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THE FINANCIAL IMPACT OF LENDER-OF-LAST-RESORT BORROWING FROM THE FEDERAL RESERVE DURING THE FINANCIAL CRISIS

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Abstract

The U.S. Federal Reserve (Fed) was reluctant to release the names of firms that borrowed, and the amounts borrowed, from the emergency loan facilities during the financial crisis. We show that when the details of this information were finally made public by the Fed, there was no stock market reaction, contrary to the thought that this was valuable information. However, further investigation shows that stock returns for publicly traded borrowing institutions declined significantly and almost immediately after the Fed borrowing was initiated, although the information had not been made public by the Fed at the time. The underperformance of borrowing institutions was greatest for those that received the largest loans or had the largest amount of loans outstanding. This evidence is consistent with the idea that investors were able to trade on the information about the Fed's emergency loan program, although the Fed purposely tried to keep the information private.

JEL Classification: G01, G10, G20, G28

I. Introduction

Like much of the existing literature in finance, the broad purpose of this research is to investigate how financial markets incorporate information into market prices. A key distinguishing feature of our study is that we examine how private (vis-à-vis public) information flows into stock prices. In our investigation, we uncover evidence that the stock prices of institutions that borrowed from the U.S. Federal Reserve (Fed) during the recent financial crisis seemed to quickly incorporate information about the details of the lending that the Fed attempted to keep private. Specifically, borrowing firms are found to suffer stock price declines almost immediately after the firm borrowed from the Fed.

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During the past two decades, there has been a movement by central banks around the world to increase the level of transparency in their monetary policy actions and thus provide more public information about their actions (Svensson 1999; Geraats 2002; Blinder et al. 2008). For instance, central banks in Australia, Brazil, Canada, Chile, Mexico, New Zealand, Spain, and Sweden adopted the policy of publishing inflation targets during the 1990s. Crowe (2010) shows empirically that transparent policies, such as inflation targeting, provide economic benefits by reducing information asymmetries between policy makers and economic agents. A survey in Fry et al. (2000) reveals that nearly three-fourths of central banks around the world consider transparency a "vital component" of their policy framework.

Similar to other central banks, the Fed has recently increased the transparency of its monetary policy by providing more public information to market participants.[1] For example, the Fed now announces its target for the federal funds rate, whereas it did not provide this explicit information to the public until the mid-1980s. More recently, instead of stating only a given range, the Fed now states an explicit target inflation rate of 2%. Although the Fed's level of transparency and public information provision about monetary policy decisions have been increasing, the Fed was reluctant to release to the public information about the specific borrowers from its emergency lending programs during the recent financial crisis, releasing neither the identity nor the amount borrowed either incrementally or entirely.

The motivation for withholding information from the public about the identity of the borrowers and the amount borrowed appears to have been driven by fear that the news could have caused a "bank run" on the borrowing institution. Knowledge of a bank's participation in either of the Fed's lender-of-last-resort facilities could have provided an unfavorable signal to both financial markets and depositors, which could have reduced public confidence in the stability of the participating bank.[2] Empirical research tends to support this contention of a stigma associated with borrowing from the Fed (Peristiani 1998; Furfine 2001; Darrat et al. 2004; Armantier et al. 2011).

As anecdotal evidence of the idea that the Fed wants to increase transparency while carefully managing the stigma associated with participation in the various Fed lending programs, Chairman Ben Bernanke testified before the U.S. Congress in February 2010:

> We are also prepared to support legislation that would require the release of the identities of the firms that participated in each special [emergency lending] facility after an appropriate delay. It is important that the release occur after a lag that is sufficiently long that investors will not view an institution's use of one of the facilities as a possible indication of ongoing financial problems, thereby undermining market confidence in the

[1] Although Thornton (2003) questions the wisdom of seeking to achieve increased monetary policy transparency as an end goal, recent speeches have highlighted the importance of Fed transparency (see, e.g., http://www.federalreserve.gov/newsevents/speech/bernanke20100525a.htm) in the eyes of many. Blinder et al. (2008) further document moves by the Fed to enhance transparency.

[2] The Fed, as well as the federal government, instituted a variety of emergency lending programs during the financial crisis aimed at both depository and nondepository institutions. The analysis in this study focuses on Fed programs that are similar in nature to the lender-of-last-resort funding. Cyree, Griffiths, and Winters (2013) examine Fed emergency lending programs aside from the two we investigate.

> institution or discouraging use of any future facility that might become necessary to protect the U.S. economy.[3]

In other words, the Fed's willingness to release the identity of borrowing institutions depended on "an appropriate delay." We know of no research addressing the appropriate period for such a delay and little on the decaying of valuable information.

After this testimony and in response to a Freedom of Information Act request by Bloomberg, the Fed divulged detailed public information about the specific institutions that had participated in the emergency lending programs. This information not only identified the name of the borrowing institution and the date of the borrowing, but also included the incremental amount borrowed and the outstanding balance by date of new borrowing. This information was released to the public in late 2010 and early 2011 for the Discount Window (DW) and the Term Auction Facility (TAF) borrowings, respectively. Before this release, such informational detail about participation in these emergency programs was purposely kept private by the Fed. In this manner, the treatment of information on individual bank emergency borrowing contrasts the other efforts to enhance the transparency and information regarding Fed actions.

Our first objective is to examine the stock prices of borrowing institutions surrounding participation in the Fed's borrowing programs. The maintained hypothesis is that the detailed information about participation was valuable news for market participants, or the Fed would not have supported the idea to initially keep this information private. An empirical investigation should be insightful because it is not clear how stock market participants should view the news that a particular bank borrowed from the Fed. On the one hand, market participants might see the news as distressing, indicating unforeseen financial difficulties for the borrowing firm. This would be consistent with there being a "stigma" associated with borrowing from the Fed. On the other hand, market participants might see the news as favorable, as the borrowing firm was extended credit from the Fed, which might have better information about the firm, and accordingly this might provide a good financial signal. Timothy Geithner, among others, argued this point as the president of the New York Fed, early in the financial crisis.[4]

The empirical investigation unfolds in four stages. Using simple, standard event-study techniques, we examine stock returns of participating firms around the dates the Fed initially made the detailed micro-borrowing information public.[5] Results show that

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[3] http://www.federalreserve.gov/newsevents/testimony/bernanke20100224a.htm

[4] http://blogs.wsj.com/economics/2008/09/12/why-hasnt-lehman-come-calling-on-feds-discount-window/

[5] In addressing this research question, the exact timing of when the market gained knowledge of the borrowing by specific institutions is not fully clear, due in large part to the reluctance of the Fed to release this information. The Federal Reserve Board released detailed borrowing information on the TAF program, as well as other emergency lending programs on December 1, 2010. This information, however, did not include detailed information regarding the lending from the DW. Bloomberg, through its Freedom of Information Act request, received data from the Fed on March 31, 2011, which included the identity of the borrower, amount borrowed, and the date borrowing was initiated for all of the emergency lending programs. Bloomberg then sorted through that data and released standardized files to the public for all emergency lending programs on December 22, 2011. Stock return event studies are conducted around each of these dates for participating banks and show that stock returns remained at relatively normal levels, suggesting that either (1) the information about bank participation was not informative or (2) the information was already priced into stocks.

the equity market did not significantly respond to this information when Bloomberg made the information public to financial market participants. Finding that stock returns remained at relatively normal levels during the period surrounding the public release of this information could be consistent with one of three views. First, it is possible that released information had become stale because of the extensive delay in the release of this information, as seems to be suggested by the Bernanke quote above. Second, the lack of an announcement effect could be consistent with the view that the market did not value this information. Finally, the results could simply indicate that financial markets had already incorporated this information into stock prices.

In an attempt to differentiate among these possibilities, an event study surrounding the date borrowing was actually undertaken by the firm is conducted. To the extent that the Fed was successful in keeping the identity of the borrower private at the time of the actual borrowing, a significant market reaction surrounding this new event date should not be found. Instead, results show negative and significant cumulative abnormal returns (CARs) for participating banks following the receipt of emergency loans. The negative postevent CARs are not only statistically significant, but they also appear to be economically meaningful. For instance, in the week following the receipt of emergency loans, the average participating bank experienced negative CARs of −1.35%, which would be large if annualized. Results also show negative five-day CARs for both DW borrowing, which occurs at sporadic intervals selected by the borrowing firm, and TAF borrowing, which generally occurred on a regular two-week pattern set by the Fed. Furthermore, these results are robust to tests that attempt to account for the possibility that the observed negative CARs are simply a function of the financial crisis period instead of a result of initiating a loan from the Fed. These findings are consistent with the notion that financial market participants had the ability to discern which banks borrowed from the emergency lending facilities during the financial crisis, despite the Fed's attempt to keep this information private.

Additional tests examine whether the negative CARs for participating banks were driven by banks that received the largest emergency loans or had the largest amount of loans outstanding. Consistent with this idea that detailed borrowing information affected stock prices, the estimated CARs for borrowing banks decrease monotonically across outstanding loan terciles. Firms that had borrowed the most saw the greatest decline in their stock returns. The tests also provide evidence that CARs for participating banks generally decrease across terciles, based on the amount of newly initiated emergency loans, although the relation is not monotonic. These findings hold in a multivariate setting when we control for a number of other firm-specific characteristics.

