate is 9.55%. The selection of these characteristics is consistent with what is shown in Agarwal et al. (2014).

Table 3 also reports general information about the distribution of banks across member banks and nonmember banks, and across banks’ regulators. The table shows that 5.72% of observations belong to examination spells in which a bank has borrowed from the Federal Reserve’s primary credit facility. The majority of those borrowers, 3.70%, belong to occasional primary credit borrowers, and the rest, 2.01%, belong to frequent primary credit borrowers.²² Of banks in the sample, about 0.42% fail in the year of the exam or the following year. We use bank failures as a measure of performance, however, due to infrequency of bank failures, we also rely on CAMELS rating revisions to measure performance. Around 13% of exams lead to a CAMELS rating downgrade, and 6.42% lead to a CAMELS rating upgrade. Because we are interested in whether discount window borrowing is associated with an unfavorable supervisory outcome for a bank, we use CAMELS

financial crisis period – from December 17, 2008 to September 22, 2008 – and find that more than half of the TAF participants submitted bids above the primary credit rate during this period.

²²We define an occasional borrower as a bank that has borrowed at most once a quarter during an examination spell and a frequent borrower as a bank that has borrowed twice or more in at least one quarter during an examination spell.

downgrades as the main dependent variable in our tests and use CAMELS upgrades only for robustness checks. The statistics on the downgrades of each component of CAMELS—that is, capital adequacy, assets, management capability, earnings, liquidity, and sensitivity—are also provided in Table 3.

Figure 6 provides some preliminary information about what types of banks are more likely borrow from the primary credit program. The figure shows that when we put banks in 5 equally sized quintiles based on their ratio of Tier 1 capital to total assets (leverage ratio), banks that are more capitalized are less likely to borrow from the primary credit program. The relationship between bank capital and number of loans obtained is clear and monotonic. Similarly banks with higher ratios of non-performing loans to total assets are more likely to borrow more from the primary credit program.

7.2 The Information Value of Discount Window Loans

The results above are based on observable bank characteristics. In Tables 4 and 5 we show how primary credit borrowing is related to banks' future outcomes after controlling for bank observable characteristics. The results confirm that discount window borrowing signals information not included in publicly available data about banks.

In Table 4, we focus on a binary variable indicating whether the bank failed within two years after an exam.²³ The choice of a two-year interval, rather than a one-year or shorter period, is driven by the rarity of bank failures as ex post performance measures. Controlling for time and bank fixed effects as well as bank characteristics, the results reveal a significant association between primary credit borrowing and higher likelihood of failure, with an increase of 0.6–0.7 percentage points. Considering the average failure rate of 0.42% in the sample, primary credit borrowing is associated with approximately three times higher chances of failure relative to non-borrowers, even after accounting for observable bank characteristics.

Table 5 shows the results using future CAMELS composite and component ratings as perfor-

²³Using an interval from the time of borrowing until a specified period (e.g. one year or two years) afterwards could serve as an alternative approach to identify the failure of a borrowing bank. However, this approach presents challenges. First, it would entail different sets of benchmark banks for each borrowing day, making cross-bank comparisons difficult. Second, complications arise from banks borrowing multiple times within a year and during the financial crisis, when extended borrowing terms were common. These factors make it challenging to determine the appropriate benchmark period.

mance measures. Each regression includes quarter and bank fixed effects (except for Columns 1 and 2), and standard errors are clustered at the state level to correct for both between-bank or within-state and within-bank serial correlations in the error terms (following Agarwal et al. (2014)). The coefficients on primary credit borrowing indicators are statistically significant and positive with similar economic magnitude across the composite rating specifications in Columns 1–3. They are also statistically significant and positive across five out of six CAMELS rating subcomponents (Columns 4–9). Primary credit borrowers are more likely to experience a CAMELS rating downgrade relative to nonborrowers. The largest effect is for the asset quality component, which has an increase of 5.7 percentage points in the chances of a downgrade for borrowers. While this does not imply that examiners use borrowing as an input—primary credit borrowing might proxy for private information that is available to examiners—the findings suggest that discount window borrowing could be a valuable signal to market participants.

Overall, the results indicate that riskier banks are more likely to borrow from the primary credit programs relative to their peers, which means discount window borrowing is potentially an important signal for markets. The next section addresses the question of whether markets receive this signal.

8 The Stock Market Reaction to Discount Window Borrowing

In this section we examine the stock market reaction to primary credit borrowing. We take a channel-agnostic approach to measure the market reaction—although we know that the Federal Reserve does not reveal the identities of borrowers at the time they borrow, we consider the possibility that the market gains access to borrowing information through some other means. Our objective is to test whether discount window borrowing is associated with a negative cumulative abnormal return (CAR) in the stock market. We focus on the universe of all U.S. banks with publicly traded stocks that have borrowed from the discount window. Event dates include the primary credit/TAF borrowing dates and the dates following the Federal Reserve’s aggregate weekly statistics release, which as noted previously, includes the aggregate amount of discount window lending at the national and district levels (Figure 7 provides a sample from December 2018). We employ the standard event study methodology of Campbell, Lo, and MacKinlay (2012) and estimate normal

stock returns based on two separate models: the market model and the Fama-French five-factor model. Abnormal returns are calculated for a three-day event window, and the CAR for the event period is determined by summing the daily abnormal returns. We then test the hypothesis that the average CARs are equal to zero. When we use primary credit borrowing as the event, we ensure that there is no primary credit borrowing from the beginning of the estimation period to the beginning of the event period. Moreover, if a bank has borrowed multiple times in a short period of time, we consider the first loan as the event.

8.1 The Stock Market Reaction Around the Borrowing Date

If market participants can detect primary credit borrowing and consider it a negative signal about the financial condition of the borrowers, we expect to see, on average, a negative CAR around the borrowing date. Columns 1–3 of Table 6 report the mean CARs for primary credit borrowing for the entire period, primary credit borrowing for the financial crisis period, and TAF borrowing. For each event, we provide the results separately for CARs estimated based on the market model and CARs estimated based on the Fama-French model. The table reports the mean CAR, t -statistics, number of observations, and significance levels. The results in Column 1 indicate that, on average, there is no significant negative stock market reaction at the time of primary credit borrowing using the entire sample. The results are robust to the choice of model and to using alternative estimation and event-period windows.²⁴

Next, we focus on the global financial crisis period to analyze whether the stock market reacts differently to discount window borrowing during crisis times. Interestingly, we find that bank stock prices experience a positive abnormal return around primary credit borrowing during the global financial crisis. The three-day CAR is 1%–1.1% depending on which model is used to estimate normal returns, which is significant at the 5% and 10% confidence levels. The result is robust to different estimation periods and different event windows. The first conclusion from this finding is that the crisis period is different from other periods. The second conclusion is that unlike what the idea of discount window stigma implies, not only do we not observe a negative market reaction at the time of primary credit borrowing, we observe a positive reaction. We conjecture that although

²⁴In unreported tests, we use -90 to -30 days relative to the event date as the estimation period and use one-day and two-day event periods and find similar results.

market participants do not observe whether a bank has borrowed from the discount window, they can observe the consequences of borrowing. For example, the market observes that a bank was able to meet its liquidity needs with respect to debtholders, depositors, or other counterparties. This is particularly important during crises as uncertainty around banks' liquidity and survival is extremely high.

8.2 The Stock Market Reaction to H.4.1 Statistical Releases

We also investigate the possibility that the market infers the identity of borrowers from the aggregate weekly discount window lending statistics that are published by the Board of Governors. The H.4.1 statistical release, "Factors Affecting Reserve Balances of Depository Institutions and Condition Statement of Federal Reserve Banks," is typically published on Thursday afternoons around 4:30 p.m. and includes information from the Thursday of the previous week through the Wednesday before the statistical release. The release presents the balance sheet of each FRB and a consolidated balance sheet for all 12 FRBs including the aggregate amount of discount window loans extended by each FRB. Some commentators argue that it is possible for market participants to infer which banks have used the discount window based on these statistics (Hu and Zhang (2021)). Specifically, if a district with only a few large banks experiences a significant increase in its aggregate discount window balance, the market might infer that one or more of these large banks are likely the receivers of discount window funds. The first table in Figure 7 shows aggregate discount window lending amounts published in the last H.4.1 release of 2018. The second table in Figure 7 reports the aggregate amount of loans given by each FRB under Assets. To investigate whether stock market participants infer the identifies of borrower through the weekly statistics, we repeat our event study analyses, but this time we define the event window as a three-day period starting with an H.4.1 statistical release when a district experiences an abnormally large amount of discount window borrowing.²⁵

Table 7 presents the results. In Column 1, the sample includes all banks for which their district experienced an abnormal discount window volume during the week of observation. In Column 2, we restrict the sample in Column 1 to only the two largest banks in each district, defined in

²⁵We consider that a district has abnormal weekly activity if the total amount of weekly borrowing at the district is more than the average amount of weekly borrowing over the past year (52 weeks) plus three standard deviations. In robustness checks, we use alternative measures of abnormal borrowing.

terms of total consolidated assets at the time of the statistical release. As a robustness check we use alternative definitions—top one, top three, and top four banks—and yield similar results. In Column 3, we restrict this sample further to large banks in small districts (in terms of number of banks with over \$10 billion in assets) that are significantly larger than other large banks in the district. These are the largest one or two banks that are at least three times larger than the next largest bank in the district when we sort banks based on total consolidated assets. In Column 4, we include the sample of large banks from Column 2 that are not included in the sample in Column 3. In Columns 5 and 6, we use the samples from Columns 3 and 4 but focus on only statistical releases with abnormal activity during the global financial crisis. As shown in the table, only a few observations satisfy the selection criteria for Column 5. Our findings from Table 7 are as follows: First, we do not find any evidence that banks in a district with abnormal discount window borrowing experience a CAR that is statistically different from zero around release dates. Second, we do not find any evidence that the largest banks in a district with an abnormal amount of borrowing experience a CAR around release dates that is statistically different from zero. Third, focusing on small districts with a few exceptionally large banks that experience abnormal district activity, we do not find that these banks experience a CAR that is significantly different from zero around release dates either. Overall, the results show that there is no empirical evidence that suggests investors react negatively to the announcements of district-level abnormal discount window lending.

9 Discount Window Lending and Supervisory Actions

In this section, we investigate whether there is a supervision channel for discount window stigma. Specifically, we investigate whether Federal Reserve examiners, with better access to discount window data, are more likely than state examiners to take adverse supervisory actions following primary credit borrowing. As explained in detail in Appendix 1, a typical safety and soundness exam occurs once a year (sometimes once every 18 months) and includes a few weeks of on-site and off-site examination. Banks are not required by law to report the primary credit loans that they obtained during the year to examiners. We do not see the entire information set that examiners use but we know that Federal Reserve examiners are more likely to obtain data on primary credit loans

relative to their counterparts from the FDIC and state agencies. Moreover, it is not clear to what extent the knowledge about primary credit borrowing, if obtained, adds value to the public and private information that the examiners already collect about the examined bank.

