Consequences of Mandated Bank Liquidity Disclosures

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Abstract

This paper studies the capital market consequences of unique and unexpected mandatory disclosures of banks' liquidity and the resulting changes in banks' behavior. I employ a hand-collected sample of the disclosures of banks' borrowing from the US Federal Reserve Discount Window (DW) during the financial crisis. I find that these disclosures contain positive incremental market information as they decrease banks' cost of capital (measured by the equity bid-ask spreads and the cost of debt). However, I also find evidence of endogenous costs associated with more disclosure. I document that banks respond to the DW disclosures by increasing their liquidity holdings and decreasing risky assets. In line with the theoretical predictions of Goldstein and Sapra (2013), this finding indicates that, following the DW disclosures, banks try to avoid accessing the DW facility, despite its cost of capital benefits.

JEL classification: G18, G21, G28, M41

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1. Introduction

The health of a financial sector relies crucially on its liquidity, as evidenced by the recent events that triggered the financial crisis. Several regulatory proposals have been put forward with the aim of preventing a recurrence of these events, a number of which involve the disclosure of bank liquidity information. The reasoning is that greater transparency would allow market participants and bank counterparties to discipline banks (BIS 2013a, 2013b). Opponents of these proposals, however, argue that, in the presence of information asymmetry about banks' asset quality and a lack of credible communication, liquidity disclosures can be counterproductive because they might lead to decreased lending and avoidance of borrowing from the lender of last resort (Herzberg and Praet, 2008; Bernanke, 2009; and Thakor, 2012). This paper studies the capital market consequences of bank liquidity disclosures and the impact of these disclosures on banks' behavior.

I utilize information from the 2011 US Federal Reserve disclosures that reveal which banks accessed the Discount Window (DW) liquidity facilities.[1] During the 2007-2009 financial crisis, banks in the United States borrowed unprecedented amounts through the DW facilities. While weekly borrowing from the DW before the crisis averaged $170 million per week, this amount was close to $30.8 billion from August 2007 to December 2009. Banks borrowed more than 26,000 loans with a total par value of $11 trillion. More than 50% (20%) of large (small) banks used the DW between March 2008 and March 2010 to obtain additional liquidity (Berger et al., 2013). However, despite the sizeable amount of capital provided, information about individual bank borrowing from the DW was not made public

[1] The DW, established in 1913, is a facility that allows deposit-taking institutions in the United States to borrow funds from the US Federal Reserve System on an overnight basis when needed (also known as the "lender of last resort"). The DW extends credit to help alleviate liquidity strains in deposit institutions and ensure the basic stability of the payment system. Banks pre-pledge collateral and can access this facility on a "no-questions-asked" basis, provided they have sufficient collateral and remain sound. During the financial crisis, the US Federal Reserve increased the maturity of DW loans to the maximum maturity of 90 days.

until recently. On March 21, 2011, the Supreme Court ruled in favor of several US news networks and, on March 31, 2011, forced the Federal Reserve to reveal which banks accessed the DW facilities, when they did so, how much they borrowed and for how long.[2] This disclosure was an "information surprise" that can provide insight into how banks modify their behavior if liquidity disclosures were provided regularly. Using a propensity-score matched sample of banks that accessed the DW (treatment sample) and those that did not (control sample), along with a standard difference-in-differences methodology, I study two main research questions: (1) whether the DW disclosures had any consequences with respect to banks' cost of capital; and (2) whether these disclosures triggered changes in banks' borrowing and lending activities.

Previous research has documented the existence of a stigma associated with the usage of the DW by banks in the United States (Furfine, 2001 and 2003; Armantier et al., 2011; and Acharya, Gromb and Yorulmazer, 2012). Ennis and Weinberg (2013) show analytically that in the presence of information asymmetry about the quality of banks' assets, it is rational for banks to avoid using the DW facilities to prevent signaling that their need for funding might be an indicator of poor asset quality. While the DW borrowing rate should theoretically provide an upper-bound on banks' cost of short-term borrowing in the federal funds market (Acharya et al., 2012), banks are willing to pay higher rates on funds from other sources, such as interbank loans or the Term Auction Facility, TAF (Furfine, 2003).[3] Furthermore, despite the fact that funds provided through the DW and TAF had the same collateral and eligibility requirements, banks borrowed substantially higher amounts during the financial crisis

[2] Bloomberg News and Fox News filed several lawsuits against the Federal Reserve under the Freedom of Information Act requesting access to the DW borrowing data during the financial crisis (please see Appendix A for the timeline of the lawsuits). For the news coverage, see, for example, Torres, Craig (2011), "Fed Releases Discount-Window Loan Records During Crisis Under Court Order," *Bloomberg*, March 31, 2011, available at http://www.bloomberg.com/news/2011-03-31/federal-reserve-releases-discount-window-loan-records-under-court-order.html.

[3] The Term Auction Facility (TAF) was a temporary facility in operation from December 2007 until March 2010.

through the more expensive TAF and thus paid substantially more because of the perceived DW stigma (Brunnermeier, 2009; and Haltom, 2011).[4] While the aforementioned studies all document the existence of the DW stigma by comparing banks' borrowing in the federal funds (or interbank) market to that of borrowing from the Federal Reserve, the unprecedented event of the full, public DW borrowing disclosure provides a unique opportunity to test whether the stigma exists in the public capital market as well. If the market penalizes banks when the information is revealed, then it is rational for banks to adjust their behavior pre-emptively to avoid the impact of future DW disclosures.

Prior analytical research on disclosure has mainly focused on studying the effects of mandatory and voluntary disclosures by management and the role disclosure plays in informing capital market investors about a firm's future profitability (e.g., Kim and Verrecchia, 1994; and Lambert, Leuz and Verrecchia, 2012). These studies find that disclosure improves price efficiency by decreasing information asymmetry. Less is known, however, about the cost of capital impact of specific firm disclosures provided by regulators. The notable exceptions are the recent studies of the capital market consequences of US and EU bank stress test disclosures on the information asymmetry and information uncertainty about the underlying soundness of financial institutions (Peristiani, Morgan and Savino, 2010; Bischof and Daske, 2013; and Ellahie, 2013). Regulators potentially have a different objective function than an individual firm. In particular, banking regulators aim to provide disclosures that enhance market discipline and, at the same time, improve financial stability of the banking sector (Morgan and Stiroh, 2001; Goldstein and Sapra, 2013). Furthermore, regulatory disclosures might be viewed by market participants as less strategic for an individual firm than an individual firm's disclosure, thus potentially increasing the credibility

[4] In particular, during the 28 months of TAF's operation, financial institutions borrowed more than $3.8 trillion of funds at an average premium of between 37 and 150 basis points above the DW rate (Haltom, 2011).

of disclosures. Finally, disclosures by regulators might provide further impetus for additional voluntary disclosures by firms wishing to signal their quality (Bischof and Daske, 2013).

While more disclosure improves price efficiency and leads to market discipline in a setting without frictions, Goldstein and Sapra (2013) demonstrate analytically that this may not necessarily be the case for banks. This is because banks operate in the "second-best" environment, due to their interconnected nature, the presence of externalities, and banks' exposure to informational and market frictions. Furthermore, they show that, in the second-best environment, the incentives of all market participants need to be taken into account—for example, the incentives of banks when they interact with each other in the interbank market. Therefore, Goldstein and Sapra (2013) argue that while more disclosure for banks might lead to better market discipline and price efficiency, it is a necessary but insufficient condition for economic efficiency because of the endogenous costs of disclosure. Similarly, Thakor (2012) analytically predicts that mandatory financial disclosure for financial institutions might be inefficient and lead to banks' fragility. Overall, these two studies argue that, in response to increased mandatory disclosure, banks change their behavior to avoid further disclosures.

To study the first question about the effect of liquidity disclosure on banks' cost of capital, I first need to establish that the information released by the Federal Reserve was material. I assess the information content of DW disclosures using three measures: cumulative abnormal stock returns (Lo, 2003; and Larcker, Ormazabal and Taylor, 2011); abnormal stock return volatility (Landsman and Maydew, 2002); and abnormal trading volume (Beaver, 1968; and Kim and Verrecchia, 1997). I find that, following the disclosure of the DW information, banks that accessed the DW exhibit positive cumulative abnormal returns of 1.10% (measured over a four-day window, including the DW disclosure event) compared to banks that did not. I also find that banks that accessed the DW experience a 26% drop in abnormal trading volume. However, I do not find any significant abnormal return

volatility following the DW event, suggesting that negative abnormal volumes are more likely to be the result of investors' consensus, as investors will trade less if there is no disagreement about the content of disclosure (Holthausen and Verrecchia, 1990). These initial information content tests suggest that investors see the DW disclosures as a positive material event. Furthermore, the significant results indicate that the DW disclosures provide incremental material information despite being released with a two-year lag.