II. Related Literature

Policy makers seem to worry that participation in lender-of-last-resort borrowing from the central bank might convey an unfavorable signal to market participants and depositors (Peristiani 1998; Furfine 2001; Darrat et al. 2004; Armantier et al. 2011). Indeed, evidence exists supporting the notion of a stigma associated with borrowing

from the Fed. For instance, Peristiani (1998) finds that beginning in the 1980s "banks avoided the discount window because they feared that market participants might have interpreted their visits as a signal of serious funding difficulties" (p. 611). Similarly, Thornton (2001) argues that the Continental Illinois Bank failure in 1984 was a significant event in U.S. banking history that further discouraged banks from borrowing at the DW. Clouse (1994) suggests that institutions that borrow from the DW "must have exhausted all reasonably available sources of funds" before turning to the Fed. He further emphasizes, "Large banks, for example, must make greater efforts than others to obtain funding in national money markets before turning to the discount window" (p. 968).

Other studies (Furfine 2003) find evidence of a stigma associated with borrowing at the DW even after the Fed moved to a "standing facility" offering DW loans at a penalty rate relative to the target for the federal funds rate in 2003, which many thought would eliminate any stigma associated with borrowing from the Fed. Ashcraft, Bech, and Frame (2010), however, provide evidence that many depository institutions availed themselves of Federal Home Loan Bank advances early in the financial crisis, as opposed to turning to the DW.

The Fed explicitly recognized the stigma associated with DW borrowing when it established the TAF in December 2007.[6] In describing the new lending facility, the Federal Board of Governors states that "many banks were reluctant to borrow at the discount window for fear that their borrowing would become known and would be erroneously taken as a sign of financial weakness."[7,8] For whatever reason, the Fed chose to withhold details about the banks that participated in the emergency lending facilities. Furthermore, the Fed may have established the TAF with the thought that this facility would have less of a stigma than the DW. Armantier et al. (2011) provide evidence that early on, TAF borrowers were willing to pay an average premium of about 37 basis points above the contemporaneous discount rate, consistent with the view that the borrowing institution had a penchant for borrowing from TAF over the DW.[9] Still, there is no evidence to suggest that TAF borrowing completely eliminated the stigma associated with Fed borrowing. Ashcraft, Bech, and Frame (2010) find, for

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[6] See Armantier, Kreiger, and McAndrews (2008) for a description of the TAF set up by the Fed. Benmelech (2012) provides an empirical analysis of the TAF borrower institutions, documenting that 60% of the TAF loans went to foreign banks.

[7] http://www.federalreserve.gov/newsevents/reform_taf.htm. It strikes us that one way for the Fed to avoid such an erroneous inference would be for the Fed to be more transparent in its lending and publicly state that it only lends to institutions that it believes are financially sound. In other words, the lack of transparency by the Fed on this matter has likely made things more opaque, allowing market participants to make bad inferences.

[8] This argument does suggest that financial markets would value knowledge about which institutions and how much borrowing was taken down. As such, gaining knowledge about the information the Fed tried to keep private could be rewarding.

[9] Bernanke (2009) also seemed to believe the TAF introduction was successful in eliminating the stigma associated with the DW: "The introduction of this (TAF) facility seems largely to have solved the stigma problem, partly because of the sizable number of borrowers provided a greater assurance of anonymity, and possibly also because the three-day period between the auction and auction settlement suggests the facility's users are not using it to meet acute funding needs on a particular day." Allen, Hein, and Whitledge (2015) document that the premium paid by TAF borrowers that was observed early in the financial crisis pretty much disappeared in October 2008, when the Fed significantly increased its offerings in the biweekly TAF auctions.

example, that depository institutions continued to rely on Federal Home Loan Bank advances to a great extent even after the establishment of the TAF, at least through the spring of 2008.

The Board of Governors' statement describing the new TAF presumes that market participants might err in interpreting that borrowing from the Fed is a sign of financial weakness. The Board does not acknowledge cases where information about borrowing would correctly signal financial weakness of a particular institution. The situation that there was an error in judgment might be justified where market participants were worried about balance sheet solvency (as discussed in Flannery 2015) where the value of the assets exceeds the value of the liabilities. Because the Fed has signaled its reluctance to lend to a balance-sheet-insolvent institution after the Federal Deposit Insurance Corporation Improvement Act, Fed borrowing might be interpreted as a positive signal for market participants worried about the balance sheet solvency of a bank, as hinted at by Timothy Geithner himself.[10] However, Schwartz (1992) argues that it might be impossible to know if an institution that applies for DW borrowing faces a liquidity or solvency problem. Moreover, Schwartz documents that, at least before the 1991 Financial Deposit Insurance Corporation Improvement Act, the Fed loaned money to many institutions that subsequently failed.

Investors might also worry about the cash-flow solvency of borrowing institutions. Borrowing from the Fed could be viewed negatively by market participants if borrowing indeed reflects issues related to cash-flow solvency. In this case, bank management is implicitly admitting that it needed cash and could find it through normal means. As Flannery (2015) states; "Creditors' increased anxiety about a bank that borrows from the DW is probably quite rational. Central banks take high-quality assets as collateral, leaving assets that are worth less and are probably more difficult to value" (p. 162). In addition, the central bank not only takes the good assets as asserted by Flannery, but it also requires a "haircut" on the collateral in determining the value borrowed, even when U.S. Treasuries serve as the collateral. In other words, a borrowing bank needs to post a larger market value of the collateral than the amount borrowed. Indeed, Benmelech (2012) provides evidence on the collateral posted for TAF loans, indicating that the average loan-to-collateral ratio was 33% for all TAF loans. This overcollateralization of assets effectively worsens the financial position of the bank, especially in terms of liquidity concerns. Of course, institutions can be forced to file bankruptcy because of liquidity concerns, so solvency matters become an issue as well, especially when assets must be sold at fire sale prices.

As such, borrowing from the Fed, either through the DW or the TAF, may raise investor concerns about both cash-flow solvency and balance-sheet solvency and will be viewed unfavorably by investors.[11] Therefore, participation in the Fed's

[10] Smith and Wall (1992) argue that if the Fed has superior information about borrowing banks relative to the market, that news about DW borrowing should be a positive signal to financial markets. Also, see Gilbert et al. (2012) for a discussion of Fed lending to troubled banks during the financial crisis.

[11] Our focus is on the equity market response to emergency Fed lending. Others have looked broadly at how the introduction of TAF by the Fed affected money market instruments. Taylor and Williams (2008a, 2008b) argue

emergency programs during the financial crisis may indeed lead to underperformance of the borrowing bank's stock returns.[12] However, determining if and when stock prices reacted to the borrowing is an empirical question, which we seek to answer below.

The paper that is closest to ours is Cyree, Griffiths, and Winters (2013). They investigate the stock market impact of borrowing not only from the lender-of-last-resort facilities, which are analyzed in this study, but also from the Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility, the Primary Dealer Credit Facility, and the Commercial Paper Funding Facility. In this broad setting they provide evidence of negative wealth effects for banks that participated in Fed crisis lending programs, suggesting this information was valuable to market participants. They distinguish among traditional banks, investment banks, and too-big-to-fail banks in their investigation. They study the impact of such borrowings on stock returns of the borrower firm in an exponential generalized autoregressive conditional heteroskedastic estimation framework and find evidence consistent with ours. Cyree, Griffiths, and Winters also do not report results for the full sample period of the existence of the TAF, as we do. Instead, they report findings for various subperiods.[13] Although Cyree, Griffiths, and Winters investigate matters similar to our research, they do not emphasize information timing that we focus on in this article. Our investigation is much more in the tradition of research on the information transmission in finance (see Tetlock 2014 for a recent survey of this literature). Although Cyree, Griffiths, and Winters also document negative returns associated with Fed borrowing, their study is less concerned about the timing of these returns.[14] In fact, it is not clear from their study that the amount of borrowing they use as an explanatory variable was not supposed to be known by market participants at the time. This study contributes to the literature by showing that the negative returns observed by Cyree, Griffiths, and Winters, especially for TAF borrowing, occur in the days immediately following the

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that the introduction of TAF led to lower credit risk premiums in money markets. They provide evidence in support of this view. Conversely, McAndrews, Sarkar, and Wang (2008) argue that the introduction of TAF led to lower liquidity risk premiums in money market instruments. They similarly claim to provide evidence in support of this position. Finally, Thornton (2011) suggests that the introduction of TAF actually increased credit risk in financial markets as the move by the Fed and other central banks signaled the financial difficulties were more significant than the market previously thought.

[12] It is widely understood that any lending on the part of the Fed via its emergency lending programs was, at least initially, offset with open market sales of securities, so these programs resulted in no changes in monetary policy directly. Otherwise the lending would lead to a lowering of the effective federal funds rate relative to target. See Keister and McAndrews (2009) for support for the fact that Fed lending was generally offset by open market operations.

[13] As Allen, Hein, and Whitledge (2015) also find evidence of a change in the TAF in October 2008 when the Fed drastically increased the amount in each subsequent offering, to the extent that all bidders received funds thereafter, we also consider a break in October 2008. Similar results are generally found for the pre- and post-2008 periods, although the statistical significance of our findings is not as strong due to the loss of data, relative to the full-period analysis. In this way, our results may be interpreted as stronger than the findings of Cyree, Griffiths, and Winters (2013).

[14] Moreover, because the explanatory variable in Cyree, Griffiths, and Winters (2013) is the total outstanding borrowings from a given emergency lending source, this variable would reflect payments from the borrowing firms to the Fed. In contrast, our results start by focusing on newly initiated borrowings for both lender-of-last-resort programs.

borrowing, but this information was purposely kept from the market by the Fed at that time.