Our identification strategy relies on the heterogeneity in the alternate examination program that assigns U.S. federal supervisors, including the Federal Reserve, and state supervisors to the same banks at exogenously determined time intervals. With respect to state member banks, the Federal Reserve and the state are the two regulators that supervise each bank. If in one examination spell the Federal Reserve is in charge of supervising the bank, in the next examination spell the state would be in charge, and then Federal Reserve again and so on. For nonmember banks, the same process exists with the exception that the FDIC and state are the regulators. To that end, our identification strategy expands on Agarwal et al. (2014) and exploits the predetermined assignment of regulators for banks under the alternate examination program to assess the specific effect of the Federal Reserve as the regulator on the supervisory rating of primary credit borrowers. In our model an exam outcome variable, such as a downgrade in the examined bank's composite CAMELS rating, is linearly related with an indicator showing whether the bank has borrowed from the primary credit program, the regulator identity indicator, an interaction term between the borrowing indicator and the regulator identity indicator, a vector of bank characteristics, and time indicators.

We use time-fixed effects to control for the general macroeconomic characteristics at the time of the exam. We control for regulator identity since Agarwal et al. (2014) find that federal regulators—the Federal Reserve and the FDIC—are systematically more likely to downgrade ratings than state supervisors. We use bank-fixed effects to control for time-invariant unobserved characteristics of the banks, and bank financials to control for time-variant observed characteristics of the bank. Bank financial variables used are like the ones used in Agarwal et al. (2014). We use the primary credit borrowing indicator as a proxy for time-variant unobserved bank characteristics. Our main variable of interest is the interaction between the primary credit borrowing indicator and the regulator identity indicator. As discussed before, the relationship between primary credit borrowing and subsequent rating downgrades is not necessarily a causal relationship. The primary credit borrowing indicator might proxy for the bank characteristics observed to the examiner but unobserved to the econometrician. The interaction term, however, is indicative. It shows whether, after controlling for

the general effect of regulator and primary credit borrowing on the outcome rating, being examined by Federal Reserve supervisors, who have better access to discount window data, is associated with higher likelihood of a rating downgrade.

Table 8 presents the results. In the main specifications (Columns 1–2 and 5–6), we consider member banks, with the state agencies and the Federal Reserve as regulators under the alternate examination program. In the placebo specifications (Columns 3–4 and 7–8), we consider nonmember banks with the state agencies and the FDIC as regulators. Columns 1–4 of Table 8 report the results for the composite CAMELS rating downgrade for subsamples of member banks and nonmember banks. In Columns 5–8, estimates for the composite rating upgrades are used as the dependent variables for the same subsamples. Each regression includes quarter and bank fixed effects, and standard errors are clustered at the state level. We also control for quarterly bank characteristics across all specifications.

The findings from Table 8 are as follows: The coefficient on the indicator for the presence of a federal regulator is statistically significant and positive across Columns 1–4, where a CAMELS rating downgrade is the dependent variable. This coefficient is statistically significant and negative across Columns 5–8, where a CAMELS rating upgrade is the dependent variable. The results confirm prior literature’s findings that federal regulators are systematically tougher, more likely to downgrade, and less likely to upgrade CAMELS ratings. The coefficient on the primary credit borrowing indicator is statistically significant and positive for nonmember banks when CAMELS downgrades are the dependent variable (Columns 3 and 4). This coefficient is not significantly different from zero for member banks (Columns 1 and 2). However, when we distinguish between occasional primary credit borrowing and frequent primary credit borrowing in the next table (Table 9), the coefficient for primary credit borrowing becomes positive and significant for frequent borrowing but not for occasional borrowing. As explained above, the coefficient for primary credit borrowing should proxy for the private information that regulators have on the deteriorating bank conditions received as a result of their examination. This applies to all regulators and is not specific to the Federal Reserve. Columns 5–8 of Table 8 show that primary credit borrowing is not significantly related to CAMELS upgrade outcomes. The variable of the interest, however, is the coefficient on the interaction term between the Federal Reserve indicator and the primary credit borrowing. This coefficient is not significantly different from zero for either type of banks and for

either type of supervisory outcome (CAMELS downgrades and upgrades). The results in Columns 1 and 2 of Table 8 indicate that for an average member bank, the Federal Reserve is not more likely to downgrade a borrowing bank than state regulators are. The results for nonmember banks are also similar. The FDIC, which shares similar supervisory characteristics as the Federal Reserve (Agarwal et al. (2014)) but without having the lender-of-last-resort functionality, is not more likely to downgrade a borrowing bank than state regulators are (Columns 3 and 4). The results in columns 5–8 of Table 8 provide similar results for upgrade decisions: there is no difference among regulators, whether or not they have a discount window function. Overall, our results show that Federal Reserve examiners, with potentially more information about primary credit borrowing, are not more likely to punish borrowers through rating downgrades.

In Table 9, we test the robustness of our findings using different specifications. Column 1 replicates the reference specification from Table 8, including all controls and using ratings downgrades as the dependent variable. In Column 2, we differentiate between frequent and occasional borrowing and incorporate two interaction terms instead of one. The results confirm that Federal Reserve examiners are not more likely to downgrade borrowers compared to state regulators, regardless of borrowing frequency. However, the findings support the conclusion that banks in weaker financial positions are more likely to utilize the primary credit program.

Next we consider the possibility that our results are driven by heterogeneity in the organizational structure of the 12 reserve banks in charge of the Federal Reserve’s discount window lending program. We identify three groups of FRBs: those with separate departments for the discount window and supervision functions, those with both functions under one department, and those that underwent organizational change during the sample period with these functions under separate departments at one point and under one department at another point. Therefore, we consider the possibility that the insignificant coefficient on the interaction term in previous specifications is driven by the lack of organizational proximity between the discount window and supervision functions within some of the FRBs. In about half of bank-quarter observations, the dummy indicator for both functions being under one department, i.e., the “one department” dummy takes a value of one. The last two columns of Table 9 include the results. In Columns 3–4 of Table 9 we repeat the specifications from Columns 1–2 but this time we interact the main variables with the “one department” indicator. Exploiting the cross-sectional and time-varying regional heterogeneity

in the organizational structure of the FRBs, we find that lack of proximity between the discount window and supervision functions in some reserve banks does not drive our previous findings.

The results support our conclusion that there is no obvious supervision channel that explains discount window stigma.

9.1 The Supervision Channel During the Global Financial Crisis

Given the importance of the role of the Federal Reserve as the lender of last resort during the recent financial crisis, we next focus our analysis on the 2007–2010 period. This period is also distinguished from the rest of our sample in that the Federal Reserve introduced the TAF program. As explained above, all the banks that were eligible to borrow from the primary credit program were eligible to borrow from the TAF and vice versa. Hu and Zhang (2021) argue that banks self-select into different discount window lending programs. They argue that unlike primary credit funding that is released on the same day it is requested, TAF funding is released with a three-day delay—that is, winners of a TAF auction receive funding in three days. Therefore, they predict that the weakest banks borrow from the primary credit program immediately because they are desperate for liquidity and cannot afford to wait. Stronger banks, in contrast, participate in the auction because the potential of borrowing cheap renders the auction more attractive than primary credit loans. Table 10 presents the results of our main model for the global financial crisis period. We distinguish between TAF borrowing and primary credit borrowing during an examination spell and include an interaction term between dummies representing each type of borrowing and the Federal Reserve dummy. We also include an interaction term between the TAF borrowing dummy and the primary credit borrowing dummy. As shown earlier there are banks that participated in both programs. Confirming our prior results, we find that the Federal Reserve is not more likely to downgrade primary credit borrowers than its state counterparts who do not have a discount window function. In fact, we find that Federal Reserve examiners are less likely to downgrade TAF borrowers relative to state borrowers. A potential explanation for this finding is that, as Hu and Zhang (2021) argue, banks that participate in the auction-based mechanisms are in a stronger financial position than banks that borrow primary credit.

9.2 Textual Analysis of Examination Reports

Finally, we conduct a textual analysis of confidential examination reports as a direct method to see whether discount window borrowing is used as a reason for downgrading a bank by an examiner. We consider all the examination documents related to member banks in the Federal Reserve Bank of Richmond District that borrowed from the discount window during 2003–2018. We identify 33 such banks using discount window loan data. These banks collectively borrowed 709 times during the sample period. There are a total of 5,142 documents related to these banks in the Federal Reserve’s central document repository. Of these documents, we identify 214 documents in which either “discount window” or “primary credit” appear at least once. We then read these 214 documents carefully to understand whether examiners use discount window information to punish the examined bank. We find that this is not the case. Of the 214 documents with at least one keyword, we find that only two documents directly report actual discount window borrowing. In the other 99% of the documents, only the potential role that the discount window might play for contingency liquidity planning is mentioned, not the actual discount window borrowing. This mention is not limited to discount window borrowers. In addition to being required to hold liquid assets to meet unexpected liquidity needs, all supervised banks are required to have a liquidity contingency plan that details what actions the bank would take in case its liquid assets are not sufficient. To that end, banks usually provide a list of external sources of liquidity that they can access in emergency situations.²⁶ The exam reports we analyzed show that the external sources of liquidity that banks generally mention in their contingency plans include but are not limited to (1) funding from other banks through unsecured correspondent lines or the repo market, (2) loans from the Federal Home Loan Banks (FHLBs), and (3) loans from the discount window.

Table 11, Panel A provides a breakdown of borrowing banks’ documents. In Panel B, we provide two examples of how discount window keywords are mentioned in internal supervisory reports in the context of liquidity contingency planning. We also provide excerpts of the two cases we find that the examiners refer to actual discount window borrowing. Bank names and dollar amounts

²⁶The Federal Reserve’s examiner manual recommends that banks consider the discount window as a reliable contingency funding source. “The Federal Reserve’s primary credit program (discount window) offers depository institutions an additional source of available funds... for managing short-term liquidity risks. ...Management may find it appropriate to incorporate the availability of the primary credit program into their institution’s diversified liquidity-management policies, procedures, and contingency plans.” See Commercial Bank Examination Manual, Section 4020.1, p. 2, available at <https://www.federalreserve.gov/boarddocs/supmanual/cbem/200904/4000.pdf>.

are omitted for anonymity. The two cases suggest that examiners pay little attention to discount window borrowing and do not consider it negatively. The first excerpt belongs to a frequent user of the primary credit program that borrowed multiple times and in most years during the sample period. Despite this unusually large number of discount window loans, only once did examiners mention borrowing, and the bank received a CAMELS rating of 1, the highest rating a bank can receive. In the other case, examiners expressed concerns about the bank’s liquidity, not because of discount window borrowing, but due to the bank’s lack of available collateral for future borrowing. The full exam report reveals the bank’s deteriorating financial condition across various dimensions.