Next, I directly investigate the cost of capital consequences of DW disclosures by studying changes in the equity bid-ask spread and the cost of debt. I find that the DW disclosures significantly decrease the information asymmetry component of the bid-ask spreads for banks that accessed the DW in the short-horizon of seven days around the announcement date. However, I find that the information asymmetry component of the bid-ask spread increases for banks that accessed the DW over the longer horizon of two quarters after the event. Regarding the cost of debt, I find that following the DW disclosures, banks that accessed the DW receive significantly lower bond issuing yields, with an average significant reduction of 1.16 percentage points, compared to the matched control group of banks that did not access the DW facilities. Overall, these findings suggest that the DW disclosures result in a decrease in the banks' cost of capital as measured by short-term equity and debt prices. Furthermore, unlike in prior studies, which document the existence of the DW stigma in the interbank market, there seems to be no evidence suggesting the stigma's presence in the public capital markets.

Finally, I study the effects of the DW disclosures on banks' lending, liquidity, and borrowing to establish whether banks change their behavior in response to the DW disclosures. I document that, following the DW disclosures, banks increase liquidity and decrease asset risk, measured as a proportion of risk-weighted assets in total assets. Banks also decrease their borrowing from other sources of unsecured lending, given by the

proportion of their pledged assets in total assets. Furthermore, banks that accessed the DW appear to borrow less from the interbank market and increase their balance sheet liquidity by closing the loan-to-deposit gap. In addition, banks that borrowed more or accessed the DW more frequently decrease their risky lending and increase liquidity. Therefore, banks appear to change the composition of their balance sheets and hold more liquidity following the DW disclosures. These results, taken together with the capital market tests, suggest that while the DW disclosures provide some incremental information and are perceived positively by equity and debt investors, they also create incentives for banks to avoid accessing the DW in the future, despite the capital market benefits. This seeming inefficiency is an example of the endogenous costs (or unintended consequences) of disclosure discussed by Goldstein and Sapra (2013) and Gigler et al. (2013). In this setting, the endogenous cost of disclosure for banks is the potential increase in the cost of interbank borrowing due to the signal that DW disclosures provide about banks' liquidity needs and the quality of their assets.

This study contributes to the literature across several dimensions. First, it adds to the literature on the role and economic consequences of mandatory disclosure. There is ample literature on the capital market consequences of mandated changes of particular accounting standards, rules, or regulatory events.[5] These studies reveal that mandatory disclosure leads to a reduction in information asymmetry and firms' cost of capital. I add to this literature by documenting how *unexpected* mandatory liquidity disclosures by a *regulator*, at the time of disclosure, provide incremental information to the capital market and lead to changes in banks' cost of capital. Mandatory disclosure by a regulator is an interesting setting as it provides standardized information for all companies and is less likely to be influenced by the strategic behavior of a particular firm. The unexpected nature of this disclosure allows me to

[5] For example, see Watts and Zimmerman (1986); Fields, Lys and Vincent (2001); Kothari (2001); Leuz and Verrecchia (2000); Daske et al., (2008, 2013); Hail, Leuz and Wysoki (2010); DeFond et al., (2011); Zhang, (2007); and Petacchi (2012).

exploit the exogenous variation resulting from the information shock and hence to draw causal inferences. Furthermore, I also contribute to the studies which investigate mandatory disclosure by bank regulators during the recent financial crisis (e.g., Perestiani et al., 2010; Bischof and Daske, 2013; and Ellahie, 2013). I add to these studies by providing evidence that supplemental mandatory liquidity disclosures decrease cost of capital and lead to a decrease in banks' risk-taking behavior. Moreover, while these studies focus on the effect of disclosure during the financial crisis, I show corroborating evidence that DW disclosures provide incremental information to the capital markets even after the financial crisis.

Second, this paper contributes to the literature on the role of disclosure as a disciplining device for financial institutions (Flannery, 1998; Flannery, Kwan and Nimalendran, 2010; and Bushman and Williams, 2012). One of the arguments in support of the DW disclosure is that it can improve market discipline by providing additional information about banks' asset quality and liquidity. As Beatty and Liao (2013) point out, it is important to study and understand the effects of new regulatory changes for banks and, in particular, the increased liquidity disclosure requirements. However, given that the regulation affects all banks, studying the impact of these changes empirically poses a challenge of constructing a counterfactual scenario. The setting of the unexpected liquidity disclosure enables me to construct a counterfactual scenario of the consequences of liquidity disclosure by comparing banks that were directly affected by these disclosures (banks accessing the DW) with those that were not. My findings show that liquidity disclosures provide incremental information to the capital market over and above that available in regulatory and financial filings and result in the reduction in banks' cost of capital.

Third, because banks operate in the second-best environment with informational and market frictions, my setting allows me to directly test the endogenous costs of disclosure. In line with the analytical predictions of Goldstein and Sapra (2013) and Thakor (2012), and in

contrast to the work that shows more disclosure is always better (e.g., Blackwell, 1951), I find that banks change their behavior following the DW disclosures by decreasing asset risk and increasing liquidity holdings. This is consistent with banks' attempts to mitigate the effects of similar disclosures in the future. Furthermore, banks change their behavior despite the positive reaction in the public capital market, suggesting that they perceive these disclosures to increase their cost of funding in some other way, in particular, through the interbank market. This is an example of price efficiency not directly translating into economic efficiency, as banks respond to disclosures by changing their *ex ante* behavior (Bond, Edmans and Goldstein, 2012; Goldstein and Sapra, 2013; and Gigler et al., 2013).

Finally, this paper provides new evidence on whether the DW stigma is reflected in the capital markets. Unlike the interbank markets, in which the existence of the stigma has been widely documented (Furfine 2001; 2003; Armantier et al., 2011; and Acharya et al., 2012), I find no supporting evidence for the existence of the DW stigma in the public capital markets (either debt or equity). My findings also corroborate those of Berger et al. (2013), who study which banks accessed the DW and TAF during the financial crisis and document changes in banks' lending behavior and balance sheet structure contemporaneously to their usage of TAF and DW. My study differs in that it focuses on the capital market consequences of the public disclosure of DW information and changes in banks' behavior following this disclosure. To the best of my knowledge, consequences of disclosing the DW information have not yet been documented.

The rest of this paper is organized as follows: section 2 provides a brief history of the discount window and its role; section 3 reviews the literature and formulates the hypotheses; section 4 introduces data sources and discusses the research design; section 5 presents the empirical results; and section 6 summarizes the main findings.

2. Borrowing from the Federal Reserve

The Discount Window (DW) facility at the Federal Reserve functions as a safety valve for financial institutions. Through this facility, the Federal Reserve can act as a "lender of last resort" and provide access to liquidity for solvent banks with sufficient collateral.[6] Since 2003, depository institutions have been allowed to borrow from the DW easily and without any questions asked.

While the function of the DW remained relatively constant, its administration has changed over time. Prior to the mid-1960s, the DW loans were extended at "penalty" rates equal to or higher than short-term market interest rates (Madigan and Nelson, 2002; and Klee, 2011). From the mid-1960s until January 2003, the rate paid on the discount window borrowing was pegged at 25 to 50 basis points below the target federal funds rate and, to reduce potential arbitrage opportunities, deposit institutions borrowing from the DW had to demonstrate that they were unable to obtain funding from any other sources and were subject to additional regulatory scrutiny. Accessing the DW, therefore, became associated with the inability to borrow funds from other sources, giving rise to a stigma (Brunnermeier, 2009; and Haltom, 2011). This regime changed in January 2003, when the Federal Reserve returned to the "penalty rate" framework and increased the discount rate to 100 to 150 basis points above the federal funds target rate. Two facilities were established: primary credit for institutions in sound condition and secondary credit for financial institutions that do not qualify for primary access funding. Primary access facility provides credit mainly overnight on a "no-questions-asked" basis with minimal administration and no restrictions on its use. Secondary credit is available to troubled financial institutions to meet overnight backup

[6] All commercial banks, thrift institutions, and US branches and agencies of foreign banks have access to the DW. The range of acceptable collateral includes investment-grade certificates of deposit, AAA-rated commercial mortgage-backed securities, US Treasury securities, state and local government securities, collateralized mortgage obligations (AAA), consumer loans, commercial and agricultural loans, and certain mortgage notes on one-to-four family residences.

liquidity needs and is closely monitored by the Federal Reserve. These changes were implemented as an attempt to eliminate the stigma associated with the DW access; however, they were unsuccessful (Furfine, 2003; and Haltom, 2011). In this paper, I study banks that access the primary credit facility of the DW.