In addition to the Cyree, Griffiths, and Winters (2013) study, this research contributes to the literature that has broadly examined the effectiveness of the Fed's emergency loan programs (Allen, Hein, and Whitledge 2015; Ashcraft, Bech, and Frame 2010; Hancock and Passmore 2011; Goodfriend 2011; Ivashina and Scharfstein 2010; Duygan-Bump et al. 2013; Beltratti and Stulz 2012; Berger et al. 2014). Finally, our research is closely related to other research on other aspects of Fed information release to the public. For example, Bernile, Hu, and Tang (2014) provide evidence that suggests that Federal Open Market Committee meeting information flows into financial markets during the short period, called the embargo period, in which the press is notified of this information, but the press is not supposed to release this information for 30 minutes. Similarly, Cieslak, Morse, and Vissing-Jorgensen (2014) document a biweekly cycle in stock returns that coincides with Board of Governor deliberations that are supposed to be private.

III. Data Description

The data used in the analysis come from a variety of sources. From Bloomberg we obtain the key emergency loan transactions data, which provide the foundation of our empirical investigation. Bloomberg obtained the data from the Fed after filing a Freedom of Information Act request. The data provide the identity of the borrowing participant, the date of the borrowing, the emergency loan amount borrowed on that date, the total outstanding balance at that date, and the identity of the lending facility from which the loan occurred. Most of the emergency loans fell under two lending facilities: DW loans and TAF loans. Our tests, therefore, focus on these two lending programs as they are aligned with the Fed's lender-of-last-resort function and are most closely linked to monetary policy matters. Several other facilities existed during the financial crises but made up a small portion of overall emergency lending during the crisis.[15] The emergency loan data from Bloomberg provide information about lending from August 2007 to April 2010.[16]

[15] There are six additional lending facilities that were reported in the GAO's audit of the Fed. Dollar Swap Lines were used to exchange dollars for foreign currency from other foreign central banks to stabilize dollar funding markets globally. The Term Securities Lending Facility provided the auctioning of collateralized loans of U.S. Treasury securities to primarily dealers. Primary Dealer Credit Facility provided collateralized overnight cash loans to primary dealers. The Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility was a lending program that provided loans to depository institutions to purchase asset-backed commercial paper from different money market mutual funds. The Commercial Paper Funding Facility provided loans that were used to finance the purchase of asset-backed and unsecured commercial paper. The Term Asset-Backed Securities Loan Facility provided loans to eligible investors to finance the purchase of asset-backed securities. Figure 11 of the GAO audit shows that TAF made up a substantial portion of the Fed lending programs and can be viewed on the Government Accountability Office website (http://www.gao.gov/new.items/d11696.pdf).

[16] Berger et al. (2014) also look at both the DW and TAF borrowing during the financial crisis. They are mainly interested in the financial profile of the borrowing bank and how the funds were used. They find that small banks, those with total assets under $1 billion, had worse financial characteristics, unlike large banks.

From the universe of stocks available on the Center for Research in Security Prices (CRSP), we gather firm-specific market characteristics of the borrowing firm, such as share price, volume, bid–ask spread, and market capitalization. The number of publicly traded firms that received emergency funding and that can be matched to CRSP is 57.[17] However, not all of the firms that received emergency loans were banks and not all of those firms survived until the Bloomberg announcement date, December 22, 2011. For example, nonbank Verizon Wireless received a loan for $794 million on October 27, 2008, and only 54 firms had available data as of the Bloomberg date. To identify the bank reaction to these lender-of-last-resort loans, bank-specific balance sheet data from Bank Compustat are obtained, which include assets, liabilities, equity, deposits, the dollar amount of loans for sale, the dollar amount of nonperforming loans, and the dollar amount of investment securities held by banks. Because of the need for additional banking-related variables available on Bank Compustat, some of our analysis is separated by inclusion in that data set. Thus, the tests conduct examinations using both the full sample and the sample of firms listed on Bank Compustat, respectively.

Table 1 reports statistics that describe our sample. Panel A reports results for the sample of banks with data available on Bank Compustat and Panel B reports summary statistics for the sample of firms that do not have data available on Bank Compustat. The number of publicly traded banks with available data on Bank Compustat is 45 and the number of firms without Bank Compustat data is 12. Most firms borrowed from both DW and TAF. The sample includes 39 firms that borrowed from both DW and TAF, 6 firms that borrowed only from DW, and 12 firms that borrowed only from TAF. According to Panel A, the average firm had a total amount of TAF loans (*TotalTAF*) of $6,958.64 million whereas the average firm had a smaller total amount of DW loans (*TotalDW*) of $707.86 million, indicating that TAF loans greatly exceeded DW loans (examining medians also show similar size differentials). The average amount of TAF loans (*MeanTAF*) for a particular firm in our sample is $861.39 million and the average amount of DW loans (*MeanDW*) is $77.64 million. The average bank in our sample has *Assets* of $88.67 billion, *Liabilities* of $81.29 billion, a debt-to-assets (*D/A*) ratio of 0.9115, *Deposits* of $45.86 billion, loans for sale (*LoansForSale*) of $991.79 million, nonperforming loans (*NonPerfLoans*) of $899.22 million, and investment securities (*InvSec*) of $14.18 billion. The average bank in the sample also had a share price (*Price*) of $12.33, a market cap (*MktCap*) of $6.14 billion, a book-to-market ratio (*B/M*) of 0.1924, share volume (*Volume*) of 8.98 million, and a percentage bid–ask spread (*Spread*) of 2.15%.

Panel B of Table 1 shows that the average firm, without data available on Bank Compustat, had a *TotalTAF* of $6.459 billion and a larger *TotalDW* of $2.760 billion than the firms in Panel A. Furthermore, Panel B shows that *MeanTAF* is nearly $1.4 billion whereas *MeanDW* is $672 million for our firms without Bank Compustat data. The average firm in Panel B also had *Assets* of $272.18 billion, *Liabilities* of $251.79 billion,

[17] The Fed loaned money to approximately 400 firms, many of which were foreign and/or private institutions. See Benmelech (2012) for additional information on foreign borrowers.

TABLE 1. Summary Statistics.

	Mean (1)	Median (2)	Std. Deviation (3)	Min (4)	Max (5)
Panel A. Stocks with Available Data on Bank Compustat					
TotalTAF	6,958.64	159.45	22,286.40	0.00	100,167.00
TotalDW	707.86	19.50	1,653.83	0.00	7,675.00
MeanTAF	861.39	0.00	5,485.39	0.00	78,000.00
MeanDW	77.64	30.00	171.50	0.00	3,500.00
Assets	88,673.64	2,278.31	377,529.31	265.92	2,223,299.00
Liabilities	81,289.40	2,143.07	346,369.58	238.35	2,008,168.00
D/A	0.9115	0.9039	0.0236	0.8350	0.9893
Deposits	45,862.75	1,794.61	186,444.70	229.84	1,009,277.00
LoansForSale	991.14	1.42	5,149.68	0.00	44,827.00
NonPerfLoans	899.22	87.00	3,426.82	0.00	35,747.00
InvSec	14,175.85	264.17	58,830.05	36.86	480,020.00
Price	12.33	7.71	10.67	0.68	81.20
MktCap	6,137.48	137.97	25,538.68	16.10	183,125.00
B/M	19.243	1.393	2.068	0.360	8.708
Volume	8,980.48	1,100.18	48,157.32	1.68	836,893.49
Spread	0.0215	0.0052	0.0299	0.0000	0.1993
Panel B. Stocks without Available Data on Bank Compustat					
TotalTAF	6,458.87	76.00	18,025.98	0.00	60,420.60
TotalDW	2,759.50	22.00	7,672.42	0.00	25,705.00
MeanTAF	1,399.98	0.00	3,616.04	0.00	25,000.00
MeanDW	671.99	1.00	952.83	0.00	3,250.00
Assets	272,179.75	13,572.74	616,094.32	3,585.05	2,187,631.00
Liabilities	251,789.35	10,856.27	574,216.96	3,077.68	2,074,033.00
D/A	0.8327	0.7999	0.0582	0.7482	0.9703
Price	25.34	26.07	22.01	1.16	168.84
MktCap	14,529.83	7,427.13	25,055.03	16.71	146,644.58
B/M	0.1573	0.0487	0.3697	0.0299	3.0353
Volume	51,122.59	6,680.62	160,537.49	125.09	1,204,693.48
Spread	0.0023	0.0006	0.0051	0.0003	0.0408

Note: This table reports statistics that describe the sample used in the analysis. All figures, other than ratios, are in millions of dollars. Panel A reports summary statistics for variables that are obtained from Bank Compustat. Of the 57 publicly traded firms that received emergency loans during the financial crisis (August 2007 to April 2010), 45 firms had available data on Bank Compustat. Panel B contains a subsample of firms that do not have available data on Bank Compustat. *MeanTAF* is the average amount of Term Auction Facility (TAF) loans outstanding for a particular stock and *MeanDW* is the average amount of Discount Window (DW) loans outstanding for a particular stock. *TotalTAF* is the total amount TAF loans for a particular stock and *TotalDW* is the total amount of DW loans for a particular stock. *Assets* are from Bank Compustat. *D/A* is the debt-to-assets ratio. *Deposits* are the average dollar amount of deposits on a bank's balance sheet over the sample period. *LoansForSale* is the average dollar amount of loans that are for sale. *NonPerfLoans* are the dollar amount of nonperforming loans. *InvSec* is the average dollar amount of investment securities held by a particular bank. *Price* is the average share price over the period and *MktCap* is the average market capitalization according to Bank Compustat. *B/M* is the book-to-market ratio. *Spread* is the stock price bid–ask spread. Summary statistics are taken over the entire sample period as many of these variables were volatile during the crisis period.

D/A of 0.8327, *Price* of $25.34, *MktCap* of $14.53 billion, *B/M* of 0.1573, *Volume* of 51.12 million, and *Spread* of 0.23%.

IV. Empirical Findings Related to the Fed's Emergency Lending

In this section we first perform a standard event study around the release of information by Bloomberg on the emergency loan program. We then carefully examine stock returns surrounding the receipt of emergency loans by banks in both univariate and multivariate frameworks.