In summary, the results from Sections 8 and 9 demonstrate that borrowing from the discount window does not elicit negative reactions from capital markets or Fed supervisors since 2003. However, the evidence presented in Section 6 shows that some banks avoid discount window borrowing during this time period and instead choose more expensive short-term funding options. Moreover, the insights shared by industry experts, as summarized in Section 3, further support the persistence of discount window stigma. One plausible explanation that connects these findings is the opacity surrounding the discount window program, which the Fed maintains to ensure borrower confidentiality. This opacity presents a challenge for banks to verify the absence of adverse consequences associated with borrowing, especially after 2003. We delve into this point in greater detail in the Introduction section of the paper. In the upcoming section, we discuss this issue further and explore potential solutions for the Fed to consider.

10 Discussion and Concluding Remarks

Despite the importance of the discount window as a policy tool, there are many gaps in our knowledge of discount window borrowing and the characteristics of the institutions that borrow. Using a unique, comprehensive dataset from the Federal Reserve we shed light on several key issues, including discount window stigma. Many of the details that we provide about discount window borrowing are presented for the first time in the literature.

We show that borrowing from the discount window has been prevalent in all years, with an average of 513 unique institutions borrowing each year. The peak occurred in 2009, during the global financial crisis, with 1,145 unique borrowers accessing the primary credit program. Although bor-

rowing was predominantly done by domestic banks, we also show that foreign banking organizations were special beneficiaries of the discount window during the global financial crisis. The loans they obtained were significantly larger and with longer terms relative to the loans obtained by domestic banks.

Despite the large number of primary credit loans during the crisis, some institutions did not borrow from the Federal Reserve until the introduction of the Term Auction Facility. Our results show that 88 banks that borrowed from the TAF never borrowed from the primary credit program. The majority of these institutions picked TAF because they could obtain loans at a better rate relative to prevailing primary credit rate. We find that 13 banks obtained TAF loans at an interest rate that was higher than the prevailing primary credit rate and paid a premium of up to 150 basis points. Despite being a small portion of borrowers, the banks that did not use the primary credit program, but instead paid a premium for TAF funds, are a clear indication that stigma prevented some banks from borrowing at the discount window.

The Federal Reserve overhauled the discount window in 2003 and was explicit that the changes were intended to eliminate stigma. The Federal Reserve adopted a “no questions asked” policy, set general criteria for borrowing at the window, and committed to maintaining the confidentiality of borrowers at the time of borrowing. The results of our empirical analysis show that following these reforms, no clear evidence can be found that markets reacted negatively to discount window borrowing following the 2003 reforms. Although our results show that on average borrowers are weaker financially than non-borrowers, we find no significant abnormal returns following borrowing or the release by the Federal Reserve of aggregate discount window statistics for banks that borrowed from the discount window. We also do not find that the Federal Reserve examiners with better access to discount window loan data are more likely to downgrade supervisory ratings following banks’ discount window borrowing.

Discount window stigma is based on the belief that borrowing from the Federal Reserve signals negative information about the borrower and if stakeholders observe this signal, they will react negatively. Our findings indicate that the Federal Reserve successfully kept borrowing confidential, but discount window stigma remains. Given that the 2003 reforms did not eliminate stigma, our paper raises an important issue: what is the ideal mechanism design to remove stigma in an environment where stigma is already institutionalized?

Three main proposals are currently being discussed to reduce stigma associated with discount window borrowing. One proposal is to increase opacity, preventing market participants from receiving the signal provided by such borrowing. However, our findings suggest that this may not effectively reduce stigma, as there is no evidence of excessive transparency being a problem since the introduction of the primary credit program. Another proposal is to make discount window borrowing uninformative, eliminating the negative signal associated with it. One practical approach to achieve this is mandating that all banks borrow from the discount window regularly and randomly, in significant amounts and with sufficient frequency to make it difficult for market participants or supervisors to discern whether the borrowing is driven by liquidity needs or simply required. However, this approach could be perceived as inconsistent with the central bank's role as the lender of last resort, as it would establish a routine practice of borrowing from the central bank even in non-distressed situations. Moreover, our findings do not support the necessity of such an approach, as we find no negative impact from markets or bank supervisors following discount window borrowing. The third approach is to publish discount window information with a delay, enabling banks to conduct back testing and assess the implications of borrowing. Since 2010 the Federal Reserve has revealed loan information with a two-year lag, allowing banks to conduct back testing, at least in capital markets. Our study serves as an example of an analysis that can address banks' concerns, demonstrating that discount window borrowing has not had any adverse effects on borrowers through market or supervision channels.

The failure of SVB illustrates the significance of the discount window as a contingency funding source. If SVB had availed itself of the discount window prior to its failure, it could have obtained crucial liquidity support, potentially averting the need for FDIC intervention. These observations underscore the importance of addressing banks' concerns regarding the potential adverse consequences associated with discount window borrowing. Furthermore, it emphasizes the need for new empirical studies and theoretical work in this area to further enhance our understanding of the role and impact of central bank lending programs in maintaining financial stability.

Appendix 1: Banking Supervision in the United States

The Federal Reserve plays a distinct role in the U.S. economy. It sets monetary policy. It also supervises and regulates banking institutions. While these responsibilities have been extensively studied individually, their interplay remains largely unexplored. This study examines a vital tool used by the Federal Reserve to implement monetary policy—supplying credit through its discount window and setting the discount rate. By addressing the question of whether the Federal Reserve’s supervisory role undermines its role as the lender of last resort, our findings shed partial light on this issue.

Approximately every 12-18 months, U.S. commercial banks undergo safety and soundness examinations by bank regulators. These exams typically consist of an on-site examination, complemented by an off-site review. The examination process begins with a request letter for various documents, including financial statements, policies, board minutes, and audit reports. The off-site review involves analyzing information from the bank and other sources. During the on-site review, which lasts about two to three weeks, discussions are held with bank management and relevant parties.²⁷ After the examination, examiners prepare an internal conclusion memo and assign CAMELS ratings to the bank. The examination concludes with an “exit meeting” where findings and ratings are presented to bank management, followed by the issuance of a written examination report by the regulatory authority. CAMELS ratings reflect the bank’s condition based on examiner assessments of its financial performance and management practices across the CAMELS components (capital, asset quality, management, earnings, liquidity, and sensitivity to market risk). Ratings are assigned on a numerical scale of one to five, with one indicating the highest rating and five being the lowest. CAMELS ratings play a critical role in regulatory decisions, impacting dividend distribution, mergers, expansions, and potentially leading to enforcement actions or bank closures.

Four banking regulators in the United States conduct safety and soundness examinations, including the Office of the Comptroller of the Currency (OCC), the FDIC, the Federal Reserve, and state banking departments. The choice of regulator(s) for a bank’s examination depends on the bank’s charter and its membership in the Federal Reserve System. State-chartered banks that are Federal Reserve System members are regulated by both the chartering state and the Federal

²⁷An examination conducted solely through off-site reviews is referred to as an off-site examination, while an examination that includes both off-site and on-site reviews is known as an on-site examination.

Reserve, while nonmember banks are regulated by the chartering state and the FDIC.²⁸ Agarwal et al. (2014) explain that prior to the 1970s, state-chartered banks underwent separate annual examinations by state and federal banking agencies. To eliminate duplication, the FDIC and later the Federal Reserve conducted joint examinations with state banking departments in select states. This led to the realization that federal agencies could rely on state examinations in alternate cycles. The Federal Deposit Insurance Corporation Improvement Act (FDICIA) of 1991 formalized this practice, allowing federal agencies to rely on state exams if deemed sufficient. Cooperative agreements were established or revised accordingly. The “alternate examination program” assigned state-chartered commercial banks to fixed 12-month or 18-month rotations between state and federal supervisors. The econometric identification in our analysis hinges on the exogenous alternate examination policy between state and federal supervisors, which is explained in detail in the main paper. This setup allows us to exploit within-bank variation to identify average differences in supervisory rating reactions to discount window borrowing. Notably, the Federal Reserve exclusively serves as the lender of last resort and has access to all discount window loan information.²⁹ Moreover, the assignment of regulators is exogenous to a bank’s financial conditions.

Banks are generally not required to report their discount window borrowing to examiners, making it difficult to detect such short-term loans, particularly if there is no incentive for banks to voluntarily disclose them. However, the discount window staff at the Federal Reserve have full information on all discount window loans. If banks perceive that borrowing from the Federal Reserve as the lender of last resort could have negative implications for their relationship with the Federal Reserve as the bank supervisor, they may choose to refrain from borrowing. Previous studies (Peristiani (1998); Furfine (2003); Armantier et al. (2015)) suggest this behavior, and our discussions with Federal Reserve staff reveal that examiners can request access to a bank’s discount window information, unlike other bank regulators. Although Fed examiners may have more knowledge about discount window borrowings, it is uncertain whether this information significantly enhances their understanding of a bank’s financial and liquidity position, as they already have

²⁸The Office of the Comptroller of the Currency (OCC) was established by the National Bank Act of 1863, which aimed to charter national banks and support the circulation of a standardized currency during the Civil War. While the role of national banks in currency circulation has evolved since the establishment of the Federal Reserve, the bank chartering system continues to persist.

²⁹It is noteworthy that nonmember banks, despite not being regulated by the Federal Reserve, are granted the ability to borrow from the discount window under the same terms and conditions as member banks, as facilitated by the Monetary Control Act of 1980.

access to various sources of private information. Consequently, discount window borrowing is a less important signal for examiners compared to market participants.

Appendix 2: Additional Details on Data Preparation

In this section we explain the additional steps we take to prepare the data.

To obtain daily stock price information we merge the primary credit loan data and TAF loan data with the CRSP-FRB link provided by the Federal Reserve Bank of New York that links regulatory identification numbers (RSSD ID) to permanent company number (PERMCO) used by the CRSP. The PERMCO is a unique and permanent company identification number assigned to publicly traded institutions in the CRSP database. We use the borrowing bank’s RSSD ID as well as the borrowing bank’s ultimate parent RSSD ID to conduct the match. The reason is that although most publicly traded institutions are bank holding companies, we also observe some commercial banks being directly traded in the data.