As the financial crises unfolded in the second half of 2007, borrowing from the DW remained low (Bernanke, 2009). In August 2007, the Federal Reserve reduced the spread between the discount rate and the federal funds rate to 50 basis points and increased the DW loan terms from overnight to 30 days. The Federal Reserve also introduced the Term Auction Facility (TAF) to overcome the stigma problem associated with the DW (Bernanke, 2009). The key difference between the DW and TAF was that TAF was administered through a series of fortnightly auctions: the Federal Reserve announced that it would auction a fixed amount of funds, and an unlimited number of banks could bid for up to 10% of that amount (the cap was imposed to ensure that funds were distributed evenly).[7] Funds were given to bidders providing the highest bid, which exhausted all available funds. Furthermore, bidders were only notified that their bid was successful three days after the auction had taken place. Hence, TAF guaranteed that multiple banks were able to borrow from the Federal Reserve and reduced the likelihood that any one borrower would be identified by the market as requiring immediate funding and hence penalized (Armantier et al., 2011; and Haltom, 2011).

On March 31, 2011, the Federal Reserve made an unprecedented release of the DW borrowing information after it had lost a series of lawsuits filed under the Freedom of Information Act. The Federal Reserve initially refused to reveal this information by arguing that such disclosure would dissuade banks from borrowing from the DW in the future and thus undermine financial stability; however, just a few days earlier, on March 21, 2011, the Supreme Court denied the Federal Reserve's petition to hear its appeal. This was the first

[7] Collateral requirements were exactly the same for DW and TAF funds.

time the DW information was made public since its inception in 1913.[8] In addition, as required by the Dodd-Frank Act, on December 1, 2010, the Federal Reserve released information about TAF borrowing.

In this paper, I focus on the DW disclosures event on March 31, 2011 (the DW disclosure event). In addition, in robustness tests, I also investigate the reaction to the TAF disclosure event (December 1, 2010) and the Supreme Court decision event (March 21, 2011).

3. Review of the literature and hypotheses development

As discussed briefly above, accessing the DW facility is associated with a stigma based on the notion that only a bank in financial trouble will borrow funds from the Federal Reserve over other sources of funds (e.g., Peristiani, 1998; and Armantier et al., 2011). Ennis and Weinberg (2013) provide a formal model showing the existence and rationality of the stigma as a result of information asymmetry and noisy signaling; while Furfine (2001; 2003) finds empirical evidence in support of the stigma. In addition, studies of banks' behavior during the recent financial crisis reveal further support that, even during times when liquidity needs are extreme, banks pay a substantial premium for other sources of funds instead of accessing the DW (Armantier et al., 2011; and Acharya et al., 2012). One factor that contributed to the existence of this stigma is information asymmetry about the quality of banks' assets (Artuc and Demiralp, 2010; and Furfine, 2001).

Information asymmetries create costs by introducing adverse selection into transactions between buyers and sellers of firm shares, which is typically manifested in reduced levels of liquidity for firm shares (e.g., Copeland and Galai, 1983; Kyle, 1985; and Glosten and Milgrom, 1985). In order to overcome the reluctance of potential investors to

[8] The Dodd-Frank Act introduced a requirement for the Federal Reserve to release the DW access details with a two-year lag. The first release was on September 28, 2012. Going forward, this information will be released quarterly.

hold firm shares in illiquid markets, firms issue capital at a discount. Discounting results in fewer proceeds to the firm and hence higher cost of capital. The disclosure theory for capital markets predicts that if informative disclosures are backed by commitment to increased levels of disclosure, the information asymmetry component of the equity bid-ask spread should decrease (Baiman and Verrecchia, 1996; Diamond and Verrecchia, 1991; and Verrecchia, 2001). However, if disclosure is partial, such as in the case of redacted disclosures, the equity bid-ask spread will increase (Verrecchia and Weber, 2006). If, on the one hand, the stigma associated with the DW also applies to the capital markets, the revelation of which banks accessed the DW during the financial crisis will lead to a negative market reaction. On the other hand, because banks accessing the DW are required to be in good standing and have enough high quality collateral, the reaction might be positive. Over a short horizon, the changes of investors' beliefs based on changes in information asymmetry will result in changes in the bid-ask spread and thus changes in the cost of equity capital.

One of the main arguments in support of the DW disclosure is that it provides additional information about banks' liquidity and asset quality and may increase market discipline. Bank supervisors are willing to disclose information about banks to share the role of policing bank risk with private investors, in particular, bondholders. Morgan and Stiroh (2001) find that banks' bondholders take into account the underlying risk of banks' portfolios of assets. However, the authors also find that investors appear to fail to incorporate all information or fully penalize large or more opaque banks, suggesting that the disciplinary mechanism partially fails for banks either considered to be "too big to fail" or "too difficult to understand" by the bond market. Prior studies on the role of disclosure in the credit markets have documented that while higher disclosure quality leads to a lower cost of debt (Sengupta, 1998; Yu, 2005), bond prices have high sensitivity to negative news (Easton, Monahan and Vasvari, 2009). Therefore, if the DW disclosure increases transparency and hence reduces the

adverse selection costs for bondholders, the DW disclosures will be viewed as positive news by bondholders as they will reduce the uncertainty associated with the quality of banks' assets (Duffie and Lando, 2001). However, if banks accessing the DW are instead perceived as having poor asset quality in line with the documented stigma, the reaction will be negative. Given that the DW disclosures are provided with a lag, I expect to find no significant effect on banks' cost of capital if the DW disclosures do not contain any new information for banks' investors.

The effects of the DW disclosures on cost of debt and equity are, therefore, unclear *a priori* and the net impact of the two opposing effects has to be assessed empirically. In my first hypothesis, I test whether the DW disclosures result in a change in the cost of banks' capital as measured by the information asymmetry component of the equity bid-ask spread and the offering bond yields:

> *H1: DW disclosures decrease (increase) banks' cost of capital as measured by the equity bid-ask spread and offering bond yields if they decrease information asymmetry (increase DW stigma).*

The literature on real effects of accounting disclosure emphasizes the two-way impact between firm decisions and capital market pricing (e.g., Kanodia and Lee, 1998; Sapra, 2002; and Kanodia, Sapra and Venugopalan, 2004). If the DW disclosures provide additional information to banks' investors, they will result in changes in banks' cost of capital. Whether banks adjust their behavior accordingly, however, is unclear. Banks operate in the second-best environment with informational and market frictions and are prone to externalities. Therefore, increased disclosure, even if it results in price efficiency, might not necessarily lead to economic efficiency due to endogenous costs (Bond et al., 2012; Goldstein and Sapra, 2013; and Gigler et al., 2013). Furthermore, in the second-best environment, it is important to take into account the effect of disclosure not only on market discipline but also on all market

participants, for example, the effect of disclosure on bank's interactions with each other in the interbank market (Goldstein and Sapra, 2013).

Goldstein and Sapra (2013) present a theoretical model in which a banking regulator discloses the results of banks' stress tests. They show that market discipline is a necessary but insufficient condition for economic efficiency. This is because disclosure might induce suboptimal *ex post* market externalities that would lead to excessive and inefficient reaction to public news. This disclosure might also reduce traders' incentives to gather information and hence impose market discipline. Most importantly, this disclosure might lead banks to change their behavior *ex ante* in anticipation of future disclosures and thus make *ex post* inefficient decisions. The authors refer to these predicted outcomes as endogenous costs of disclosure. In addition, Thakor's (2012) theory of information disclosure with disagreement examines the implications of mandatory disclosure for financial and non-financial firms. He finds that banks optimally disclose less strategic information than non-financial firms and that mandatory disclosure may make banks more fragile. However, in a recent empirical study of the European banks' response to the regulator's disclosure of the EU banks' stress tests results, Bischof and Daske (2013) find that this mandatory disclosure causes banks to lower their risk-taking behavior.

When the information about the DW access is released, the market is already aware of the Dodd-Frank Act requirements to provide DW access disclosures from September 2012, and that these DW disclosures apply to all banks accessing the DW.[9] The unexpected disclosure provides banks with a signal about how such disclosures will be viewed by banks' investors over and above that of the overall passage of the Dodd-Frank Act, to which investors had a mixed reaction (Gao, Liao and Wang, 2013). Hence, if banks perceive

[9] While many of the Dodd-Frank provisions specifically target the largest financial institutions with total assets in excess of $50 billion, the DW disclosure requirements affect all banks accessing the DW. For the timeline of events please see Appendix A.

investors and counterparties to react negatively to the release of the DW information, they would adjust their behavior before the scheduled information is released. Such real changes in banks' behavior are likely to decrease their likelihood of accessing the DW in the future. In particular, if banks perceive that future DW disclosures will increase their cost of funding and ability to access the interbank market, they will seek to obtain short-term liquidity from other sources to avoid the impact of future disclosures. Furthermore, banks might change the riskiness of their assets to avoid short-term liquidity needs that might require them accessing the DW. Therefore, my second hypothesis tests whether banks alter the composition of their balance sheets in response to this release of the DW borrowing information:

> *H2: Disclosure of the DW information ex post affects banks' asset allocation, liquidity, and risk decisions ex ante.*

4. Data and empirical research design

4.1 Data and sample selection

The DW borrowing data for most of the financial crisis (March 2008 to March 2010) is obtained directly from Bloomberg in the form of PDF files it received from the Federal Reserve on March 31, 2011. DW data contains the name of the bank, the district Federal Reserve from which the funds were borrowed, the amount borrowed, and the loan terms (collateral and other identifying information is redacted). TAF data is obtained directly from the Federal Reserve, following the mandatory release under the Dodd-Frank Act on December 1, 2010. TAF data is available for the duration of the facility (December 2007 to March 2010) and, apart from the actual information on loans, also includes data on unencumbered collateral and its quality.