Event Study Surrounding the Release of Emergency Loan Transactions by Bloomberg

Given that Bloomberg received the lending information from the Fed, only after a Freedom of Information Act request, the analysis begins by examining the returns around the release of the firm-level data by Bloomberg. Table 2 reports the results of a standard event study surrounding the release of the Bloomberg data on December 22, 2011. Event returns are estimated using market-adjusted returns, although our results are robust to a variety of estimation methods such as a standard market model and raw returns. The analysis in this table includes the 54 publicly traded firms that received emergency loans either through the DW or TAF and were still listed on a stock exchange at the time of the Bloomberg announcement. Several firms that received emergency lending were no longer in business or had been acquired by the time Bloomberg released the data to the public.

Table 2 reports postevent windows and shows that mean CARs are relatively small and positive. For instance, for the postevent time window of (0, 1), the mean CAR is 0.03%. Column (5) reports the Patell *Z*-statistic and column (6) shows the results of a rank test. In both columns, CARs (0, 1) are not statistically different from zero. In fact, similar conclusions are drawn for each of the four postrelease windows reported in Table 2. These findings indicate that upon Bloomberg's release of the details of the Fed's emergency loan program, prices of stocks that received emergency loans remained relatively constant.

In unreported tests, event days are used that capture the dates when the information might have first been publicly released and the tests find qualitatively similar results. For example, the Board of Governors provided detailed transaction information on TAF borrowings and other non-DW funding to particular financial institutions on December 1, 2010.[18] Running an event study similar to that reported in Table 2 for this announcement date yields similar results to those found in Table 2. These unreported results are available upon request. Similarly, no significant abnormal returns are observed when the event day is the initial Fed release of microdata on DW borrowing on March 31, 2011. In this investigation, the equity market does not seem to react to the newly released information about the firms that

[18] http://www.federalreserve.gov/newsevents/reform_taf.htm

TABLE 2. Return Event Study—Bloomberg Emergency Loan Data Release Date.

	N (1)	Mean CAR (2)	Median CAR (3)	Positive/Negative (4)	Patell *Z* (5)	Rank Test (6)
CAR (0, 1)	54	0.03%	−0.02%	27/27	0.360	0.434
CAR (0, 3)	54	0.05%	−0.04%	24/30	0.068	0.256
CAR (0, 5)	54	0.95%	0.11%	36/18	1.322	1.086
CAR (0, 10)	54	−1.04%	0.00%	21/33	−0.616	0.151

Note: This table reports the results of an event study examining the returns surrounding the Bloomberg release of the emergency loan transactions for firms on December 22, 2011. CARs are cumulative abnormal returns calculated from a standard market model. We include variable postrelease event windows, where day 0 is the day of the release. The table also reports the number of observations used in the event study (*N*), the mean CAR for the particular event window, the median CAR, and the number of positive CARs/number of negative CARs (positive/negative). We include two test statistics: Patell *Z*-statistic and rank test.

borrowed or about how much they borrowed when the Fed made this information public for the first time.

Event Study Surrounding the Receipt of Emergency Loans

The findings in Table 2 suggest that the news about the borrowing was already reflected in stock prices. Next, stock returns around the date emergency loans were received are examined. Given the results in the previous subsection, we explicitly test the hypothesis that the Fed's attempt to withhold the identities of banks from the public was successful. Because large, publicly traded banks are examined, we hypothesize that when a large bank borrowed from the Fed, equity markets would show no abnormal behavior at that time. Such a hypothesis is consistent with the maintained hypothesis that the Fed was able to keep such information private, although it might have been valuable information to market participants.

Table 3 reports the results of a standard event study surrounding the dates that emergency loans were received by specific borrowing institutions. Panel A reports the event-study results for combined DW and FAF borrowing and, again, includes the 54 publicly traded firms that received emergency loans through either the DW or the TAF. Our event day is the day a borrowing institution actually received emergency funds from the Fed. It is important to note that at this time, the Fed did not divulge who was borrowing, so the identity of our borrowing firms was likely unknown on our event day. Many of these firms engaged in multiple borrowings from the Fed, yielding 1,139 borrowing initiation dates for the firms in our sample.[19] Results provided in Panel A show that both mean and median CARs are universally negative and generally statistically different from zero in periods immediately after the receipt date. For instance, the mean CAR (0, 1) is −0.37% and is statistically different from zero at the 5% level (Patell $Z = -1.963$). Furthermore, returns appear to become more negative for the longer postevent windows, consistent with

[19] In unreported results, the same analysis found in Panel A of Table 3 is performed, but the period following the Lehman bankruptcy, which occurred in September 2008, is excluded. Excluding observations from September 2008 to December 2008 reduces our sample by 163 observations but does not significantly affect our key finding that postborrowing CARs are negative and statistically different from zero.

TABLE 3. Event-Study Results and Robustness.

	N (1)	Mean CAR (2)	Median CAR (3)	Positive/Negative (4)	Patell *Z* (5)	Rank Test (6)
Panel A. Term Auction Facility and Discount Window Borrowing						
CAR (0, 1)	1,139	−0.37%	−0.21%	529/610	−1.963**	−1.539
CAR (0, 3)	1,139	−0.65%	−0.30%	522/617	−1.045	−2.166**
CAR (0, 5)	1,139	−1.35%	−0.72%	532/607	−2.999***	−3.519***
CAR (0, 10)	1,139	−1.90%	−1.12%	494/645	−3.559***	−4.031***
Panel B. Random Event Days						
CAR (0, 1)	1,139	0.12%	0.26%	539/600	1.349	0.809
CAR (0, 3)	1,139	−0.14%	0.10%	520/619	−0.415	−0.301
CAR (0, 5)	1,139	−0.02%	0.00%	551/588	−0.129	−0.182
CAR (0, 10)	1,139	−0.78%	−0.23%	516/623	−0.963	−1.331
Panel C. Nonborrowing Financial Firms						
CAR (0, 1)	4,556	−0.03%	−0.02%	2,268/2,288	0.619	−0.202
CAR (0, 3)	4,556	−0.07%	−0.01%	2,221/2,335	−1.081	−1.326
CAR (0, 5)	4,556	−0.04%	−0.04%	2,245/2,311	−1.213	−0.83
CAR (0, 10)	4,556	−0.07%	−0.01%	2,239/2,317	−0.816	−0.27

Note: This table reports the results of an event study examining the returns surrounding the receipt of Term Auction Facility and Discount Window emergency loans by firms between 2008 and 2010. CARs are cumulative abnormal returns calculated from a standard market model. We include variable postrelease event windows, where day 0 is the day of the release. The table also reports the number of observations used in the event study (*N*), the mean CAR for the particular event window, the median CAR, and the number of positive CARs/number of negative CARs (positive/negative). We include two different test statistics: Patell *Z*-statistic and rank test.

***Significant at the 1% level.

**Significant at the 5% level.

a gradual diffusion of information. The mean CAR (0, 5) is −1.35% and the mean CAR (0, 10) is −1.90%. Both of these CARs are statistically different from zero at the 5% level and economically meaningful.[20] Median CARs are generally smaller but otherwise still significant and behave similarly. These results suggest that despite the Fed's attempt to restrict information about firms involved in the emergency lending programs, the market

[20] It is important to note an important statistical matter with the borrowing data used throughout our event analysis. There are overlapping borrowing observations within our event windows that may influence the conclusions that we attempt to draw in this study. After a careful examination of the 1,139 events, there are only 45 times when a TAF window overlapped with a DW window. When we eliminate these 45 instance, we do not find results that differ quantitatively. The story is much different when we look at how DW borrowing overlapped within a 10-day window. Almost 70% of the DW borrowing occurred within 10 days of another borrowing event. Given the nature of the DW, this is understandable. When a bank is struggling to meet liquidity needs, it might go to the DW every day for an extended period. Indeed, there are instances when banks had five or more DW events within 10 calendar days. It is also true that this type of overlap affects the statistical inferences made from our tests. Given that the overlapping DW borrowing events adversely affect the CARs of banks, it is possible that the economic meaning of our findings remains intact, and indeed multiple borrowing events by an institution within an event window might be economically more troublesome than just borrowing once during a window.

somehow incorporated this nonpublic information into the stock prices of the firms that were recipients of these emergency loans.

At this point, the hypothesis that the Fed was successful in keeping borrowing information from financial market participants is rejected. Because the rejection of the maintained hypothesis is unexpected, we examine potential problems with our method. For example, given the amount of information that was being released about banks during this period, it is important to control for confounding events. To isolate the effect of emergency lending, we identify and exclude all observations with material news events (earnings announcements, changes in corporate policies, etc.) that occurred on the same day as the borrowing. Confounding events were gathered from LexisNexis keyword searches, and all firm observations with news events on the same day as the borrowing event were excluded from the sample. Although several event-day observations were excluded from the sample, the overall number of firms in the sample did not change and the results of these unreported tests are qualitatively similar to those results reported in this study.

In addition, it is possible that our tests are simply capturing the tail of a downward price trend in the financial stocks used in our sample. Struggling firms might be more prone to borrow from the Fed and the negative price reaction we observe during the postevent period we investigate might be part of a continuation of this trend. We attempt to control for this possibility in two ways. First, we conduct the event study using exactly the same firms in our sample but instead of identifying an event day as a day when emergency loans are initiated, we use random dates during our financial crisis sample (August 2007 to April 2010). Results from randomized event days can be found in Panel B of Table 3. Confirming the robustness of the results, returns are relatively normal during the period immediately after these randomized event days. These results are in sharp contrast to the findings in Panel A and highlight the importance of our event-day identification in explaining the negative CARs. Additionally, we examine abnormal returns during the days before the day emergency loans were initiated.[21] Specifically, we find that returns for participating firms during the two days before the event day are indistinguishable from zero. For instance, the abnormal return on day $t-1$ is -0.07% (Patell $Z=-0.002$) and the abnormal return on day $t-2$ is -0.18% (Patell $Z=-1.024$). These findings provide us with some confidence that the postevent negative abnormal returns in Panel A of Table 3 are firm-specific events and are not due to market trends.