Bank failures are based on the Federal Reserve’s National Information Center (NIC) definition. Specifically, we consider that a bank has failed when the quarterly REASON_TERM_CODE variable equals 5, which is defined as “Failure, entity ceases to exist.”³⁰

We use a unique data set from the NIC covering results of all safety and soundness exams conducted by U.S. banking regulators. We analyze only CAMELS ratings assigned after an on-site, full-scope inspection. This reflects the concern that limited and targeted inspections produce a less comprehensive supervisory information set than is produced in a full inspection. We also focus on “independent” exams, excluding exams that are jointly or concurrently conducted by two regulators on a bank. In an independent exam, only one regulator is responsible for conducting the examination and is fully in charge of determining the bank’s CAMELS ratings at the end of an exam. Independent exams constitute most exams in the data. Following the methodology in Agarwal et al. (2014), we select the sample of banks based on the alternative examination program rules by excluding a small fraction of state-chartered banks that are excluded from rotations such as de novo banks and banks under further scrutiny by supervisors.

CAMELS ratings, which provide a measure of each bank’s condition, comprise six components:

³⁰For details, see <https://www.ffiec.gov/npw/StaticData/DataDownload/NPW%20Data%20Dictionary.pdf>, pp. 26-27.

(1) capital adequacy, (2) asset quality, (3) management, (4) earnings, (5) liquidity, and (6) sensitivity to market risk. The components are given one of the following ratings: 1 = strong, 2 = satisfactory, 3 = less than satisfactory, 4 = deficient, and 5 = critically deficient. The empirical tests use composite CAMELS ratings, which are based on bank examiner judgements and may weight some components more than others. CAMELS ratings are confidential and revealed by banking supervisors only to senior management at the bank.

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Table 1: Basic Descriptive Statistics - Primary Credit Program

The table reports aggregate statistics on all the loans obtained from the Federal Reserve under the Primary Credit Program from 2003 to 2019. The Primary Credit Program is the main discount window facility in the United States since 2003.

Characteristic	Value
Number of Unique Borrowers	2,958
Domestic Banks	2,336 (78.97%)
Domestic Non-Bank Depository Institutions	526 (17.78%)
Foreign Banking Organizations	92 (3.11%)
Number of Unique Loans	42,713
Median Size of a Loan	\$3.13 million
Median Loan Term	1 day
Median Loan Interest Rate	0.75%

Table 2: Evidence of Perceived Stigma from Term Auction Facility Loans

The table reports the combination of domestic banks that borrowed from Term Auction Facility during the global financial crisis. These banks are divided into various groups based on whether or not they paid a premium relative to prevailing primary credit program rates to borrow from TAF and whether or not they also participated in the primary credit program.

Banks that Borrowed from TAF	Number	Percentage
All	326	100%
(1) Paid a lower rate relative to the prevailing primary credit program rate	255	78%
(2) Paid a higher rate relative to the prevailing primary credit program rate	71	22%

Breakdown of Group (2):

(2.1) Participated in the primary credit program both before and after TAF borrowing	34	48%
(2.2) Participated in the primary credit program only before overpaying for TAF	7	10%
(2.3) Participated in the primary credit program only after overpaying for TAF	17	24%
(2.4) Did not participate in the primary credit program	13	18%

Table 3: **Summary Statistics of State-Chartered Banks**

The table presents summary statistics for state-chartered banks. The unit of observation in the top panel is a bank quarter. The unit of observation in the bottom panel is an examination spell, defined as the time period that ends with the closing of an exam and starts with the closing of the previous exam. The bank-level characteristics reported in the table are: Tier 1 risk-based capital ratio, leverage ratio (Tier 1 capital as a share of total risk-unweighted assets), expense or efficiency ratio (noninterest expense as a percentage of net operating revenue), return on assets, share of nonperforming loans to total loans, delinquency rate of the loan portfolio (delinquent loans include loans that are 30-plus days past due and loans in nonaccrual status, and nonperforming loans that are 90-plus days delinquent and loans in nonaccrual status), and annual loan growth rate. In the bottom panel, FRB, FDIC, and STATE respectively indicate whether the Federal Reserve, the Federal Deposit Insurance Corporation, or state regulators is the lead regulator in on-site examinations. Primary credit (PC) borrowing is a dummy variable that receives a value of 1 if a bank has borrowed from the Federal Reserve’s PC at least once during an examination spell. Occasional use of PC and frequent use of PC are respectively related to whether the bank under examination has borrowed maximum once a quarter during the examination or more. The table also reports whether the bank has failed within two years following the examination as well as whether the bank’s composite CAMELS rating and each CAMELS rating component is downgraded as a result of an exam. Sample period is 2003:Q1–2019:Q4.

Bank Financials	Observations	Mean	Std dev
Tier 1 capital ratio (%)	244,912	17.00	8.32
Leverage ratio (%)	244,912	10.95	3.52
Expense ratio (%)	244,815	65.48	15.29
ROA (%)	244,912	1.06	0.70
Delinquency rate (%)	244,096	0.18	0.39
Nonperforming to loans (%)	243,968	1.11	1.31
Loan growth rate (%)	238,575	9.55	18.09
Binary Variables	Observations	Number	Percentage
State member bank (SMB)	33,919	3,473	10.24
State nonmember bank (NMB)	33,919	30,446	89.76
FRB	33,919	1,829	5.39
FDIC	33,919	13,478	39.74
STATE	33,919	18,612	54.87
PC borrowing	33,919	1,939	5.72
Occasional use of PC	33,919	1,256	3.70
Frequent use of PC	33,919	683	2.01
Bank failure	33,919	144	0.42
CAMELS composite rating downgrade	33,919	4,359	12.85
Capital rating downgrade	33,919	3,743	11.04
Asset rating downgrade	33,919	6,099	17.98
Management rating downgrade	33,919	5,229	15.42
Earnings rating downgrade	33,919	5,045	14.87
Liquidity rating downgrade	33,919	3,863	11.39
Sensitivity rating downgrade	33,919	3,971	11.71
CAMELS composite rating upgrade	33,919	2,179	6.42

Table 4: **Primary Credit Borrowing—Ex Post Failure**

The table reports results from an ordinary least squares regression that examines the relationship between using Federal Reserve’s primary credit facility by a bank and ex post bank failure. In models 2 and 3, we control for bank and quarter fixed effects. In model 3, we control for quarterly bank-level characteristics including Tier 1 risk-based capital ratio, leverage ratio (Tier 1 capital as a share of total risk-unweighted assets), expense or efficiency ratio (noninterest expense as a percentage of net operating revenue), return on assets, share of nonperforming loans to total loans, delinquency rate of the loan portfolio (delinquent loans include loans that are 30-plus days past due and loans in nonaccrual status, and nonperforming loans that are 90-plus days delinquent and loans in nonaccrual status), and annual loan growth rate. Standard errors are clustered at the state level. ***, **, and * denote 1%, 5%, and 10% statistical significance, respectively. Standard errors are reported in parentheses.

	Ex post bank failure		
	(1)	(2)	(3)
PC borrowing	0.006*** (0.002)	0.007*** (0.003)	0.006** (0.002)
Tier1 capital ratio			-0.020* (0.010)
Leverage ratio			-0.032 (0.039)
Expense ratio			-0.013** (0.005)
ROA			-0.533*** (0.169)
Delinquency rate			-0.077 (0.061)
Nonperforming to loans			0.227*** (0.080)
Loan growth rate			-0.015** (0.007)
Bank FE		YES	YES
Quarter FE		YES	YES
Observations	244,915	244,911	238,429
Adj. R2	0.00	0.39	0.41

Table 5: Primary Credit Borrowing—CAMELS Ratings Downgrades

The table reports results from an ordinary least squares regression that examines the relationship between using the Federal Reserve's primary credit facility by a state-chartered bank and subsequent downgrades in confidential supervisory ratings (CAMELS ratings). In models 1–3, a dummy variable that indicates downgrade in combined CAMELS rating is the dependent variable. In models 5–9, a dummy variable that indicates downgrade in subcomponent ratings are used as dependent variables. Models 2–9 include quarter and bank fixed effects. Models 3–9 control for quarterly bank-level characteristics including Tier 1 risk-based capital ratio, leverage ratio (Tier 1 capital as a share of total risk-unweighted assets), expense or efficiency ratio (noninterest expense as a percentage of net operating revenue), return on assets, share of nonperforming loans to total loans, delinquency rate of the loan portfolio (delinquent loans include loans that are 30-plus days past due and loans in nonaccrual status, and nonperforming loans that are 90-plus days delinquent and loans in nonaccrual status), and annual loan growth rate. Standard errors are clustered at the state level. ***, **, and * denote 1%, 5%, and 10% statistical significance, respectively. Standard errors are reported in parentheses.

	Combined CAMELS			Capital	Asset	Management	Earnings	Liquidity	Sensitivity
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
PC borrowing	0.034*** (0.012)	0.037*** (0.014)	0.030*** (0.013)	0.035*** (0.012)	0.057*** (0.014)	0.025* (0.013)	0.026* (0.013)	0.027** (0.012)	0.013 (0.012)
Control for financials			YES	YES	YES	YES	YES	YES	YES
Bank FE		YES	YES	YES	YES	YES	YES	YES	YES
Quarter FE		YES	YES	YES	YES	YES	YES	YES	YES
Observations	244,915	244,911	238,429	238,429	238,429	238,429	238,429	238,429	238,429
Adj. R2	0.00	0.19	0.21	0.23	0.23	0.18	0.21	0.18	0.16

Table 6: **Stock Market Cumulative Abnormal Returns—Borrowing Day Returns**

The table reports cumulative abnormal returns (CARs) for discount window borrowing events that are calculated as the sum of daily abnormal returns between the event date and two days after the event date. The source of daily bank stock returns to estimate CARs is the Center for Research in Security Prices (CRSP). CARs are computed separately from two models. Each model is estimated from days -60 to -30 relative to the day of borrowing. To estimate model parameters (betas), daily excess return of borrowing bank stock (with respect to risk-free rate) is regressed on a set of daily factors. The abnormal daily returns are then calculated as the difference of realized and predicted return on each day in the event period. The two models used are (1) the market-model in which the excess return on Standard & Poor’s index is the sole factor in the model and (2) the Fama-French five-factor model in which the factors include: the excess return on value-weight return on all CRSP firms, SMB (Small Minus Big), HML (High Minus Low), RMW (Robust Minus Weak), CMA (Conservative versus Aggressive). PC denotes primary credit borrowing and TAF denotes Term Auction Facility borrowing. Test statistics for t -tests and the number of observations used to estimate the mean CARs are reported in parentheses below the mean. ***, **, and * denote 1%, 5%, and 10% statistical significance, respectively.