For accounting and regulatory data, I use the consolidated financial statements for bank holding companies (FR Y-9C reports), which are publicly available on the Federal

Reserve Bank of Chicago website.[10] Since internal financing from the parent company is the cheapest form of funding, financial institutions are unlikely to access the DW unless they are unable to obtain funds from the parent company (Kashyap, Rajan and Stein, 2002; Gatev and Strahan, 2006; Ashcraft, 2008). Therefore, in my analysis, I focus on the top-level banks by manually matching the codes of banks accessing the DW to their top-level bank or bank holding company. The data is also complemented with the structural information from the FDIC Call Reports for commercial banks to identify the top-level BHC as well as a manual name match of the information revealed through the FDIC's National Information Center. Form FR Y-9C contains detailed information on the financial performance of BHCs, their consolidated financial statements, and accompanying details as well as exposures and regulatory capital details. This data is also supplemented with market data from CRSP, bond issuance data from Mergent Fixed Income Securities Database (FISD), and accounting data from Compustat.[11]

I also conduct an extensive news search using Factiva to ensure that no other market-sensitive events occurred contemporaneously with the DW disclosures. Appendix C shows the news coverage for the US banking sector during the DW disclosure as well as on placebo dates the year before and after. As can be seen from the chart, DW news represented approximately one-half of all news articles on the US financial sector on March 31, 2011. DW did not feature at all in the news, either in the previous year or the year after.

I focus my study on public BHCs in order to establish the capital market response to the DW disclosures. My final dataset consists of 197 banks that accessed the DW and 76 banks that accessed TAF. In particular, 138 of these banks accessed the DW only and 17

[10] Data is available at http://www.chicagofed.org/webpages/banking/financial_institution_reports/bhc_data.cfm. BHCs are required to submit their regulatory filings within two months after the end of each calendar quarter.
[11] BHCs are manually matched to the identifying information on issuers based on CUSIP, location and name of the top-level BHC and issuer identifying information in Mergent FISD.

banks accessed TAF only. 59 banks accessed both facilities.[12] The sample also includes banks that did not access either DW or TAF matched on their likelihood of accessing the DW facilities using propensity-score matching. These banks form the control sample in my analysis.

Table 1, Panel A presents the descriptive statistics for the main sample. Panel B presents variables used in the cost of equity tests, and Panel C shows the summary statistics for the variables used in the cost of debt issuance analysis. Panel D presents the variables used in the propensity-score matching before and after the match. It shows that, on average, banks accessing the DW are significantly larger and more profitable than banks which did not access the DW. The matched sample, however, shows that treatment and control banks are no longer different after the matching exercise. The matched sample is used in the remainder of the analysis. Untabulated univariate comparisons of the means show that DW banks have higher bid-ask spreads, smaller market size, and less volatile equity returns than the control banks. Also, on average, they receive lower offering yields than the control sample of banks.

4.2 Research design

The unexpected and unprecedented release of the DW information represents an exogenous information shock. However, since the DW information is disclosed with a lag, before testing the cost of capital consequences of these disclosures, I test whether these disclosures provide any material information. I focus on short four-day windows, which include the event date (0, +3), using three measures of information content: cumulative abnormal returns, abnormal trading volumes, and abnormal returns volatility. While price changes reflect the average change in investors' beliefs attributable to the disclosure of new information, trading volumes

[12] The starting sample consisted of 473 banks that accessed the DW and 123 that accessed TAF. In particular, 350 accessed the DW only, 20 accessed the TAF only, and 103 accessed both facilities. The sample attrition occurred due to matching on bank size, availability of public information, and the requirement for banks to exist in the sample during the matching period. The full sample was also analyzed for robustness.

reflect idiosyncratic interpretation of new information (Beaver, 1968; Holthausen and Verrecchia, 1990; and Kim and Verrecchia, 1991, 1997). Since disclosure could be neutral in the sense of not changing the expectations of the market overall (i.e., resulting in no price reaction) and yet alter the expectations of individual investors (thus leading to trading), volume reactions might be more sensitive tests of the usefulness of public disclosures than price reactions (Beaver, 1968; Bamber et al., 2011; and Chae, 2005). Holthausen and Verrecchia (1990) show that trading volumes consist of two components: informedness and consensus, which may shift upward or downward depending on whether shifts in informedness and consensus are reinforcing or countervailing.[13] In order to identify which effect might dominate, I use abnormal return volatility as an alternative measure of information content (Landsman and Maydew, 2002; and DeFond et al., 2007).

I identify the information content of the DW disclosures using cross-sectional tests around the DW event date:

$$y_i = \gamma_0 + \gamma_1 Treated_i + \sum_k \gamma_k Controls_i + \theta_i \quad (1)$$

where y_i is one of the measures of cumulative abnormal returns, abnormal volume, or abnormal volatility estimated around a short window following the DW event; $Treated_i$ identifies whether bank *i* accessed the DW and captures the average treatment effect; and $Controls_i$ is a vector of control variables defined in more detail below. I define cumulative abnormal returns (*CAR*) and abnormal volatility (*AVAR*) using the market model and the CRSP value-weighted market index.[14] Since the unexpected DW disclosures on March 31, 2011, were preceded by the scheduled TAF disclosures on December 1, 2010, providing

[13] Furthermore, Brochet, Naranjo and Yu (2013) demonstrate that, if complexity affects the usefulness of the information released, more complexity reduces the information content, leading to less trading volume and smaller price movements.

[14] Using all US stocks or S&P 500 as benchmarks instead does not alter inferences. I do not focus only on the SIC6000 because the analyzed disclosures affected all listed deposit-taking institutions, which represent a significant proportion of the SIC6000 firms.

some information about banks that accessed both facilities, I measure the normal period as a one-year of trading activity six months before the TAF disclosure event to avoid creating overlapping windows. Consistent with prior studies, I measure abnormal volatility of stock returns as the ratio of event window return volatility to the return volatility in the non-event period (Beaver, 1968; Landsman and Maydew, 2002; and Landsman et al., 2011): $AVAR_i = ln\left(\overline{u_{it}^2}/\sigma_i^2\right)$, where $u_{it} = R_{it} - \left(\hat{\alpha}_i + \hat{\beta}_i R_{mt}\right)$, R_{it} is the firms' stock return, R_{mt} is the value-weighted US stock market return, and $\hat{\alpha}_i$ and $\hat{\beta}_i$ are bank *i*'s estimation-period market model parameter estimates. σ_i^2 is the variance of the market-model residuals in the non-event period defined before the TAF event on December 1, 2010. Abnormal volume is calculated as $AVOL_{it} = ln(\overline{V}_{it}/V_i)$, where $\overline{V}_{it}$ is the mean event-period volume for bank *i* and V_i is the mean estimation-period volume measured over a period of 30 trading days before the TAF disclosures event (DeFond et al., 2007).[15] Abnormal volumes are in natural logarithms to account for their high skewness (Landsman et al., 2011).

I control for observable characteristics that might influence the underlying trading activities (for example, see Larcker et al., 2011; Landsman, et al. 2011). These are as follows: market value measured as the natural logarithm of market value of equity (*Size*); the ratio of book value of equity to market value of equity (*Book-to-Market*); the market-adjusted return over the prior six months (*Momentum*); and leverage, measured as a ratio of total liabilities scaled by the market value of equity (*Leverage*) (DeFond et al., 2007; and Landsman et al., 2011). Given that the amount and frequency of the DW borrowing represents incremental information not available to investors prior to the disclosure, I also control for the DW borrowing (*Average amount borrowed/Assets*) and the frequency of accessing this facility (*Total number of visits*).

[15] Inferences remain unchanged if I compute abnormal volumes using the market model or use longer non-event windows to estimate "normal" trading volumes.