However, it is also possible that the results are simply capturing a downward price trend that is driven by the broader financial sector. If prices for all financial firms were decreasing more than the market during this period, our negative market-adjusted returns could just be picking up the decline in financial stocks and not necessarily a response to information related to borrowing from the Fed. To explore such a possibility, we examine financial firms that do not borrow from the Fed on days when borrowing firms receive funds. That is, we look at nonborrowing financial firms on dates when other

[21] There was a few-day gap between when a bank was notified of receiving TAF monies and the time the funds were dispersed. However, in unreported results, we fail to find evidence of significant abnormal returns one or two days before the receipt of the funds.

financial firms borrowed from the Fed. Results from these tests are reported in Panel C of Table 3. To test whether nonborrowing firms also experienced abnormal declines, we examine the four firms closest in market value of equity and with the same Standard Industrial Classification (SIC) code for each borrowing firm, and then test whether the returns for those nonborrowing firms are significantly different from zero. Results show that nonborrowing firms do not have CARs that are significantly different from zero, which supports that our results are not driven by industrywide declines in price and instead are driven by price declines of firms that participated in the lending programs.

We consider other checks to confirm that our results were not driven by data problems or methodology concerns. In unreported results, a sample of nonborrowing banks across our sample period is obtained. After excluding banks that borrowed on a particular day during our sample period, CARs of nonborrowing institutions are not significantly different from zero on days some banks borrowed from the Fed. As an additional robustness test, CARs for borrowing banks are estimated, but instead of using a standard market model, we use the return from an equally weighted banking industry return as the benchmark. Similar to our previous findings, results show that CARs for borrowing banks are still significantly different from zero when adjusting for an industry return instead of a market return. Again, these findings suggest that the results in Panel A of Table 3 are not driven by the movement of stock prices by the broader financial sector.

DW versus TAF—Event Study

Given the findings in Table 3, it is useful to examine if only one of these two major lender-of-last-resort loan programs is driving the results, as these earlier results combine both DW and TAF borrowings. The DW has been around longer, and ever since the Continental Illinois National Bank problems in 1984, DW borrowing has been associated with a stigma. Therefore, the market might be more focused on this lending and better able to acquire information about discount lending to banks. In addition, TAF was designed to have regular two-week interval borrowing, with at least 10 firms participating in each auction. As such, the negative CARs that are observed in Table 3 might be driven solely by DW borrowing and not TAF borrowing. Alternatively, because TAF loans are, on average, much larger than DW loans, perhaps TAF borrowing is driving the results in Table 3.

Table 4 reports the results after partitioning the observations into the two different lending programs. Panel A reports the results for DW borrowing and Panel B shows the results for TAF borrowing. The CARs reported in Table 4 are universally negative and frequently statistically different from zero, suggesting borrowing from either facility was associated with subsequent negative stock returns. In comparing the two panels, note that DW borrowing initiations, although generally smaller borrowing magnitudes, were more numerous than TAF borrowings. Panel A shows that the mean CAR (0, 1) for the DW borrowing is negative but not statistically different from zero. Column (5) does show, however, that *Z*-statistics are large enough to reject the null hypothesis that abnormal returns are zero when looking at CARs with two longer horizons ((0, 5) and (0, 10)). When focusing on the economic magnitude of the CARs in

TABLE 4. Return Event Study—Receipt of Emergency Loans Sorted By Lending Type.

	N (1)	Mean CAR (2)	Median CAR (3)	Positive/Negative (4)	Patell *Z* (5)	Rank Test (6)
Panel A. Discount Window Borrowing						
CAR (0, 1)	840	−0.34%	−0.13%	390/450	−0.951	−1.221
CAR (0, 3)	840	−0.74%	−0.29%	381/459	−1.543	−2.427***
CAR (0, 5)	840	−1.24%	−0.59%	397/443	−2.222***	−3.213***
CAR (0, 10)	840	−1.60%	−0.91%	380/460	−1.943**	−3.445***
Panel B. Term Auction Facility Borrowing						
CAR (0, 1)	300	−0.46%	−0.42%	130/161	−1.751**	−1.155
CAR (0, 3)	300	−0.37%	−0.35%	141/159	−0.527	−0.798
CAR (0, 5)	300	−1.65%	−0.92%	135/165	−2.134***	−2.126**
CAR (0, 10)	300	−2.73%	−2.07%	114/186	−3.684***	−2.685***

Note: This table reports the results of an event study examining the returns surrounding the receipt of Discount Window emergency loans (Panel A) and Term Auction Facility emergency loans (Panel B) by firms between 2008 and 2010. CARs are cumulative abnormal returns calculated from a standard market model. We include variable postrelease event windows, where day 0 is the day of the release. The table also reports the number of observations used in the event study (*N*), the mean CAR for the particular event window, the median CAR, and the number of positive CARs/number of negative CARs (positive/negative). We include two different test statistics: Patell *Z*-statistic and rank test.

***Significant at the 1% level.

**Significant at the 5% level.

Panel A, the event-study results provide evidence of meaningful negative returns surrounding the receipt of discount loans especially with a delay of more than five days. The statistical significance we find is different from the findings of Cyree, Griffiths, and Winters (2013). They generally find that DW borrowing amounts are not statistically associated with DW borrowing. Our findings suggest that it might have taken a little longer for the market to ascertain the identity of these borrowers than Cyree, Griffiths, and Winters's analysis allowed.

In Panel B of Table 4, results provide strong evidence of negative abnormal returns for banks that received emergency TAF loans. In fact, for the longer postevent windows, we again find that the mean and median CARs are negative and significantly different from zero. Here, however, even the mean CAR (0, 1) is −0.46% and statistically significant at the 5% level (Patell $Z = -1.751$). Moreover, the two-day CAR in Panel B is greater than the two-day CAR in Panel A. Similar results are found when examining CAR (0, 5) and CAR (0, 10). Median CARs are consistently less than mean CARs across all panels, although results from nonparametric rank tests generally confirm our parametric results. These results provide strong evidence that the negative abnormal returns observed in Table 3 are found in both TAF and DW loans, but appear slightly stronger for TAF borrowings. If the CARs are taken as a measure of the stigma of borrowing from the Fed in the equity market, we find no evidence that the TAF had less stigma than DW borrowing, although the stated intent of the Fed was to lessen the stigma of such borrowing.

Event Study Surrounding the Receipt of Emergency Loans—Amount of Lending

The results provided up to now do not differentiate among borrowers in terms of how much each borrowed. However, as emphasized here, this information was eventually provided to the public by the Fed long after the borrowing was initiated. In this section, we seek to determine whether market participants could not only identify borrowers but could also differentiate relatively larger borrowers from smaller borrowers. We start by considering the total outstanding amount of facility borrowings at each time a new loan was initiated.

To begin, Table 4 is replicated, distinguishing DW and TAF borrowing, but the event-study results are conditioned on the size of the outstanding emergency loan balance in each program the date the firm received a new loan as well as on the individual borrowing amounts.[22] Each day a firm used a Fed lending facility is categorized as an event day. Stock-event-day observations are then sorted based on the total amount of DW and TAF loans outstanding. In Panels A and B of Table 5, the absolute amount of outstanding borrowing is used. To the extent that the market views the receipt of emergency loans as bad news, the larger amount of emergency loans outstanding should be easier to discern and should result in larger postevent negative abnormal returns.

Panels A and B of Table 5 report the results of this analysis. As before, Panel A presents the results for DW borrowing and Panel B presents the results for TAF borrowing. For brevity, the results for the postevent window (0, 5) six-day CARs are reported, although results from other postevent windows produce qualitatively similar results. Regarding DW borrowing, mean and median CARs are uniformly decreasing across increasing terciles, meaning that events with larger outstanding loan balances resulted in larger negative abnormal returns.[23] Furthermore, DW loans in the smallest tercile (TI) produce negative but not statistically significant CARs. Relative to the findings in the previous table, the results in Panel A suggest postevent CARs are decreasing in the amount of DW loans outstanding. The fact that the six-day CARs for the smallest borrowers are not significantly different from zero suggests that either market participants could not identify such borrowers or they did not see such borrowings as troubling, or both. We conclude that our findings of adverse market reaction are indeed driven by the largest DW borrowers.

Results in Panel B of Table 5 for TAF borrowing similarly show that mean CARs are generally decreasing monotonically across the amount of TAF loans outstanding. In fact, TAF loans in the largest tercile result in mean abnormal returns of −1.89%. Again, these results support the idea that the postevent negative abnormal returns, which we find surrounding TAF borrowing, are driven by firms with the largest outstanding loan balances. Again, as found with DW borrowings, small TAF borrowers do not appear to experience statistically significant CARs. This evidence is inconsistent with the

[22] Cyree, Griffiths, and Winters (2013) measure their TAFSIZE and DWSIZE variables as the change in the outstanding balances of borrowings in the respective programs. As such, the results reported in Table 5 in this article are most similar to those of Cyree, Griffiths, and Winters. We note, however, that Cyree, Griffiths, and Winters do not explicitly mention when these variables become known to the public.

[23] Indeed, the median CAR for the smallest tercile is estimated to be positive but not statistically different from zero.

TABLE 5. Return Event Study, Six-Day CARs—Sorted by the Amount of Loan Outstanding of Emergency Loans.