PC borrowing (all)	PC borrowing (crisis)	TAF borrowing (crisis)
(1)	(2)	(3)
Market model		
0.002	0.010*	−0.011
(1.487)	(1.925)	(1.403)
1,432	356	117
Fama-French model		
0.001	0.011**	−0.004
(0.868)	(2.024)	(0.540)
1,432	356	117

Table 7: Stock Market Cumulative Abnormal Returns—Abnormal District Activity

The table reports cumulative abnormal returns (CARs) for Federal Reserve H.4.1 weekly release date events. The sample includes all publicly traded banks located in Federal Reserve districts with larger than normal weekly discount window lending activities, defined as having an aggregate weekly primary credit lending that is larger than average district's annual aggregate weekly primary credit lending plus three standard deviations. CARs are calculated as the sum of daily abnormal returns between the event date and two days after the event date. The source of daily bank stock returns to estimate cumulative abnormal returns is the Center for Research in Security Prices (CRSP). CARs are computed separately from two models. Each model is estimated from days -60 to -30 relative to the day of borrowing. To estimate model parameters (betas), daily excess return of borrowing bank stock (with respect to risk-free rate) is regressed on a set of daily factors. The abnormal daily returns are then calculated as the difference of realized and predicted return on each day in the event period. The two models used are (1) the market-model in which the excess return on Standard & Poor's index is the sole factor in the model and (2) the Fama-French five-factor model in which the factors include the excess return on value-weight return on all CRSP firms, SMB (Small Minus Big), HML (High Minus Low), RMW (Robust Minus Weak), CMA (Conservative versus Aggressive). Results are reported separately for all banks, large banks, exceptionally large banks (defined as extremely large banks in small districts), and for banks during crisis period. Test statistics for t -tests and the number of observations used to estimate the mean CARs are reported in parentheses below the mean. ***, **, and * denote 1%, 5%, and 10% statistical significance, respectively.

	All banks	Large banks	Exceptionally large banks	Other large banks	Exceptionally large banks (crisis)	Other large banks (crisis)
	(1)	(2)	(3)	(4)	(5)	(6)
Market model						
	0.001	0.001	-0.001	0.001	0.016	0.021
	(1.566)	(0.319)	(0.239)	(0.418)	(0.425)	(1.479)
	7,208	312	34	278	4	28
Fama-French model						
	0.001	0.001	0.008	-0.000	0.094	0.015
	(1.145)	(0.486)	(0.955)	(0.055)	(1.772)	(1.343)
	7,208	312	34	278	4	28

Table 8: The Impact of Supervisor Identity on CAMELS Rating Revisions Following Primary Credit Borrowing

The table reports results from an ordinary least squares regression that examines the relationship between using the Federal Reserve's primary credit facility by a bank and subsequent CAMELS rating composite downgrades and upgrades. We distinguish between state-member banks (SMBs) that are supervised by state regulators and the Federal Reserve and nonmember banks (NMBs) that are supervised by state regulators and the Federal Deposit Insurance Corporation. In each specification, we control for the lead supervisory agency that took the regulatory action (FRB or FDIC, with state regulators being the omitted variable). All regressions include bank and quarter fixed effects. Standard errors are clustered at the state level. ***, **, and * denote 1%, 5%, and 10% statistical significance, respectively. Standard errors are reported in parentheses.

	CAMELS rating downgrade			CAMELS rating upgrade				
	SMBs, FRB-STATE rotating	NMBs, FDIC-STATE rotating	(4)	SMBs, FRB-STATE rotating	NMBs, FDIC-STATE rotating	(6)	(7)	(8)
FRB	0.137*** (0.012)	0.140*** (0.012)		-0.081*** (0.012)	-0.083*** (0.012)			
FDIC		0.069*** (0.010)	0.069*** (0.010)				-0.019*** (0.006)	-0.020*** (0.006)
PC borrowing		0.019 (0.033)	0.036*** (0.014)			-0.045 (0.027)		-0.012 (0.012)
FRB × PC borrowing		-0.047 (0.046)			0.040 (0.030)			
FDIC × PC borrowing			-0.002 (0.017)					0.013 (0.014)
Control for financials	YES	YES	YES	YES	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	22,103	216,326	216,326	22,103	22,103	216,326	216,326	216,326
Adj. R2	0.22	0.22	0.23	0.15	0.15	0.14	0.14	0.14

Table 9: The Impact of the Frequency of Primary Credit Borrowing on CAMELS Rating Downgrades

The table reports results from an ordinary least squares regression that examines the relationship between using the Federal Reserve’s primary credit facility by a bank and subsequent CAMELS rating composite downgrades. The sample includes state-member banks (SMBs). In each specification, we control for whether the Federal Reserve was the lead supervisory agency that took the regulatory action (with state regulators being the omitted variable). We distinguish between occasional use of primary credit and frequent use of primary credit. If a bank has borrowed no more than once a quarter from the Federal Reserve’s primary credit program, then we consider the bank as an occasional borrower. Otherwise, we consider the bank as a frequent borrower. All regressions include bank and quarter fixed effects. Standard errors are clustered at the state level. ***, **, and * denote 1%, 5%, and 10% statistical significance, respectively. Standard errors are reported in parentheses.

	SMBs, FRB-STATE rotating			
	(1)	(2)	(3)	(4)
FRB	0.140*** (0.012)	0.140*** (0.012)	0.144*** (0.023)	0.145*** (0.024)
PC borrowing	0.019 (0.033)		0.019 (0.033)	
Occasional use of PC		-0.029 (0.029)		-0.030 (0.029)
Frequent use of PC		0.109* (0.055)		0.110* (0.056)
FRB × PC borrowing	-0.047 (0.046)		-0.034 (0.069)	
FRB × Occasional use of PC		-0.015 (0.048)		0.039 (0.063)
FRB × Frequent use of PC		-0.104 (0.074)		-0.157 (0.103)
FRB × One department			-0.007 (0.029)	-0.008 (0.029)
FRB × One department × PC borrowing			-0.023 (0.074)	
FRB × One department × Occasional use of PC				-0.093 (0.082)
FRB × One department × Frequent use of PC				0.096 (0.101)
Control for financials	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES
Observations	22,103	22,103	22,103	22,103
Adj. R2	0.22	0.22	0.22	0.22

Table 10: The Impact of Supervisor Identity on CAMELS Rating Downgrades during the Financial Crisis

The table reports results from an ordinary least squares regression that examines the relationship between using the Federal Reserve’s primary credit facility and/or Term Auction Facility (TAF) by a state member bank and subsequent CAMELS rating composite downgrades. We control for whether the Federal Reserve is the lead supervisory agency in the examination that took the regulatory action. We limit the sample to on-site examinations during the global financial crisis, when in addition to the primary credit program, banks have access to TAF. All regressions include bank and quarter fixed effects. Standard errors are clustered at the state level. ***, **, and * denote 1%, 5%, and 10% statistical significance, respectively. Standard errors are reported in parentheses.

	SMBs, FRB-STATE rotating		
	(1)	(2)	(3)
FRB	0.248*** (0.044)	0.236*** (0.048)	0.242*** (0.048)
PC borrowing	0.070 (0.114)	-0.085 (0.146)	0.008 (0.150)
TAF borrowing	0.040 (0.349)	0.286 (0.379)	0.696 (0.480)
PC borrowing × TAF borrowing			-0.701 (0.451)
FRB × PC borrowing		0.269 (0.164)	0.196 (0.175)
FRB × TAF borrowing		-0.622** (0.270)	-1.048** (0.461)
FRB × PC borrowing × TAF borrowing			0.573 (0.426)
Control for financials	YES	YES	YES
Bank FE	YES	YES	YES
Quarter FE	YES	YES	YES
Observations	3,183	3,183	3,183
Adj. R2	0.76	0.76	0.76

Table 11: **Textual Analysis of Supervision Documents**

Panel A reports the breakdown of examiner-produced documents in which discount window keywords were mentioned at least once. The sample include confidential reports on 33 state member banks in the Federal Reserve Bank of Richmond District that borrowed from the discount window during 2003–2019. Panel B presents the excerpts from some of the documents in which discount window keywords were mentioned. Bank names and dollar amounts are removed to preserve anonymity of the borrowing banks. The source is the Federal Reserve’s central document repository. **Panel A - Breakdown of Reports Read by the Authors**

Supervisory documents on the borrowing banks	5,142
in which discount window keywords are mentioned	214
in which the discount window is only mentioned as an option for liquidity contingency planning	212
in which actual discount window borrowing is identified and reported	2

Panel B - Examples of How Discount Window is Mentioned in Examiner Reports

Example of discount window mentioned for contingency planning	
Example 1	Liquid assets total . . . and are comprised primarily of commercial paper and interest-bearing balances. In addition, contingent funding sources include secured borrowing availability of . . . from the FHLB and . . . from the discount window along with unsecured correspondent lines totaling The liquidity position has continued to tighten over the past year as loan growth has outpaced deposit generation.
Example 2	The reliance on wholesale funding has decreased since the prior examination as management grew deposits and nearly eliminated the use of brokered deposits. Management maintains strategic focus and investing in resources to grow low cost, core deposits. Contingent sources of funding are acceptable, including . . . in secured borrowing availability with the discount window and . . . million with the FHLB. Additional secondary funding sources include availability in unsecured Federal funds facilities totaling
Cases of actual discount window borrowing mentioned	
Case 1	The cost of funds has historically been above the peer median due to the highly competitive nature of most of Bank . . . deposit markets. In an effort to control the cost of funds, senior management has increased the use of borrowings and brokered deposits as funding sources. Of the . . . in asset growth, . . . was funded by an increase in borrowings from the FHLB of . . . and the Federal Reserve discount window , and an additional . . . was funded by an increase in brokered deposits. The remainder was funded largely by an increase in core deposits. . . . These funding concentrations have developed inasmuch as the bank actively seeks the lowest funding costs available without unduly increasing interest rate risk exposure. . . . The funding concentrations are not regarded as a matter of significant regulatory concern at this time.
Case 2	Liquidity is less than satisfactory as the institution’s weak financial condition has restricted its access to secondary and contingent sources of funds. All borrowings are on a secured basis. An appreciable percentage of the balance sheet is funded by . . . in FHLB advances with an additional . . . in capacity. Borrowings from the Reserve Bank’s discount window are limited to a secondary credit facility of about Remaining unpledged collateral of . . . is used to satisfy the Payment Systems Risk requirement that is in place for institutions in troubled financial condition.