Next, I test whether the release of the DW information results in a change in banks' cost of capital. I use the information asymmetry component of the equity bid-ask spread and bonds' offering yield as my measures of the cost of capital. In order to isolate the information asymmetry component of the equity bid-ask spread, I follow Stoll (1978; 1989) and estimate the adverse selection component of the bid-ask spread by considering small and fixed order processing and the larger inventory holding costs of the market-maker and estimate the following regression using a standard difference-in-differences design:

$$BA\ Spread_{it} = \beta_0 + \beta_1 Event_t + \beta_2 Treated_i + \beta_3 Event_t \times Treated_i + \beta_4 Size_{it} + \beta_5 Volume_{it} + \beta_6 Volatility_{it} + \sum_n \beta_n Controls_{it} + \epsilon_{it} \quad (2)$$

where $BA\ Spread_{it}$ is the natural logarithm of the relative equity bid-ask spread for each bank deflated by the average price, $Event_t$ is the DW disclosure, $Treated_i$ takes the value of one for banks which have accessed the DW, $Event_t \times Treated_i$ is the interaction term which takes the value of one in the post-event window for banks that have accessed the DW; $Size_{it}$ is the natural logarithm of daily market capitalization of each bank to take into account its size, $Volume_{it}$ is the volume of shares trading as a proportion of the shares outstanding, and $Volatility_{it}$ is the rolling standard deviation of daily stock returns in the previous trading year. In addition to the short-term tests using the above difference-in-differences methodology, I also test the long-run effect of the DW disclosure on banks that have accessed the discount window. In order to take into account unobserved heterogeneity at the bank-level and aggregate shocks over time, I use fixed effects at the levels of the bank holding company and time. The inclusion of fixed effects implies that only the difference-in-differences effect is identified. The estimated specification, therefore, takes the following form:

$$BA\ Spread_{it} = \beta_1 Event_t \times Treated_i + \beta_2 Size_{it} + \beta_3 Volume_{it} + \beta_4 Volatility_{it} + \sum_n \beta_n Controls_{it} + T_t + B_i + \epsilon_{it} \quad (3)$$

where T_t and B_i refer to the time-level and bank-level fixed effects, respectively, and the rest of the variables are as defined above.

I estimate the effects on banks' cost of borrowing from the public market by using a difference-in-differences research design, heeding the effects of unobserved heterogeneity and aggregate shocks or shifts in debt-financing over time by including bank-level and quarterly fixed effects:[16]

$$Offering\ Yield_{it} = \alpha_1 Event_t \times Treated_i + \sum_l \alpha_l Controls_{it} + T_t + B_i + v_{it} \quad (4)$$

where *Offering Yield*$_{it}$ is the bond-offering yield-to-maturity of bank *i*'s bond at time *t*, measured at the time of bond issuance; $Event_t \times Treated_i$ is the interaction term which takes the value of one for banks that have been identified as having accessed the DW in the post-DW disclosure period; and $Controls_{it}$ include the yield-to-maturity of a corresponding US Treasury bill or bond matched to each bond in the sample on maturity and coupon (*Benchmark Treasury Yield*) to control for changes in benchmark risk-free interest rates and controls for bond-specific characteristics. Other controls are as follows: the bond maturity in years (*Bond Life*); the total dollar amount of the face value of each bond at issuance (*Amount of Issue)*; and indicators for whether a bond is *Callable*.[17] I also control for bank-specific characteristics that might affect the cost of issuance (Morgan and Stiroh, 2001), such as bank size measured as the natural logarithm of total assets (*Log Assets*); the overall riskiness of bank's assets measured as the share of risk-weighted assets in total assets (*Asset Risk*); bank's capitalization measured as the share of Tier 1 regulatory capital in total assets (*Tier Ratio*); bank's need to rely on outside funding measured as the share of total deposits in total assets (*Deposits/Assets*); and, finally, bank's profitability measured as the return on assets (*ROA*).

[16] Yu (2005) points out that, to the extent that security issues are often accompanied by additional disclosures, bond offering yields are more sensitive to perceived accounting transparency and disclosure quality than the secondary market bond yields.

[17] I do not control for whether a bond is a putable or subordinated, as the majority of the sample has very few observations with these characteristics during the time period I study.

Finally, to estimate the real effects of the DW disclosure on banks' subsequent risk-taking behavior, I once again use the difference-in-differences estimation to compare banks that have accessed the DW with those that did not. I include bank- and quarter-level fixed effects in all of the long-run specifications to account for unobserved heterogeneity and aggregate shocks. As a result, only the difference-in-differences effect is identified:

$$y_{it} = \delta_1 Event_t \times Treated_i + \sum_m \delta_m Controls_{it} + T_t + B_i + \vartheta_{it} \quad (5)$$

where y_{it} refers to the proxies of risk-taking behavior measured as idiosyncratic volatility; asset risk (proportion of risk-weighted assets in total assets); and risky proportion of the balance sheet activities (proxied as a proportion of commercial and industrial loans in total assets).

The potential endogenous costs of disclosure for banks can take several forms: in order to avoid accessing the DW in the future, banks might increase their overall balance sheet liquidity by holding more liquid assets, decreasing their pledged collateral and reducing their riskier lending. Furthermore, banks might change the overall liquidity needs by closing the gap between loans and deposits by either actively seeking to increase deposits or by decreasing lending (Acharya and Mora, 2013; Berger et al., 2013). In order to identify the effect of disclosure on banks' asset allocation and liquidity-holding, I use the same research design as above and investigate whether banks change the structure of their balance sheets to increase liquidity by increasing the proportion of liquid assets in total assets (*Liquid Assets*); decreasing the amount of pledged collateral, which typically consists of highly liquid assets (*Percentage Pledged*); change their net borrowing in the federal funds and repo market (*Fed Funds and Repo Borrowed*); and, finally, change their loan-deposit gap as a proxy for the

overall balance sheet liquidity, measured as the difference between the levels of loans and deposits as a share of total assets (*Loan-Deposit Gap*).[18]

One of the endogenous costs of disclosure for banks is the potential increase in their cost of funding through the interbank market since the DW disclosures provide information about the quality of banks' balance sheets and their need for accessing liquidity. In the presence of information asymmetry and a lack of credible communication, banks that accessed the DW might experience an increase in their cost of interbank funding if their counterparties perceive the DW access to provide a negative signal in line with the DW stigma. I therefore test whether banks' access to funding changes following the DW disclosures by testing whether banks experience any significant changes in the federal funds market (Δ*Net Fed Funds and Repo*$_t$/*Assets*$_{t-1}$), with other sources of borrowing, which include borrowing from the DW (Δ*Other Borrowed Funds*$_t$/*Assets*$_{t-1}$), and with the wholesale funding overall (Δ*Wholesale Funding*$_t$ / *Assets* $_{t-1}$). Finally, I also compute the implicit interest rate changes on large and core deposits to test whether banks that accessed the DW offered higher rates on deposits to increase their core funding in order to increase their overall liquidity (Acharya and Mora, 2013).

The cross-sectional and difference-in-differences research design assumes that the selection into treatment is random. However, in this setting there might be self-selection into treatment (accessing of the DW) by various banks. Therefore, I construct a matched sample by matching treated and control (untreated) banks using the propensity score matching methodology with one-to-one matching without replacement. The observable covariates on

[18] Following the analysis of Cornett et al. (2011), I also estimate the effect on liquidity, loan growth, and credit growth to study whether banks changed their liquid asset holdings following the DW disclosure. The dependent variables of interest are the growth of liquid assets measured as the change in liquid assets (cash plus non-asset-backed securities) scaled by the beginning of quarter total assets (Δ*Liquid Assets*$_t$/*Assets*$_{t-1}$); quarterly growth in lending measured as a change in loans scaled by the beginning of quarter total assets (Δ*Loans*$_t$/*Assets*$_{t-1}$); and quarterly growth in credit (sum of loans plus undrawn commitments) scaled by the sum of the beginning of quarter total assets and undrawn commitments (Δ*Credit*$_t$/(*Commit* + *Assets*)$_{t-1}$). Please see Appendix B for variable definitions.

which the banks are matched are identified as the most likely determinants of liquidity needs and the likelihood of accessing the DW (Berger et al., 2013). These variables are total assets which proxy for banks' size (*Assets*); banks' capital adequacy position computed as a ratio of Tier 1 regulatory capital to total assets (*Tier Ratio*); portfolio risk measured as the standard deviation of the return on assets (*Std ROA*); commercial real estate normalized by total assets (*CRE/Assets*); mortgage-backed securities normalized by total assets (*MRE/Assets*); profitability measured as a return on equity (*ROE*); and, finally, liquidity computed as a ratio of liquid assets (cash and cash equivalents) to total assets (*Liquid Assets / Assets*). In order to proxy for credit risk, I also include leverage (*Leverage*) in the set of matching variables.[19] The matching sample also excludes systemically important financial institutions, which are subject to the "too big to fail" biases and also had access to other sources of funding.[20]

5. Results

5.1 Information content

The first hypothesis tests whether the revelation of information about banks accessing the DW provides incremental material information to market participants and results in changes in banks' cost of capital. Since the DW disclosures contained information that was released with at least a one-year lag, I first need to establish whether these disclosures provide any new and material information to capital market participants.