	N (1)	Mean CAR (2)	Median CAR (3)	Positive/Negative (4)	Patell *Z* (5)	Rank Test (6)
Panel A. Discount Window Borrowing Sorted by Amount of Loan Outstanding						
TI (Low)	277	−0.47%	0.13%	137/140	−0.247	−1.031
TII	281	−1.60%	−1.03%	128/153	−1.680**	−1.968***
TIII (High)	282	−1.63%	−1.39%	116/166	−2.403***	−3.713***
Panel B. Term Auction Facility Borrowing Sorted by Amount of Loan Outstanding						
TI (Low)	98	−0.81%	−0.59%	43/55	−1.038	−0.438
TII	102	−1.46%	−0.59%	41/61	−1.487	−1.963**
TIII (High)	100	−1.89%	−0.52%	47/53	−2.099**	−1.771**
Panel C. Discount Window Borrowing Sorted by Amount Borrowed						
TI (Low)	277	−0.32%	0.29%	130/147	−0.519	−0.313
TII	281	−1.92%	−1.27%	130/151	−2.179**	−2.539***
TIII (High)	282	−1.46%	−0.86%	122/160	−2.857***	−4.208***
Panel D. Term Auction Facility Borrowing Sorted by Amount Borrowed						
TI (Low)	98	−1.15%	−0.88%	42/56	−1.581	−0.813
TII	102	−2.48%	−1.67%	40/62	−2.115**	−2.526***
TIII (High)	100	−1.29%	−0.77%	45/55	−0.839	−1.683**

Note: This table reports the results of an event study examining the returns surrounding the receipt of Discount Window emergency loans (Panel A) and Term Auction Facility emergency loans (Panel B). However, in this table, we sort events into terciles based on the amount of the loans outstanding. TI contains events with the smallest emergency loans and TIII contains events with the largest emergency loans. Using a standard market model, we report cumulative abnormal returns (CARs) from day 0 to day 5 during the postevent period. We include variable postrelease event windows, where day 0 is the day of the release. The table also reports the number of observations used in the event study (*N*), the mean CAR for the particular event window, the median CAR, and the number of positive CARs/number of negative CARs (positive/negative). We include two different test statistics: Patell *Z*-statistic and rank test.

***Significant at the 1% level.

**Significant at the 5% level.

maintained hypothesis that market participants were not able to distinguish borrowers based on how much they borrowed.

Panels C and D of Table 5 report results when the postevent six-day CARs are conditioned on the size of each new Fed loan undertaken on a given date, as opposed to the total outstanding loan balance. Panel C reports results for new DW loans and Panel D reports results for new TAF loans. Results in Panels C and D differ slightly from the results in Panels A and B, although CARs for the larger loans are still statistically significant. In particular, Panel C shows that the average postevent CARs are negative in all three terciles for DW loans. However, here the CARs are most negative in the second tercile, not the third tercile. Also, it is important to note that the CARs in the lowest tercile are not statistically different from zero. Thus, equity market participants appear unable to differentiate DW borrowers by the size of their borrowings, and the smallest borrowers were not penalized.

Panel D of Table 5 reports the results for TAF loans ranked by the size of new borrowing undertaken at each auction. Again, the mean postevent six-day CARs are negative in all three terciles. Similar to Panel C, CARs in the tercile with the smallest new loans are not statistically different from zero. Therefore, the smallest new loans do not produce CARs that are reliably different from zero for both DW loans and TAF borrowings. This finding suggests that equity investors either were only able to identify the large Fed borrowers or did not find the borrowing of smaller amounts economically important. The fact that the market responded differently to firms with larger outstanding borrowing balances and larger individual loans can be seen as additional evidence that market participants were able to infer some information despite the Fed's purposely opaque policies. It is possible that other factors might influence the relation between the amount of Fed borrowing and postevent CARs, such as the size of the firm. Therefore, controls for this and other factors are provided in a multivariate setting in the next section.

Additional Evidence: Multivariate Tests—Examining Postevent CARs

This subsection considers a further explanation for postevent CARs controlling for other firm-specific factors that might explain postevent CARs, as well as a more complete investigation of loan amounts. In other words, we further examine other possible explanatory variables determining the size of our estimated CARs. Here, we intend our approach to be as inclusive as possible seeking to examine a wide array of possible explanatory variables. Based on earlier research examining short-run stock returns, we include control variables to capture the financial conditions of the borrowing firm, such as financial leverage, market capitalization, and book-to-market value. Market liquidity variables such as share turnover and bid–ask spreads are also included, given that prior research shows that illiquidity has positive stock return predictability.

Using unbalanced panel regressions, the following equation is estimated and the results are reported in Table 6:[24]

$$CAR(0,5)_i = \alpha + \beta_1 LOAN_i + \beta_2 D/A_i + \beta_3 \ln(MktCap_i) + \beta_4 Price_i + \beta_5 B/M_i + \beta_6 Turnover_i + \beta_7 Spread_i + \beta_8 BANKC_i + \beta_9 TBTF_i + \varepsilon_i \quad (1)$$

The dependent variable (*CAR(0,5)*) is the CAR from day 0 to day 5, where day 0 is the day firm *i* received an emergency loan, either from the DW or the TAF. The key variable of interest is represented here as the independent variable *LOAN*. In our estimation of (1), we examine six loan size variables, attempting to control for the size of the loan, which has been shown to be important in explaining abnormal returns around the initiation of the borrowing. A negative and significant β_1 coefficient would indicate that the stock market for borrowing firm *i* sells off by a larger amount, the larger the loan amount.

[24] In these multivariate tests and those that follow, we estimate several variants of the equations, including different combinations of the control variables, and find the results to be qualitatively similar to those reported in this study.

TABLE 6. Cross-Sectional Regression Results.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept	0.3648**	0.3612**	0.3544**	0.3659**	0.3650**	0.3658**	0.3709**
	(.019)	(.020)	(.024)	(.019)	(.019)	(.019)	(.018)
LoansOut	−0.0028***						
	(.001)						
TAFOut		−0.0029***					−0.0045***
		(.001)					(.002)
DWOut			0.0124				−0.0096
			(.193)				(.499)
NewLoan				−0.0041			
				(.078)			
NewTAF					−0.0046**		0.0068
					(.044)		(.091)
NewDW						0.0436**	0.0468
						(.017)	(.092)
D/A	−0.3504**	−0.3458**	−0.2806	−0.3266**	−0.3275**	−0.2859**	−0.3337**
	(.015)	(.017)	(.054)	(.024)	(.024)	(.048)	(.022)
ln(*MktCap*)	−0.0055	−0.0057	−0.0088**	−0.0067	−0.0067	−0.0095**	−0.0072
	(.175)	(.164)	(.030)	(.102)	(.102)	(.020)	(.082)
ln(*Price*)	0.0382	0.0383	0.0674	0.0499	0.0486	0.0704	0.0511
	(.304)	(.301)	(.064)	(.182)	(.192)	(.053)	(.172)
B/M	0.0232	0.0227	0.0233	0.0253	0.0248	0.0209	1.8752
	(.212)	(.223)	(.213)	(.175)	(.184)	(.265)	(.3148)
Turnover	−0.1084	−0.1007	−0.1466	−0.1639	−0.1563	−0.1167	−0.0446
	(.709)	(.729)	(.617)	(.574)	(.592)	(.689)	(.878)
Spread	−0.2822	−0.2818	−0.3044**	−0.2988**	−0.2974**	−0.2989**	−0.2731
	(.057)	(.057)	(.041)	(.045)	(.045)	(.044)	(.065)
BANKC	0.0017	0.0028	−0.0037	−0.0029	−0.0020	−0.0047	0.000
	(.911)	(.856)	(.811)	(.849)	(.896)	(.759)	(.968)
TBTF	0.0559**	0.0568**	0.0325	0.0452	0.0469***	0.0285	0.0441
	(.025)	(.023)	(.175)	(.074)	(.063)	(.231)	(.084)
Adj. R^2	0.0678	0.0682	0.0596	0.0608	0.0616	0.0629	0.071
N	1,139	1,139	1,139	1,139	1,139	1,139	1,139
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: The table reports the results from estimating the following equation.

$$CAR(0,5)_i = \alpha + \beta_1 LOAN_i + \beta_2 D/A_i + \beta_3 \ln(MktCap_i) + \beta_4 Price_i + \beta_5 B/M_i + \beta_6 Turnover_i + \beta_7 Spread_i + \beta_8 BANKC_i + \beta_9 TBTF_i + \varepsilon_i.$$

The dependent variable (*CAR(0,5)*) is the cumulative abnormal returns from day 0 to day 5, where day 0 is the day firm *i* received an emergency loan (either from the Discount Window or the Term Auction Facility). The independent variables include the variable *LOAN*, which consists of six loan size variables. *LoansOut* is the total amount of all emergency loans outstanding on the event day. *TAFOut* is the total amount of TAF loans outstanding on the event day. *DWOut* is the total amount of Discount Window loans outstanding on the event day. *NewLoan* is the amount of the new loan on the event day. *TAFNew* is the amount of the new Term Auction Facility loan on the event day. *DWNew* is the amount of the new Discount Window loan on the event day. We also include the debt-to-assets ratio (*D/A*); the natural log of market capitalization (ln(*MktCap*)); the natural log of the share price (ln(*Price*)); the book-to-market ratio (*B/M*); the share turnover, which is the ratio of volume to shares outstanding (*Turnover*); the percentage bid–ask spread (*Spread*); an indicator variable equal to 1 if the firm has available information on Bank Compustat, and 0 otherwise; and an indicator variable *TBTF* that equals 1 if the firm was considered too big to fail according to the Financial Stability Board, and 0 otherwise. We report the results with controls for year dummy variables. The total number of observations in this analysis is 1,139. The *p*-values, which are obtained from White's (1980) robust standard errors, are reported in parentheses.