Figure 1: Number of Unique Borrowers from the Primary Credit Program By Year

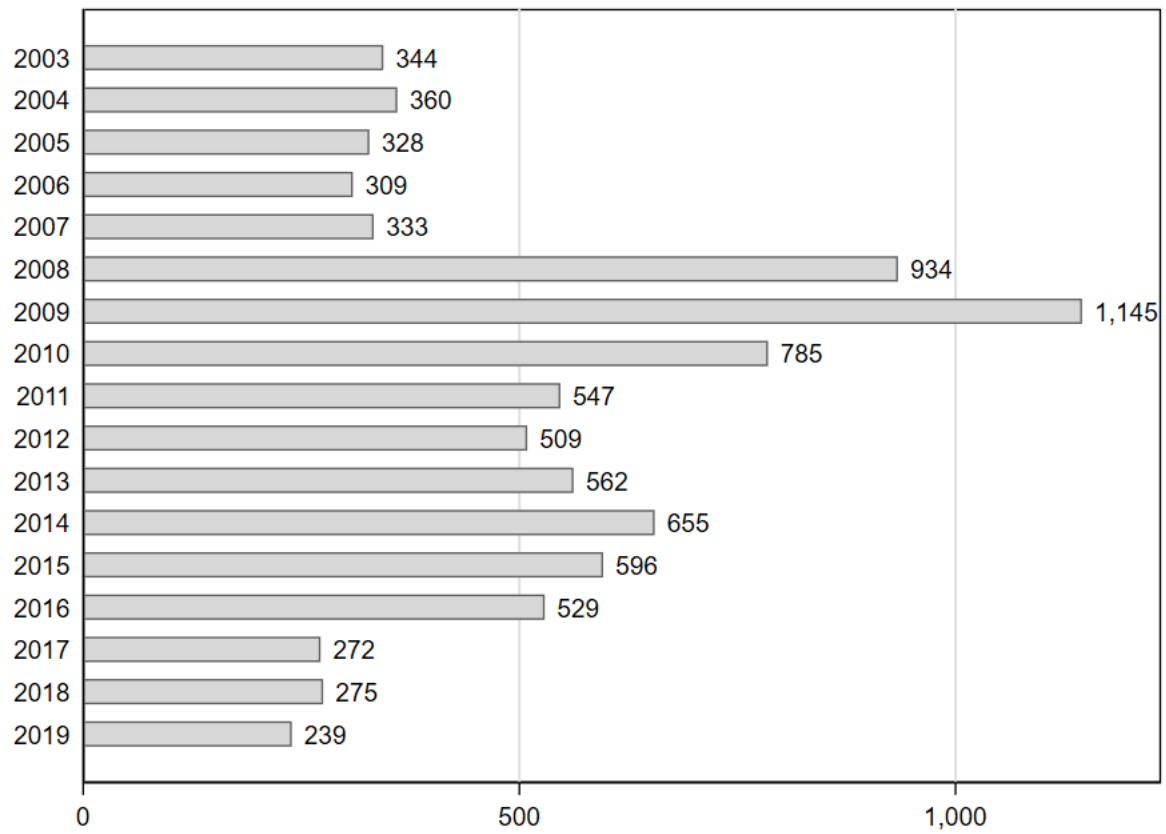
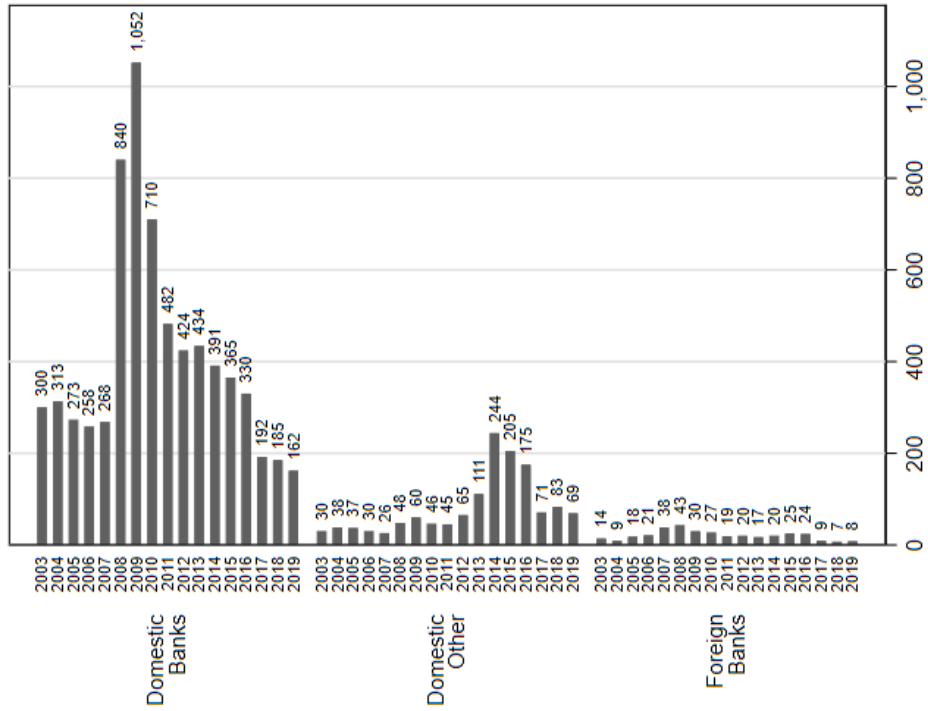


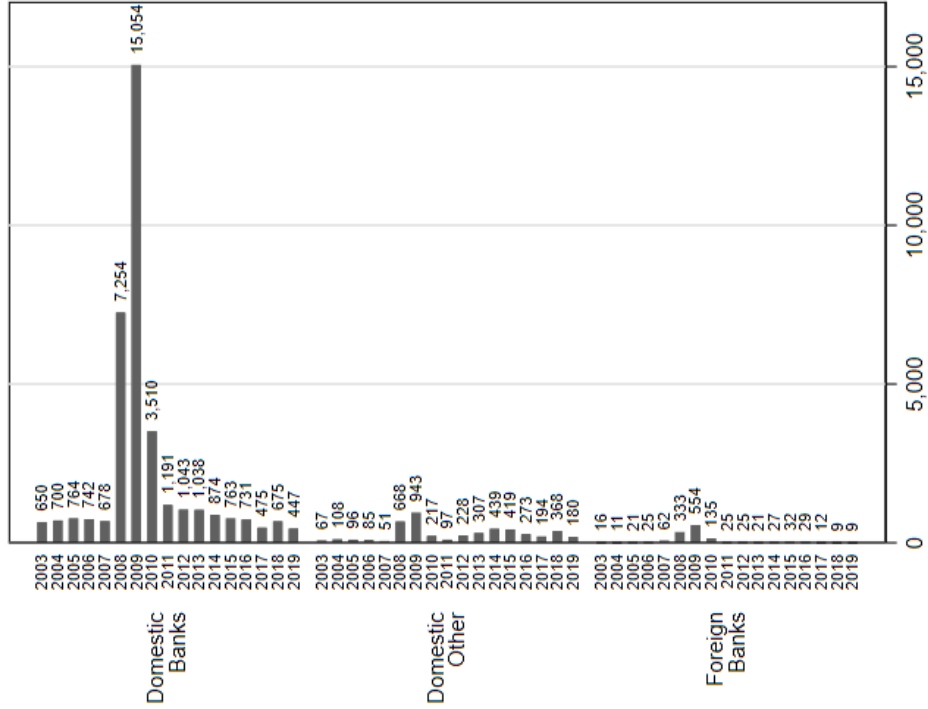
Figure 2: Distribution of Primary Credit Loans By Borrower Type and Year

The figure reports the annual distribution of primary credit loans across five dimensions and across three institution type during 2003–2019. The five dimensions are (a) number of borrowers, (b) number of loans, (c) mean loan size, (d) mean loan term, and (e) mean interest rate. The three institution types include (1) domestic banks, (2) domestic non-bank depository institutions such as credit unions and savings and loan institutions, and (3) foreign banking organizations.

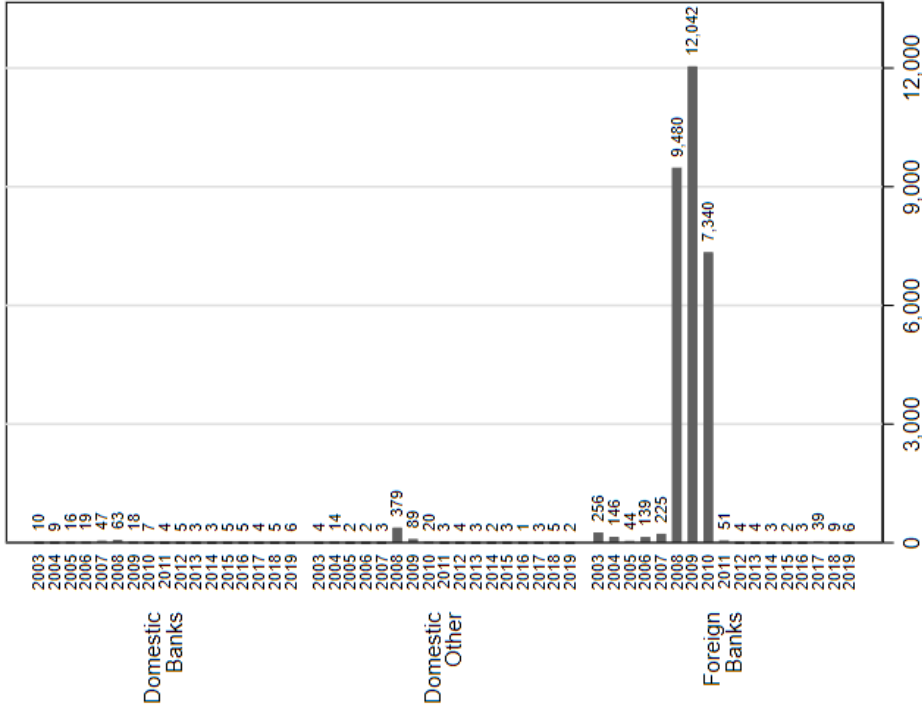
(a) Number of Borrowers



(b) Number of Loans



(c) Mean Loan Size (\$million)



(d) Mean Loan Term (Number of days)