Table 2, Panel A presents univariate tests of the difference in the market reaction during the event period using the matched sample. Banks accessing the DW saw positive and significant cumulative abnormal returns (CARs) of 1.05%, while banks that did not access the DW on average had 0.10% statistically insignificant CARs. The test of differences in

[19] I test sensitivity of the matching exercise by including a proxy for the likelihood of default, estimated using a structural model of default risk, and measures of market leverage. The composition of the matched sample remains unchanged with the inclusion of these additional variables.

[20] These banks are: Bank of America, Bank of New York Mellon, Chase Manhattan Corporation, Citigroup, Goldman Sachs, Morgan Stanley Dean Witter & Co., State Street Corp., and Wells Fargo & Company.

means shows that on average banks that accessed the DW exhibit statistically significantly different (at the 10% level) CARs that are 0.95 percentage points greater than that of the control group. Panel A, Table 2 also shows that abnormal trading volumes (AVs) were significantly more negative for banks accessing the DW following the DW disclosure event (22% lower for the DW banks and statistically significant at the 5% level). Finally, both the DW and control banks had significantly higher abnormal volatility (AVAR) following the DW event; however, their AVARs were not statistically different. This suggests that investors agreed on the impact of the content of disclosure for both banks that accessed the DW and those that did not. The univariate results, therefore, indicate that the DW disclosure provided some information content despite being released with a lag. However, this disclosure was also followed by a drop in trading volumes and an increase in abnormal volatility for all banks.

Table 2, Panel B presents multivariate results for CARs, AVs and AVARs for the matched sample controlling for size, book-to-market, returns momentum, and leverage as well as the information about the average amount borrowed as a proportion of total assets and the frequency of visits to the funding facilities. Columns (1) to (5) show the results for CARs following the DW disclosures; columns (6) to (7) show the results for the AVs; and columns (8) to (9) show the results for AVARs. The results indicate that the DW disclosure was followed by positive abnormal returns for banks that accessed the DW of between 0.96% and 1.10% over the four-day window (0,+3). This effect appears to arise from banks that accessed both facilities (TAF and DW), which experienced CARs between 1.57% and 2.00% on average following the DW disclosure (columns 4 and 5). In addition, both the average amount of borrowing from the DW and the frequency of accessing the DW exhibit negative and statistically significant coefficients, decreasing the CARs by 0.1% on average.

Table 2, Panel B, columns (6) to (7) present the results of multivariate tests of abnormal volumes following the DW disclosure. The DW disclosure led to negative abnormal trading volumes for banks that have accessed the DW (-0.2607 and highly statistically significant). Banks that did not access DW but have accessed TAF, however, did not see any abnormal trading activity. Furthermore, while the average amount borrowed from the DW has a weakly statistically significant negative effect on trading volumes, the number of visits to the DW actually increases the trading volume. There are two potential explanations for this result: either investors reached consensus and therefore did not trade (Holthausen and Verrecchia, 1990), or they found the information too difficult to interpret (Brochet, et al., 2013).[21]

The final set of cross-sectional market tests studies the effect of the DW disclosure event on abnormal return volatility, which captures information content and investors' beliefs (Holthausen and Verrecchia, 1990).[22] Columns (8) and (9) of Table 3 show that the banks accessing the DW did not experience any abnormal return volatility.[23] Taken together with the low abnormal trading volumes, this finding implies investors' agreement on the content of disclosures. Overall, the information content tests suggest that the DW disclosures provide

[21] In untabulated tests of the abnormal trading volume following the TAF disclosure event and the SC event, I find statistically significant negative abnormal volumes for the SC event following the announcement of the impending DW disclosure. However, I find that only banks, for which information was available before (i.e., banks which have accessed TAF) saw positive abnormal trading volume compared to other banks. In addition, abnormal trading volumes significantly increased following the disclosure of TAF access for banks accessing TAF. These increases in abnormal trading volumes indicate that investors viewed TAF disclosures as informative and traded on their idiosyncratic interpretation of this information. This is not surprising, as TAF disclosures were scheduled and anticipated and were also provided in a user-friendly machine-readable format.

[22] Higher AVAR implies higher information content, as with greater content, investors' beliefs are more likely to change (Kim and Verrecchia, 1991; and Landsman et al., 2011).

[23] Untabulated AVAR results for TAF disclosures and the SC decision announcement are statistically significant. In particular, AVAR increases significantly for banks which have accessed TAF following the SC announcement about impending DW disclosure. In addition, only banks that had previously accessed TAF and for whom this information was already publicly available experienced higher abnormal returns volatility. DW banks did not experience any significant AVARs. Taken together, the results suggest that the SC announcement on March 21, 2011, resulted in a divergence of investors' opinions and changes in uncertainty.

incremental material information that resulted in positive abnormal returns, low trading volumes, and no significant abnormal returns volatility.[24]

5.2 Cost of capital consequences

Having established that there is some evidence of the market reaction to the DW disclosures, I test my first hypothesis of whether this disclosure had any short- and long-run cost of capital consequences. Table 3 present univariate results for all control variables used in the cost of capital and real effects tests. It shows that univariately, short-run and long-run bid-ask spreads are lower for the banks that accessed the DW post-DW disclosure; however, this difference is not statistically significant. The lack of statistical significance in the comparison of the bid-ask spreads is likely to be driven by the fact that these difference reflect the overall difference in the bid-ask spreads rather than differences in the information asymmetry component of the bid-ask spreads. I find that post-DW disclosure the offering bond yields are 1.072 percentage points lower (highly statistically significant at the 1% level) for bonds issued by the DW banks. Table 3 also shows that banks that accessed the DW have significantly lower idiosyncratic risk in the post-DW disclosure period, lower proportion of federal funds and repo borrowing, higher proportion of liquid assets, and higher growth in net federal funds and repos as a percentage of total assets. The latter result indicates that the DW banks post-DW-disclosure on average lend more in the interbank market than they borrow. While in the pre-DW disclosure period these banks were net borrowers in the federal funds

[24] In this particular setting, three events are clustered in time and apply to all banks in the sample. As a result, cross-sectional correlation of returns could create serious inference problems—not addressing this will tend to overstate the significance of results (Bernard, 1987; and Lo, 2003). Therefore, following Lo (2003) and Larcker et al. (2011), I compute bootstrapped *p*-values for all coefficients using simulated non-event days in the sample. Inferences for all analysis remain unchanged if *p*-values are computed in this manner. I also test that the results are not driven by some spurious relationship arising on the day of the event. I use a random set of placebo dates and find insignificant results for these dates for all tests. I also conduct placebo analyses on randomly chosen dates, and compute abnormal returns, abnormal volumes, and abnormal volatility using other methodologies. The findings remain the same. Finally, I conduct an extensive news search and check whether any banks issued press releases or earnings announcements during the time of the DW disclosure event. I find that there were no other material events surrounding the event period.

market, they appear to become net lenders post-DW disclosure. This could be interpreted as an indicator that either banks have more liquid assets and hence rely on the interbank market less or that they are less able to borrow in the interbank market.

Table 4 presents the results of the difference-in-difference estimation using a matched sample and short-run estimates of the information asymmetry component of the equity bid-ask spread.[25] Columns (1) and (2) show the impact of the DW disclosures on the short-run bid-ask spread around the same window as the market test (measured as -3, +3 days including the event day). The results show that the DW disclosure increased information asymmetry for all banks. However, banks that accessed the DW and both DW and TAF facilities saw statistically significant decreases in their cost of capital as measured by the information asymmetry component of the bid-ask spread. I conduct further cross-sectional tests to see whether the frequency and amount of borrowing from the DW affect the cost of capital. As column (4) shows, conditional on banks accessing the DW, borrowers that accessed only the DW (and not TAF) and were in the top quartile by the average amount borrowed as a percentage of total assets or the top quartile of the number of times they borrowed from the DW both saw a significant increase in their equity bid ask-spreads following the disclosures. However, banks that experienced negative CARs following the disclosures also saw a decrease in their short-run bid-ask spreads. This suggests that for some banks, accessing the DW was viewed negatively in content; however, it led to a decrease in information asymmetry and hence a lower bid-ask spread.