***Significant at the 1% level.

**Significant at the 5% level.

The loan measures we consider are: *LoansOut*, the total amount of loans outstanding on the event day; *TAFOut*, the total amount of TAF loans outstanding on the event day; *DWOut*, the total amount of DW loans outstanding on the event day; *NewLoan*, the amount of the new loan on the event day; *TAFNew*, the amount of the new TAF loan on the event day; and *DWNew*, the amount of the new DW loan on the event day.[25]

There may be a need to control for the size of the firm; therefore, the natural log of market capitalization (ln(*MktCap*)) is included as an important control variable. The other variables that are included are the borrowing firm's debt-to-assets ratio (*D/A*); the natural log of the share price (ln(*Price*)); the book-to-market ratio (*B/M*); the share turnover, which is the ratio of volume to shares outstanding (*Turnover*); the percentage bid–ask spread (*Spread*); an indicator variable equal to 1 if the firm has information on Bank Compustat, and 0 otherwise (*BANKC*); and an indicator variable that equals 1 if the firm was considered too big to fail according to the Financial Stability Board, and 0 otherwise (*TBTF*). Year dummy variables are also included to account for possible fixed effects, although the coefficients are not tabulated.

Table 6 reports a model including all possible control variables, including many that do not yield coefficients significantly different from zero. Equation (1) is estimated using ordinary least squares and controls for conditional heteroskedasticity by incorporating White's (1980) robust standard errors. In columns (1) through (6), we iteratively include each variable in our *LOAN* category along with the control variables. Consistent with our findings in Table 5, *LoansOut* produces a negative and significant coefficient (estimate $= -0.0028$, p-value $= .001$), indicating that firms that had the largest amount of loans outstanding had the most negative CARs. This result indicates that contrary to the private information hypothesis, the market was able to distinguish borrowers by outstanding emergency borrowing magnitudes. In economic terms, the estimate in column (1) suggests that for every $1 billion increase in loans outstanding, six-day, postevent CARs decrease 0.28%. In column (2), we also find that *TAFOut* produces an estimate that is negative and statistically significant (estimate $= -0.0029$, p-value $= .001$). Column (3) shows that the estimate for *DWOut* is positive but not reliably different from zero (estimate $= 0.0124$, p-value $= .193$). At the margin, the information content contained in outstanding borrowings seems to be more informative than just the amount of new borrowing initiated. This finding is appealing and suggests that the information content of borrowing was cumulative, with "repeat offenders" penalized more.

Column (4) of Table 6 reports the results when we include *NewLoan* as the key loan independent variable of interest. After including our control variables, results show that postevent CARs are negative and significant at the 10% level (estimate $= -0.0041$, p-value $= .078$). Columns (5) and (6) show that the negative CARs are driven primarily by new TAF loans as the estimate for *TAFNew* is -0.0046

[25] As means of robustness, we replicate the analysis in Tables 6 and 7 using the ratio of the loan size variables to the size of the firm as the independent variables of interest. The results from these unreported tests are similar to those reported in the study.

(p-value =.044). The estimate for *DWNew* is positive and significant at the 5% level (estimate = 0.0436, p-value =.017).[26]

Examining the control variables, the regression results suggest that firms with higher debt-to-asset ratios have more negative postevent CARs, which suggests that financial markets more heavily discount stock prices of firms with higher leverage. The statistical significance of the coefficient is nearly a universal finding for all alternative models estimated. The observation is consistent with the prior that the most levered Fed borrowers should experience greater stock price decline. This suggests that market participants were able to link the identity of borrowers with their existing financial leverage, penalizing those with the most leverage. There is also some evidence that larger firms (in terms of market capitalization) and firms with less liquid stock prices (in terms of bid–ask spread) experienced larger absolute negative postevent CARs. The indicator variable *TBTF* produces positive and generally significant estimates, suggesting that these firms had slightly smaller negative abnormal returns. Such evidence, though inconsistent with our prior, suggests stock market participants saw some protection offered by the implicit too-big-to-fail policy evolving in the financial crisis, suggesting that even common stockholders saw some benefit to this designation. However, these results are not statistically robust to each of the six specifications.

Additional Examination of Bank Borrowers Subset

Given the unique nature of depository institutions, the subset of borrowers controlling for bank-specific measures of financial conditions and performance is also examined. In particular, we examine whether the size of the emergency loan explains the postevent CARs after controlling for several bank-specific factors, as well as our earlier control variables. A variety of bank-specific variables are included as control variables so that we can be confident that the prior results are not an artifact of bank-specific performance during the financial crisis. The bank-specific variables are found in Bank Compustat. This examination provides estimates of the following equation on the subsample of firms (some with multiple borrowing dates) with data from Bank Compustat.

$$\begin{aligned} CAR(0,5)_i = {} & \alpha + \beta_1 LOAN_i + \beta_2 D/A_i + \beta_3 \ln(MktCap_i) + \beta_4 Price_i + \beta_5 B/M_i \\ & + \beta_6 Turnover_i + \beta_7 Spread_i + \beta_8 TBTF_i + \beta_9 DepositsR_i \\ & + \beta_{10} NonPerfR_i + \beta_{11} InvSecR_i + \beta_{12} LoansSaleR_i + \varepsilon_i. \end{aligned} \quad (2)$$

As before, the dependent variable (*CAR(0,5)*) is the CARs from days 0 to 5, where day 0 is the day firm i received an emergency loan (either from the DW or the TAF). The independent variables are similar to those in equation (1) with the key variables of interest again being the six variables that account for the size of the emergency loan (*LOAN*). Four bank-specific ratios are included, including the ratio of deposits to total assets (*DepositsR*), the ratio of nonperforming loans to total assets (*NonPerfR*), the ratio of investment securities held to total assets (*InvSecR*), and the ratio of loans available for

[26] The positive estimate for *DWNew* is surprising, particularly the magnitude of the estimate. As shown below, however, when we account for specific bank asset structures, the positive estimate goes away.

sale to total assets (*LoansSaleR*). The number of observations decreases slightly from 1,139 to 955. As before, the results are reported with controls for year dummy variables (coefficients not reported).

The results from estimating equation (2) with *p*-values obtained from White's (1980) robust standard errors are reported in Table 7. Similar to the results in Table 6, we report the results using iteratively each of the six variables that account for the size of the emergency loan. The estimates for the control variables are similar in sign to the estimates in the previous table; therefore, for brevity, we discuss primarily the estimates for our bank-specific variables of interest.

Column (1) shows that the amount of loans outstanding is negatively related to postevent CARs (estimate = −0.0031, *p*-value = .001), which is consistent with our findings in Table 6. Likewise, we find that the estimate for *TAFOut* in column (2) is negative and significant (estimate = −0.0030, *p*-value = .001). In economic terms, the results in these two columns suggest that for every additional $1 billion of emergency loans outstanding, postevent CARs were approximately 13% lower in annual terms. The evidence is again inconsistent with the private information hypothesis. Not only does it appear that the equity market was able to identify which banks were borrowing from the Fed, but the market was further able to differentiate the biggest borrowers from the smallest borrowers. This is true after controlling for a variety of factors that influence the level of postevent CARs.

Column (3) shows that the estimate for *DWOut* is not reliably different from zero (estimate = 0.0229, *p*-value = .345). These findings again suggest that after including our control variables (including the asset structure of banks), the amount of DW loans outstanding did not appear to affect the level of postevent CARs. Similar conclusions are drawn in columns (4) through (6) when focusing on the size of the new loan. One difference between the results in column (6) of Table 7 and the results in column (6) of Table 6 is notable. The estimate for *DWNew*, which is positive and significant in Table 6, is not distinguishable from zero in Table 7 (estimate = 0.0135, *p*-value = .615), albeit estimated to be a positive coefficient.[27]

Overall, the results in Tables 6 and 7 suggest that the size of the new loans and amount of loans outstanding are important determinants in explaining postevent CARs, suggesting that markets knew not only which banks were borrowing and when, but also which were borrowing the most. Table 7 again shows that the financial leverage variable (*D/A*) is an important variable in explaining the size of the CAR. When financial leverage is greater, abnormal stock returns estimated are estimated to be more negative. One other interesting finding in Table 7 relates to the amount of loans available for sale relative to total assets. This appears to be the only added control variable that has a coefficient statistically different from zero. As expected, banks with higher ratios of loans for sale relative to total assets see less negative

[27] It is important to note that the amount of loans outstanding and the size of the new loan are highly correlated. In unreported tests, variance inflation factors between the variables are estimated and are less than 5.2. These factors are relatively small but large enough to caution the reader regarding the inferences that can be drawn from the full models in column (6) of Tables 6 and 7.