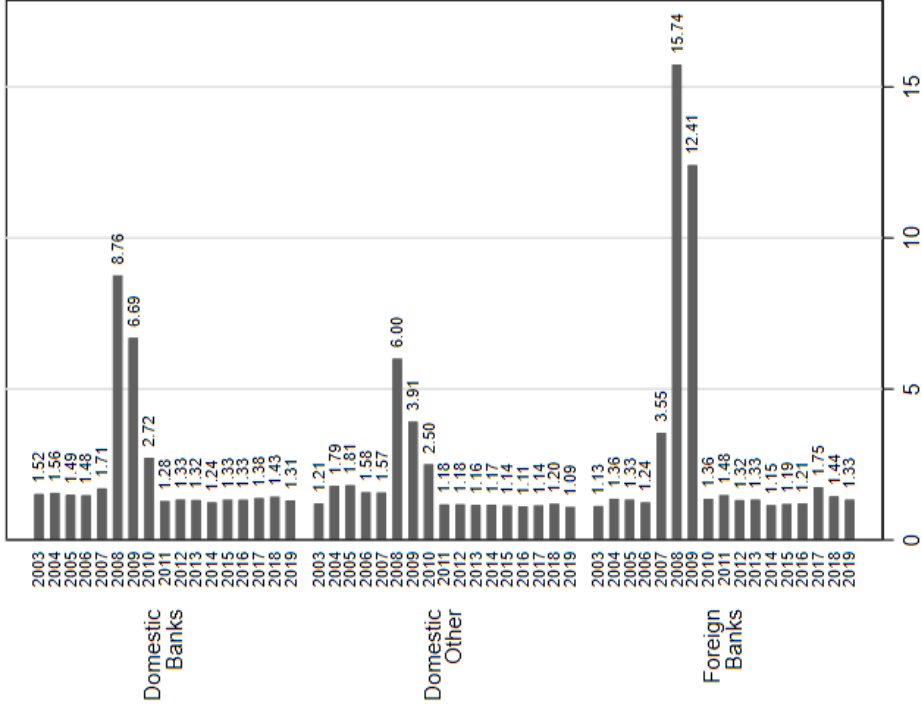
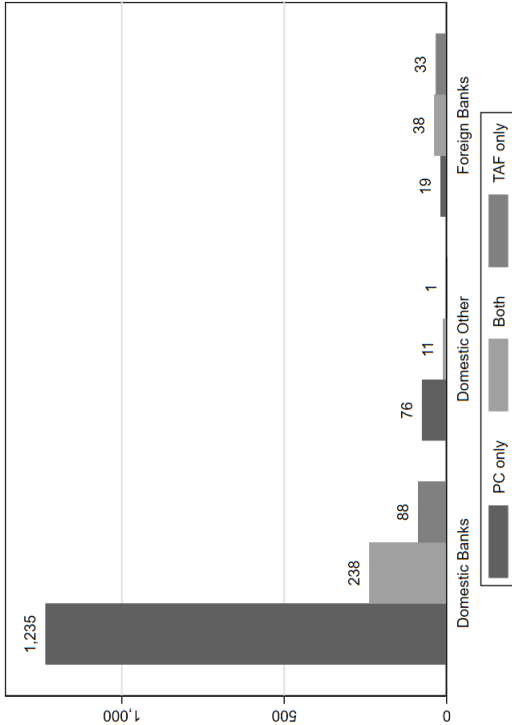
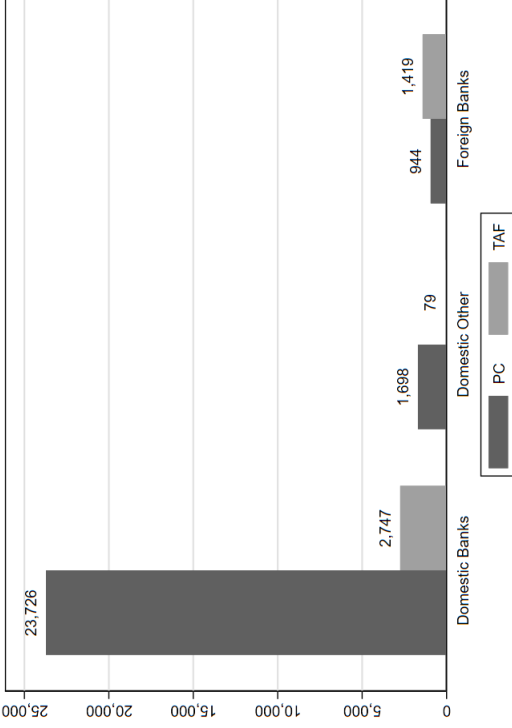


Figure 3: Term Auction Facility Loans versus Primary Credit Loans During the Financial Crisis—Distribution by Borrower Type

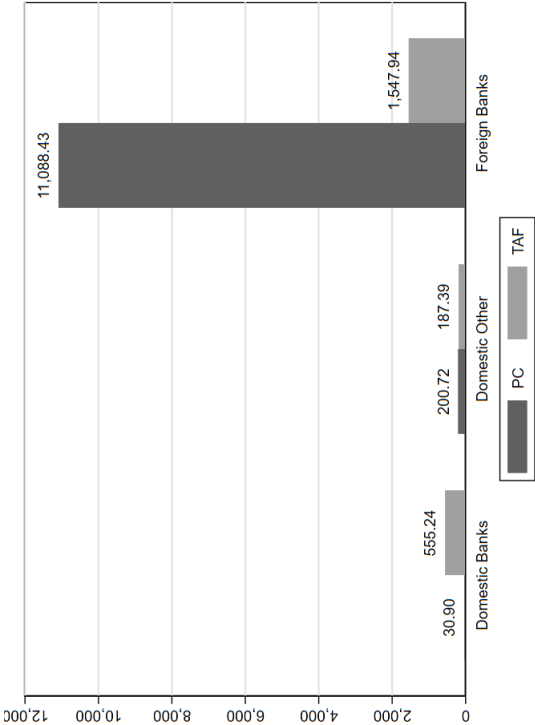
(a) Number of Unique Borrowers



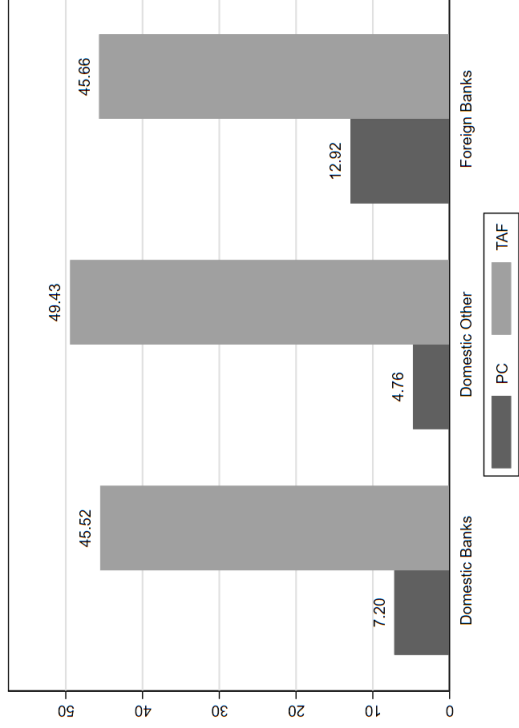
(b) Number of Loans



(c) Mean Loan Size (\$million)



(d) Mean Loan Term (Number of Days)



(e) Mean Interest Rate By Borrower Type

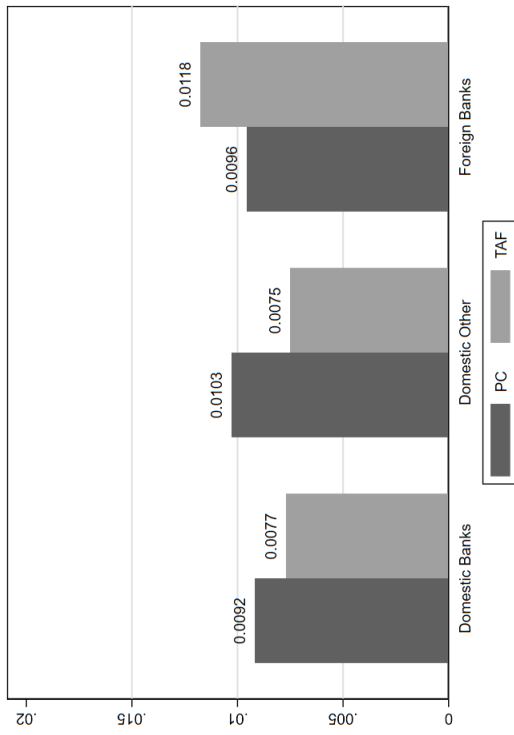


Figure 4: Term Auction Facility Rates versus Primary Credit Rates During the Financial Crisis