I also investigate the long-run effect on the equity bid-ask spreads using a difference-in-differences design over a horizon of 5 quarters which followed the passage of the Dodd-Frank Act in July 2011. In order to have an even number of quarters surrounding the event, I

[25] Since bid-ask spreads available through CRSP are based on the end-of-day quotes, their usage might be problematic for event studies with events that might have occurred during the earlier part of the day. Therefore, I recomputed relative bid-ask spreads using daily tick data from TAQ. My results remain unchanged if I used bid-ask spreads computed from TAQ data instead.

use 2010Q3 to 2011Q1 as my pre-event quarters and 2011Q2 to 2011Q3 as my post-event quarters. Table 5 presents the results of the long-run tests on the cost of equity capital as measured by monthly bid-ask spreads. Unlike with the short-run tests, I find that over a longer horizon, banks that accessed the DW only saw a weakly significant increase on average in their bid-ask spreads. I do not find any significant changes for the banks in the top quartile by the amount borrowed from the DW or the frequency of access to the DW. Taken together with the short-run tests, this finding suggests that, while in the short-run the DW disclosure significantly decreased information asymmetry for banks that accessed the DW window, the effect was not long-lived.[26] The DW disclosure seemed to have allowed resolution of at least some of this information asymmetry in the short-run and lowered banks' cost of capital.[27]

I next turn to the cost of debt component of banks' cost of capital and study the long-run effects of the DW disclosures on banks' funding costs as measured by bond offering yields at the time of issuance. I use the same time-horizon as for the long-run equity bid-ask spread analysis above. Table 6 presents the difference-in-difference results for bond offering yields (measured in percent) following the DW disclosures. Column (1) shows that following the DW disclosure, banks that accessed the DW were able to receive significantly lower yields on issued bonds, with an average significant reduction of 1.16 percentage points (a 9.6% reduction in the average spread or a $238,000-saving in interest expense, based on the average amount of bond offering amount of $20 million), compared to the matched control group of banks that did not access the DW. Column (2) shows that these results are mostly

[26] This is consistent with my untabulated findings that between the announcement of the Supreme Court decision on March 21, 2011, and the actual DW disclosures on March 31, 2011, banks experienced negative abnormal returns and the widening of the bid-ask spreads.

[27] In untabulated results, I also test the effect of the SC announcement and TAF disclosures on the short-run bid-ask spreads following the SC decision and TAF disclosure. I find that spreads increase significantly for all banks following the Supreme Court announcement and decrease for banks accessing the DW following the DW disclosure. Following TAF disclosures, however, there was a widening of the short-term bid-ask spreads for banks that accessed TAF.

driven by banks that accessed the DW only, which saw a significant reduction in their offering yield post-DW disclosures of 1.89 percentage points (a 16% reduction in the average spread or a $388,000-saving in interest expense).[28] Overall, the above suggests that the DW disclosures resulted in a lower cost of capital for banks by decreasing the cost of borrowing from the debt market and decreasing the information asymmetry component of the short-term bid-ask spread in the equity market.[29]

5.3 Changes in banks' liquidity, lending, and borrowing in response to the DW disclosures

My second hypothesis tests whether there are any real effects following the DW disclosures. Despite finding positive capital market consequences, if banks perceive *ex ante* that future disclosures will result in higher cost of funding from other sources, for example, in the interbank market because of the DW stigma, they will change their behavior following the unexpected DW disclosures ahead of the scheduled disclosures. I therefore test whether banks changed the composition of their balance sheets, their liquidity, and risk-taking and funding activities in response to the DW disclosures.

Table 7 presents tests of proxies for banks' risk-taking activities: idiosyncratic (bank-specific) risk, asset risk (measured as the proportion of risk-weighted assets in total assets), and risky lending (measured as a proportion of commercial and industrial loans in total assets). As can be seen from columns (1) and (2) in Table 7, the effect of the DW disclosure is negative and statistically significant for the idiosyncratic component of banks' risk. Column (3) in Table 7 shows that following the DW disclosures, asset risk also decreased significantly for banks that accessed the DW. Asset risk is measured as a proportion of risk-

[28] In unreported results, I find that following TAF disclosures in December 2010, banks accessing TAF experienced an increase in the cost of borrowing from the bond market of 0.728 percentage points (statistically significant at the 5% level, 6% increase in the average spread or an increase of $148,000 in the interest expense).

[29] However, while the DW disclosures decreased information asymmetry and lowered banks' cost of capital, banks that accessed the more expensive facility, TAF, were penalized by a higher cost of capital through widened bid-ask spreads and higher cost of borrowing from the bond market.

weighted assets to total assets; hence, the negative and significant coefficients imply that following the DW event, banks that accessed the DW see a decrease in the proportion of riskier assets on their balance sheets. Finally, columns (5) and (6) show the results for banks' risky lending activities measured as a proportion of commercial and industrial loans in total assets. While on average, banks that accessed the DW seem to have increased the proportion of their risky loans (coefficient of 0.0027 is statistically significant at the 5% level of significance), banks that only accessed the DW decreased this proportion (coefficient of -0.0102 is weakly statistically significant at the 10% level). The positive result appears to be driven by the category of banks that accessed both DW and TAF facilities. Overall, the results suggest that following the DW disclosures, DW banks decreased their risk and, in particular, banks that accessed the DW only achieved this through a decrease in risky lending.

In Tables 8 and 9, I study the effects of DW disclosures on bank liquidity proxies. In particular, columns (1) and (2) of Table 8 present the results for the proportion of liquid assets in total assets, and columns (3) and (4) show the results for the proportion of pledged assets in total assets. Pledged assets are defined as assets used as collateral for secured borrowing. All else equal, a decrease in the proportion of pledged assets for a bank implies an increase in unsecured (without collateral) borrowing. Furthermore, it implies an increase in liquidity as pledged assets are highly liquid assets that cannot be used by a bank while they remain pledged. Columns (5) and (6) investigate the effect of the DW disclosures on the borrowing from the federal funds and repo markets. Finally, columns (7) and (8) show the results for a loan-deposit gap as a proxy for banks' liquidity needs. Column (1) shows that following the DW event, banks increased the proportion of liquid assets on their balance sheets. This effect is highly statistically significant and implies a 2.6% increase in the liquidity ratio (based on the average ratio of 0.2608 for DW banks). Columns (3) and (4) in Table 8 show that the proportion of pledged assets following the DW disclosure decreased

significantly for banks that accessed the DW (this suggests a 5% decrease in the proportion of assets pledged, using the average ratio of 0.1145 for DW banks). In addition, the percentage of pledged assets decreased significantly for banks that accessed the DW only (a decrease of 9.6% and highly statistically significant). This finding suggests that the DW banks decreased their level of secured borrowing and released some of the most liquid assets from being pledged as collateral.

I further investigate changes in banks' behavior following the DW disclosure event by testing whether banks change their liquidity over time and whether they achieve this through the reduction of lending and other credit. Following the approach of Cornett et al. (2011), Table 9 shows quarterly growth rates in liquid assets as a proportion of the beginning of quarter assets; lending rates as a proportion of the beginning of quarter assets; and changes in credit as a proportion of commitments and total assets. As can be seen from columns (1) and (2) in Table 9, banks that accessed the DW increase their holdings of liquid assets post-DW disclosure. However, this increase does not arise from changes in overall lending or credit grants, as shown in columns (3) to (6). In fact, banks appear to also increase lending and overall credit growth. This finding is consistent with that of Berger et al. (2013), who show that banks that accessed the DW and TAF facilities during the financial crisis did not curtail their lending. Overall, the results suggest that following the DW disclosure, banks appear to increase their holding of liquid assets. Furthermore, banks decrease riskier lending and increase borrowing from other sources of unsecured lending.[30]

In the final step, using proxies for banks' funding and cost of deposit funding, I investigate whether banks' access to funding changes following the DW disclosures. Since I cannot directly observe the potential negative consequences of DW disclosures in the

[30] In untabulated results, I also investigate whether top-quartile borrowers (by the amount or frequency of accessing the DW) changed their behavior more significantly. I find that indeed these banks increased their liquidity and decreased their risky lending more significantly than the rest of the DW borrowing banks.

interbank market, I attempt to proxy them by studying banks' overall net borrowing in the interbank market, banks' reliance on wholesale funding as well as changes in the cost of deposits. Columns (1) to (4) show that there are no significant changes in the growth of net federal funds and repos or other borrowing for banks that accessed the DW post-DW disclosure. However, banks have been shown to window-dress their federal funds and repo balances at quarter-ends (Owens and Wu, 2012), which will bias against finding any result in these proxies. I find weak results that banks accessing the DW rely less on the wholesale funding. However, it appears that banks do not need to achieve this through a higher cost of deposits. This finding is consistent with Acharya and Mora (2013), who show that post-2008Q2, banks are perceived as "safe havens" and are able to attract deposits without incurring further costs. The results in this final analysis suggest that it is unclear whether banks that accessed the DW reduced their reliance on the interbank market following the DW disclosures.