TABLE 7. Cross-Sectional Regression Results.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept	0.5955***	0.5982***	0.6147***	0.5954***	0.5983***	0.6019***	0.6123***
	(.003)	(.003)	(.002)	(.003)	(.003)	(.003)	(.002)
LoansOut	−0.0031***						
	(.001)						
TAFOut		−0.0030***					−0.0049***
		(.001)					(.003)
DWOut			0.0229				
			(.345)				
NewLoan				−0.0053**			
				(.035)			0.0056
NewTAF					−0.0052**		(.197)
					(.035)		
NewDW						0.0135	−0.0718
						(.615)	(.266)
D/A	−0.4727**	−0.4747**	−0.4811**	0.4746**	−0.4768**	−0.4721**	−0.4769**
	(.017)	(.017)	(.016)	(.017)	(.017)	(.018)	(.016)
ln(*MktCap*)	−0.0100	−0.0101	−0.0128**	−0.0106**	−0.0108**	−0.0124**	−0.0106**
	(.054)	(.051)	(.014)	(.041)	(.038)	(.017)	(.043)
ln(*Price*)	0.0369	0.0373	0.0719	0.0489	0.0494	0.0705	0.0455
	(.625)	(.621)	(.339)	(.519)	(.515)	(.349)	(.547)
B/M	−0.0087	−0.0095	0.0054	0.0039	0.0031	0.0101	−1.7657
	(.805)	(.788)	(.879)	(.912)	(.931)	(.775)	(.625)
Turnover	0.0504	0.0515	−0.1682	−0.1003	−0.0950	−0.1723	0.0479
	(.892)	(.889)	(.646)	(.785)	(.796)	(.639)	(.897)
Spread	−0.2898	−0.2904	−0.3243	−0.3075	−0.3078	−0.3220	−0.2951
	(.110)	(.109)	(.075)	(.091)	(.091)	(.077)	(.104)
TBTF	0.0562	0.0559	0.0276	0.0469	0.0462	0.0272	0.0555
	(.061)	(.062)	(.342)	(.122)	(.127)	(.349)	(.069)
DepositsR	−0.0800	−0.0795	−0.0446	−0.0640	−0.0629	−0.0443	−0.0859
	(.254)	(.257)	(.523)	(.362)	(.370)	(.526)	(.223)
NonPerfR	−0.0784	−0.0799	−0.0877	−0.0834	−0.0833	−0.0763	−0.1057
	(.592)	(.585)	(.553)	(.570)	(.571)	(.604)	(.478)
InvSecR	0.0040	0.0044	0.0291	0.0153	0.0162	0.0297	−0.0023
	(.957)	(.953)	(.693)	(.837)	(.626)	(.688)	(.974)
LoansSaleR	0.7012**	0.7016**	0.5873	0.6333**	0.6354**	0.5860	−0.6906**
	(.020)	(.020)	(.052)	(.036)	(.036)	(.052)	(.022)
Adj. R^2	0.0858	0.0858	0.0755	0.0788	0.0788	0.0888	0.1023
N	995	995	995	995	995	995	995
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: The table reports the results from estimating the following equation.

$$CAR(0,5)_i = \alpha + \beta_1 LOAN_i + \beta_2 D/A_i + \beta_3 \ln(MktCap_i) + \beta_4 Price_i + \beta_5 B/M_i + \beta_6 Turnover_i + \beta_7 Spread_i + \beta_8 TBTF_i + \beta_9 DepositsR_i + \beta_{10} NonPerfR_i + \beta_{11} InvSecR_i + \beta_{12} LoanSaleR_i + \varepsilon_i.$$

The dependent variable (*CAR(0,5)*) is the cumulative abnormal returns from day 0 to day 5, where day 0 is the day firm *i* received an emergency loan (either from the Discount Window or the Term Auction Facility). The independent variables include the variable *LOAN*, which consists of six loan size variables. *LoansOut* is the total amount of all emergency loans outstanding on the event day. *TAFOut* is the total amount of Term Auction Facility loans outstanding on the event day. *DWOut* is the total amount of Discount Window loans outstanding on the event day. *NewLoan* is the amount of the new loan on the event day. *TAFNew* is the amount of the new Term Auction Facility loan on the event day. *DWNew* is the amount of the new Discount Window loan on the event day. We also include the debt-to-assets ratio (*D/A*); the natural log of market capitalization (ln(*MktCap*)); the natural log of price ln(*Price*); the book-to-market ratio (*B/M*); the share

turnover, which is the ratio of volume to shares outstanding (*Turnover*); the percentage bid–ask spread (*Spread*); and an indicator variable *TBTF* that equals 1 if the firm was considered too big to fail according to the Financial Stability Board, and 0 otherwise. We also include three ratios using variables from Bank Compustat. We include the ratio of deposits to total assets (*DepositsR*), the ratio of nonperforming loans to total assets (*NonPerfR*), the ratio of investment securities held to total assets (*InvSecR*), and the ratio of loans available for sale to total assets (*LoansSaleR*). We report the results with controls for year dummy variables. The total number of observations in this analysis is 955. The *p*-values, which are obtained from White's (1980) robust standard errors, are reported in parentheses.
***Significant at the 1% level.
**Significant at the 5% level.

abnormal returns. This makes sense as such loans provide an alternative source of funding for the borrowing bank.

The empirical investigation in this study does not explain how market participants acquired this emergency borrowing information. Rather, the observed evidence is only consistent with the efficient markets theory that indicates markets will find the information they deem valuable. Anticipating such findings, for example, Persistiani (1998) argues:

> The confidential nature of the lending process (of the Fed), however, does not guarantee that the depository institutions will be invulnerable to news or rumors. Although the Federal Reserve does not disclose the identity of the borrowing banks, it releases information on borrowed reserves by certain size categories for each Federal Reserve District. Market participants can infer from this information whether any of the major regional banks have borrowed from the discount window. (p. 613)

Extending this argument to more recent times, the Fed continued the practice of releasing aggregate information on its lending programs (both the DW and the TAF) during the financial crisis. Such aggregate information could have allowed market participants to infer the identity of, at least, the largest borrowers.[28]

The results in this study are agnostic to the legality of information disclosure in this setting. To the best of our knowledge, there is no law preventing a borrowing firm from voluntarily revealing such information. Indeed, some borrowers from the Fed's lending programs informed financial markets themselves of such borrowing, via accounting statements (e.g., 10-Ks), that the firm had borrowed or was likely to borrow in the future from the Fed, especially via the TAF.[29] Thus, the Fed's effort to "lock up" information appears to be limited, and thus it should not be surprising that market participants are able to uncover valuable information.

Moreover, in many of these statements the borrowing entity emphasized that to be able to borrow money from either the DW or the TAF meant that the borrower had been deemed to be in "a generally sound financial condition by their local Federal

[28] During our sample period, the Fed did release weekly information about its balance sheet in the H.4.1 statistical release. This release provided information on aggregate bank borrowings from the Fed, including TAF credit. An anonymous referee also pointed out that the Fed released summary aggregate lending information after each TAF auction. In all cases, however, this information was aggregate in nature and did not identify particular borrowers, or the amount borrowed, which is information critical to our event-study examination.

[29] The authors thank an anonymous reviewer for calling our attention to such information.

Reserve bank." As such, it appears these firms saw the borrowing to be a "good signal" to financial market participants. This would encourage borrowing firms to provide such information to the public. Atlhough this might have provided the incentive to voluntarily release such information to market participants, our evidence suggests the opposite market reaction to what might have been expected by such firms. Recall that stock prices of borrowing firms declined around the date the borrowing took place. This appears to be inconsistent with market participants seeing the borrowing as a sign of financial strength, but is consistent with the many instances across the country where banks advertised that they did not take "bail-out" money.

V. Conclusion

How does the stock market react to news about financial firms borrowing short-term funds from the Fed during the financial crisis? This study seeks to answer this question. After finding no evidence of a market reaction to the official release of this information by Bloomberg or earlier release dates of this information by the Fed, we examine whether the market might have traded on this information earlier, even if the Fed sought to keep such information private. There exists both economically and statistically significant evidence that stock returns fell soon after an institution received funds from either the DW or the TAF. These findings are consistent with the inconvenient truth that the Fed's effort to hide from the public the identity of the emergency borrowers, as well as the size of the borrower amounts, was not completely successful. Our investigation uncovers large negative abnormal returns soon after the firm obtained funds from the Fed, and the negative abnormal returns are absolutely larger for larger borrowers. These findings are consistent with the idea that, despite the Fed's reluctance to release detailed information about the participants in the emergency loan facility, the equity market had already begun to incorporate this information into the stock prices of banks.

If the decision by the Fed to withhold information about its lending programs was made to protect participating banks from concerned investors, our results suggest that at least some investors were still able to gain knowledge about the identities and even the relative size of the loans of large, publicly traded participating banks. It is important to note that the decision by the Fed to withhold such information about the lending participants came at a cost of less perceived transparency for large banks and resulted in, perhaps, increased calls for improved accountability on the part of the Fed.

The fact that abnormal returns are negative and significant—both economically and statistically—for banks when they borrowed from emergency loan programs is startling and raises important questions. However, detailed insights into how the market learned about the borrowing are not provided. Given that we are not able to observe the performance of borrowing banks in the setting of full transparency, we cannot speak to whether it is worthwhile for central banks to try and keep such valuable information private and not in the public domain. Perhaps a fruitful avenue for future research can address these types of questions.

Prior research argues that the motivation for central banks to increase the transparency of policy decisions is, in large part, due to the need to be held accountable by the public. Greater accountability increases the probability that the Fed can retain its political independence (Cukierman 1994; Geraats 2002). These results speak to an important trade-off between (1) withholding information about emergency lending facilities and mitigating a potentially unfavorable signal to the rest of the market and (2) providing the appropriate level of accountability to the public.[30] These findings also have implications for the management of financial institutions in a crisis period. To the extent that participating banks felt that borrowing information was to be kept private, our results suggest that this might not have been fully the case. Although the negative CARs during the period immediately following the receipt of loans represent substantial underperformance (approximately 50% in annual terms), this underperformance might have been much worse if the Fed had not kept borrowing information private.

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[30] Regarding accountability, two bills were brought before the U.S. Congress calling for greater Fed transparency and accountability during the recent financial crisis. The Federal Reserve Transparency Act (H.R. 1207) was brought before the U.S. House of Representatives in February 2009. Around the same period, the Federal Reserve Sunshine Act (S. 604) was brought before the U.S. Senate later that year.

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