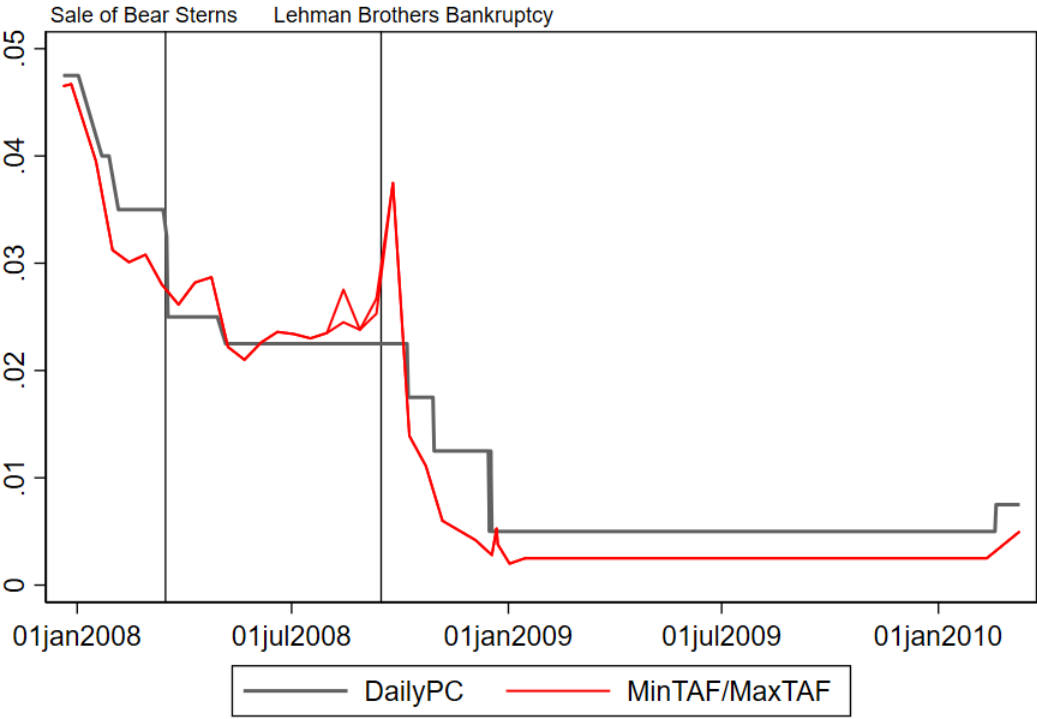


Figure 5: Percentage of TAF Credit Based on Relative Interest Rate

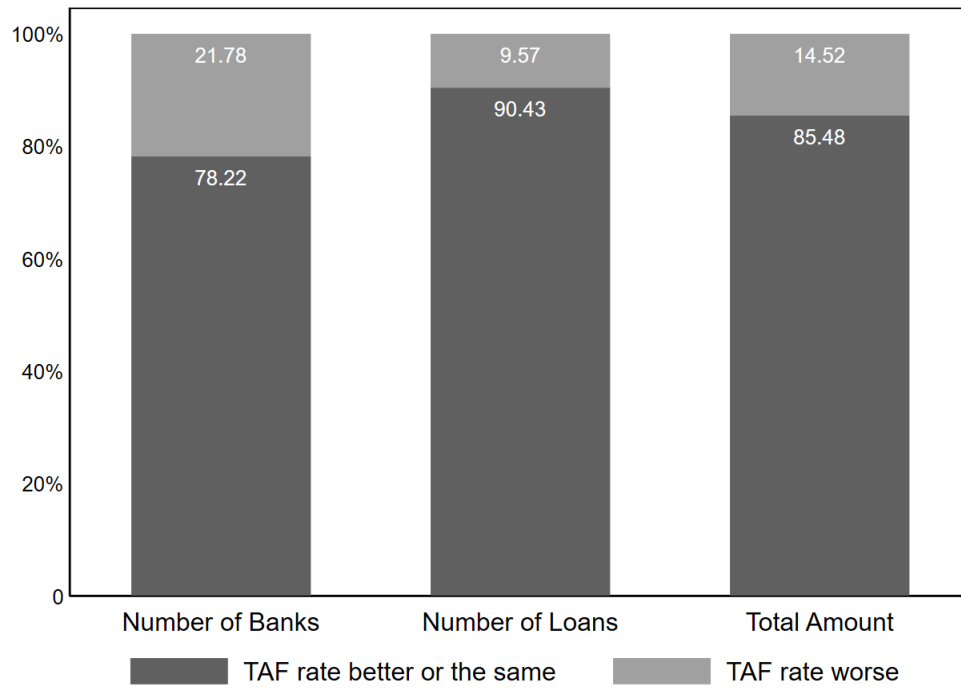
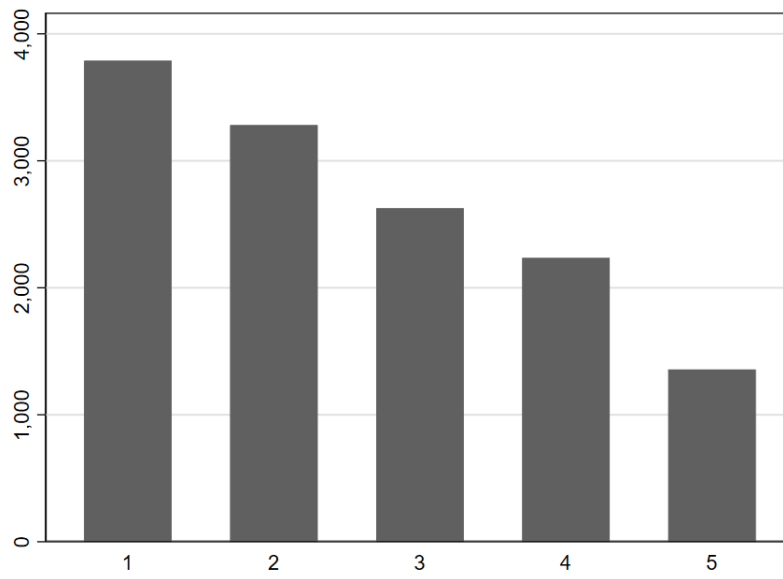


Figure 6: Number of Primary Credit Loans Borrowed Per Bank Quintile

(a) Number of Loans By Tier1 Capital/Assets Quintile



(b) Number of Loans By Non-performing Loans/Assets Quintile

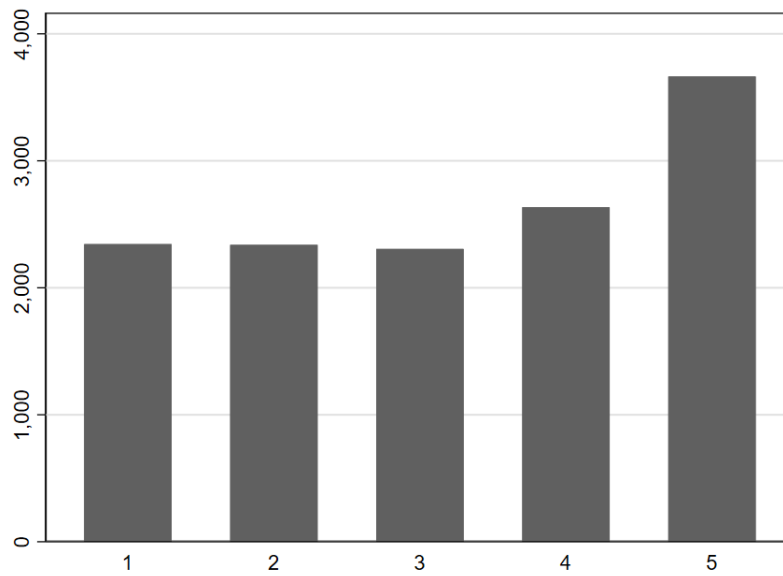


Figure 7: Sample Federal Reserve H.4.1 Statistical Release Tables

The H.4.1 statistical release, “Factors Affecting Reserve Balances of Depository Institutions and Condition Statement of Federal Reserve Banks,” is typically published on Thursday afternoon around 4:30 p.m. The release presents a balance sheet for each Federal Reserve Bank, a consolidated balance sheet for all 12 Reserve Banks, an associated statement that lists the factors affecting reserve balances of depository institutions, and several other tables presenting information on the assets, liabilities, and commitments of the Federal Reserve Banks. In the following we provide the two tables on the last public release in 2018 that include information on discount window borrowing. H.4.1 releases are publicly accessible at <https://www.federalreserve.gov/releases/h41/>

FEDERAL RESERVE statistical release



H.4.1

Factors Affecting Reserve Balances of Depository Institutions and Condition Statement of Federal Reserve Banks

December 27, 2018

1. Factors Affecting Reserve Balances of Depository Institutions

Millions of dollars

Reserve Bank credit, related items, and reserve balances of depository institutions at Federal Reserve Banks	Averages of daily figures			Wednesday Dec 26, 2018
	Week ended Dec 26, 2018	Change from week ended		
		Dec 19, 2018	Dec 27, 2017	
Reserve Bank credit	4,043,982	- 4,123	- 373,734	4,036,348
Securities held outright ¹	3,886,608	- 7,855	- 344,510	3,880,249
U.S. Treasury securities	2,240,698	+ 57	- 213,526	2,240,717
Bills ²	0	0	0	0
Notes and bonds, nominal ²	2,101,796	0	- 222,608	2,101,796
Notes and bonds, inflation-indexed ²	116,545	0	+ 6,411	116,545
Inflation compensation ³	22,357	+ 57	+ 2,671	22,376
Federal agency debt securities ²	2,409	0	- 1,982	2,409
Mortgage-backed securities ⁴	1,643,501	- 7,912	- 129,002	1,637,123
Unamortized premiums on securities held outright ⁵	140,525	- 526	- 18,711	140,257
Unamortized discounts on securities held outright ⁵	-13,459	+ 32	+ 673	-13,448
Repurchase agreements ⁶	0	0	0	0
Loans	102	+ 28	+ 40	77
Primary credit	38	+ 29	+ 8	12
Secondary credit	0	0	0	0
Seasonal credit	64	- 1	+ 31	65
Other credit extensions	0	0	0	0
Net portfolio holdings of Maiden Lane LLC ⁷	0	- 2	- 1,712	0
Float	-238	- 81	- 59	-212
Central bank liquidity swaps ⁸	4,207	+ 4,137	- 7,801	4,207
Other Federal Reserve assets ⁹	26,236	+ 144	- 1,654	25,217
Foreign currency denominated assets ¹⁰	20,847	+ 241	- 332	20,874
Gold stock	11,041	0	0	11,041
Special drawing rights certificate account	5,200	0	0	5,200
Treasury currency outstanding ¹¹	49,859	+ 14	+ 492	49,859
Total factors supplying reserve funds	4,130,930	- 3,867	- 373,573	4,123,322

Note: Components may not sum to totals because of rounding. Footnotes appear at the end of the table.

H.4.1

5. Statement of Condition of Each Federal Reserve Bank, December 26, 2018

Millions of dollars

Assets, liabilities, and capital	Total	Boston	New York	Philadelphia	Cleveland	Richmond	Atlanta	Chicago	St. Louis	Minneapolis	Kansas City	Dallas	San Francisco
Assets													
Gold certificate account	11,037	364	3,626	350	544	773	1,491	739	334	199	307	905	1,405
Special drawing rights certificate acct.	5,200	196	1,818	210	237	412	654	424	150	90	153	282	574
Coin	1,726	42	38	148	127	237	180	284	25	46	111	195	294
Securities, unamortized premiums and discounts, repurchase agreements, and loans	4,007,135	76,531	2,212,207	101,170	113,601	237,122	240,537	214,621	53,377	33,456	63,089	165,691	495,733
Securities held outright ¹	3,880,249	74,109	2,142,198	97,968	110,006	229,618	232,919	207,818	51,659	32,381	61,084	160,447	480,042
U.S. Treasury securities	2,240,717	42,795	1,237,049	56,573	63,525	132,597	134,503	120,008	29,831	18,699	35,274	92,653	277,208
Bills ²	0	0	0	0	0	0	0	0	0	0	0	0	0
Notes and bonds ³	2,240,717	42,795	1,237,049	56,573	63,525	132,597	134,503	120,008	29,831	18,699	35,274	92,653	277,208
Federal agency debt securities ²	2,409	46	1,330	61	68	143	145	129	32	20	38	100	298
Mortgage-backed securities ⁴	1,637,123	31,267	903,819	41,334	46,413	96,879	98,271	87,681	21,796	13,662	25,772	67,695	202,535
Unamortized premiums on securities held outright ⁵	140,257	2,679	77,433	3,541	3,976	8,300	8,419	7,512	1,867	1,170	2,208	5,800	17,352
Unamortized discounts on securities held outright ⁶	-13,448	-257	-7,424	-340	-381	-796	-807	-720	-179	-112	-212	-556	-1,664
Repurchase agreements ⁶	0	0	0	0	0	0	0	0	0	0	0	0	0
Loans	77	0	0	0	0	0	6	12	30	17	8	0	3
Net portfolio holdings of Maiden Lane LLC ⁷	0	0	0	0	0	0	0	0	0	0	0	0	0
Items in process of collection	239	0	0	0	0	0	239	0	0	0	0	0	0
Bank premises	2,206	108	460	82	117	194	206	194	106	95	232	220	190
Central bank liquidity swaps ⁸	4,207	179	1,326	239	340	909	243	178	61	19	42	52	619
Foreign currency denominated assets ⁹	20,874	888	6,582	1,186	1,685	4,509	1,206	885	301	96	207	258	3,072
Other assets ¹⁰	23,011	474	12,220	575	663	1,547	1,381	1,204	364	238	416	1,121	2,810
Interdistrict settlement account	0+	16,852 -	73,486 -	7,101 +	5,942 -	7,051 +	39,262 +	10,982 +	8,502 +	3,623 -	1,932 +	7,896 -	3,488
Total assets	4,075,636	95,635	2,164,790	96,858	123,256	238,652	285,400	229,512	63,221	37,861	62,623	176,620	501,209

Note: Components may not sum to totals because of rounding. Footnotes appear at the end of the table.