In order to address this concern, I utilize the new DW disclosures which first became available on September 28, 2012. I collect the new DW disclosures released by the Federal Reserve Board of Governors on September 28, 2012; December 31, 2012; March 31, 2013; June 30, 2013; and September 30, 2013. The two latter releases correspond to DW borrowing after the DW disclosure event of March 31, 2011. While having accessed the DW in the past appears to be one of the determinants of accessing the DW in the future, I find from the two latest disclosures that the public banks analyzed in this paper no longer borrow from the DW following the DW disclosure. However, a number of these banks still accessed the DW between July 22, 2010, and March 31, 2011. Since these banks still appear in the disclosures for the first three quarters after the Dodd-Frank disclosure requirement, the fact that they do not appear after the March 31, 2011, disclosures suggests, by revealed preference, that banks changed their behavior *ex ante* to avoid future DW disclosures. This is consistent with my

main finding that despite the positive capital market reaction, banks reduce or completely stop relying on the DW borrowing for short-term liquidity needs following the DW disclosures event. The potential confounding effect is that the latest data corresponds to the period after the end of the financial crisis, and hence, banks might not need as much liquidity. I address this issue by creating a matched sample based on the likelihood of accessing the DW in 2011 and still find the same result suggesting that the end of the financial crisis cannot fully explain this change in behavior.

These results, taken together with the market tests in the first half of the analysis, suggest that while the DW disclosures resulted in a positive market reaction and cost of capital benefits, banks responded to the disclosures by changing their behavior through changes in lending, borrowing, and liquidity-holding activities. This seeming inefficiency is an example of the endogenous costs of disclosure predicted by Goldstein and Sapra (2013), who suggest that in the presence of information asymmetry, externalities and frictions that banks are exposed to, mandated disclosures might lead to inefficient outcomes through changes in banks' behavior.

6. Conclusion

This paper studies the capital market consequences of unique and unexpected mandatory bank liquidity disclosures and the resulting changes in banks' behavior. During the recent financial crisis of 2007-2009, banks in the United States accessed the DW facilities at the US Federal Reserve and borrowed unprecedented amounts. However, until recently, the information about which banks borrowed from the Federal Reserve and how much they borrowed was not public. In this paper, I utilize the information from the Federal Reserve DW disclosures and investigate whether these disclosures had any capital market consequences for banks and whether banks changed their behavior in response. Using a hand-collected sample of disclosures revealing which banks accessed the DW liquidity facilities, I

find that despite being released with a two-year lag, these disclosures contain incremental market information which decreases banks' cost of capital as measured by the short-term equity bid-ask spreads and cost of debt. However, despite these cost of capital benefits, I also find that banks appear to change their lending, borrowing, and liquidity holding behavior in response to these disclosures. These changes in banks' behavior suggest that, even though the DW disclosures provided capital market benefits, they also created incentives for banks to avoid accessing the DW in the future. This inefficient behavior is consistent with the theoretical predictions of Goldstein and Sapra (2013), who find that in the second-best environment, increased disclosure might lead to inefficient outcomes through changes in banks' behavior. This is due to externalities and the informational and market frictions to which banks are exposed.

This paper contributes to several strands of the literature. First, it adds to the literature concerning the role of supplemental mandatory disclosures by documenting that non-financial disclosure by a regulator contains incremental material information even if released with a lag. Second, it provides some evidence in support of the theory of endogenous costs of mandatory disclosure by showing that banks change their lending and borrowing behavior despite observing a positive capital market reaction; therefore, confirming that price efficiency might not necessarily imply economic efficiency. Third, this paper provides some evidence on the role of disclosure as a disciplining device for financial institutions. Finally, this paper provides new evidence that, unlike in the interbank market in which the DW stigma has been widely documented, there appears to be no supporting evidence that this stigma exists in the public capital markets.

References

Acharya, Viral, Dennis Gromb and Tanju Yorulmazer (2012), "Imperfect Competition in the Interbank Market Liquidity as a Rationale for Central Banking," *American Economic Journal: Macroeconomics*, Vol. 4, No. 20, pp. 184-217.

Acharya, Viral and Nada Mora (2013), "A Crisis of Banks as Liquidity Providers," *Journal of Finance,* forthcoming.

Armantier, Olivier, Eric Ghysels, Asani Sarkar and Jeffrey Shrader (2011), "Stigma in Financial Markets: Evidence from Liquidity Auctions and Discount Window Borrowing During the Crisis," *Federal Reserve Bank of New York Staff Report*, No. 483, January.

Artuc, Erhan and Selva Demiralp (2010), "Discount Window Borrowing After 2003: The Explicit Reduction in Implicit Costs," *Journal of Banking and Finance*, 34, pp. 825-833.

Ashcraft, Adam (2008), "Are Bank Holding Companies a Source of Strength to Their Banking Subsidiaries?" *Journal of Money, Credit and Banking*, Vol. 40, No. 2-3, pp. 273-294.

Baiman, Stanley and Robert Verrecchia (1996), "The Relation among Capital Markets, Financial Disclosure, Production Efficiency, and Insider Trading," *Journal of Accounting Research*, Vol. 34, No. 1, pp. 1-22.

Bamber, Linda, Orie Barron and Douglas Stevens (2011), "Trading Volume around Earnings Announcements and Other Financial Reports: Theory, Research Design, Empirical Evidence, and Directions for Future Research," *Contemporary Accounting Research*, Vol. 28, No. 2, pp. 431-471.

Bank for International Settlements, BIS (2013a), "Basel III: The Liquidity Coverage Ratio and Liquidity Risk Monitoring Tools," *Basel Committee on Banking Supervision*, January.

Bank for International Settlements, BIS (2013b), "Liquidity Coverage Ratio Disclosure Standards – Consultative Document," *Basel Committee on Banking Supervision*, July 19.

Beatty, Anne and Scott Liao (2013), "Financial Accounting in the Banking Industry: A Review of the Empirical Literature," *Working Paper*, October.

Beaver, William (1968), "The Information Content of Annual Earnings Announcements," *Journal of Accounting Research*, Vol. 6, pp. 67-92.

Berger, Allen, Lamont Black, Christa Bouwman and Jennifer Dlugosz (2013), "The Federal Reserve's Discount Window and TAF Programs: 'Pushing on a String?'" *Working Paper*, May 2013.

Bernanke, Ben (2009), "The Federal Reserve's Balance Sheet," *Speech*, Federal Reserve Bank of Richmond 2009 Credit Markets Symposium, Charlotte, North Carolina, April 3.

Bernard, Victor (1987), "Cross-Sectional Dependence and Problems in Inference in Market-Based Accounting Research," *Journal of Accounting Research,* Vol. 25, No. 1, pp. 1-48.

Bischof, Jannis and Holger Daske (2013), "Mandatory Disclosure, Voluntary Disclosure, and Stock Market Liquidity: Evidence from the EU Bank Stress Tests," *Journal of Accounting Research*, Vol. 51, No. 5, pp. 997-1029.

Blackwell, David (1951), "Comparison of Experiments", *Proceedings of the Second Berkeley Symposium on Mathematical Statistics and Probability*, University of California Press, pp. 93-102.

Bond, Philip, Alex Edmans and Itay Goldstein (2012), "The Real Effects of Financial Markets", *Annual Review of Financial Economics*, Vol. 4, pp. 339-360

Brochet, Francois, Patricia Naranjo and Gwen Yu (2013), "Causes and Consequences of Linguistic Complexity in Non-US Firm Conference Calls," *Harvard Business School Working Paper*, No. 13-033, July.

Brunnermeier, Markus (2009), "Deciphering the Liquidity and Credit Crunch 2007-2008," *Journal of Economic Perspectives*, Vol. 23, No. 7, pp. 77-100.

Bushman, Robert and Christopher Williams (2012), "Accounting Discretion, Loan Loss Provisioning and Discipline of Banks' Risk-taking," *Journal of Accounting and Economics*, Vol. 54, pp. 1-18.

Chae, Joon (2005), "Trading Volume, Information Asymmetry and Timing Information," *Journal of Finance*, Vol. 60, pp. 413-442.

Copeland, Thomas and Dan Galai (1983), "Information Effects on the Bid-Ask Spread," *Journal of Finance*, Vol. 38, pp. 1457-1469.

Cornett, Marcia, Jamie McNutt, Philip Strahan and Hassan Tehranian (2011), "Liquidity Risk Management and Credit Supply in the Financial Crisis," *Journal of Financial Economics*, Vol. 101, pp. 297-312.

Daske, Holger, Luzi Hail, Christian Leuz and Rodrigo Verdi (2008), "Mandatory IFRS Reporting around the World: Early Evidence on the Economic Consequences," *Journal of Accounting Research*, Vol. 46, No. 5, pp. 1085-1142.

Daske, Holger, Luzi Hail, Christian Leuz and Rodrigo Verdi (2013), "Adopting a Label: Heterogeneity in the Economic Consequences of IFRS Adoptions," *Journal of Accounting Research*, Vol. 51, No. 3, pp. 495-547.

DeFond, Mark, Mingyi Hung and Robert Trezevant (2007), "Investor Protection and the Information Content of Annual Earnings Announcements: International Evidence," *Journal of Accounting and Economics*, Vol. 43, No. 1, pp. 37-67.

DeFond, Mark, Xuesong Hu, Mingyi Hung and Siqi Li (2011), "The Impact of IFRS Adoption on Mutual Fund Ownership: The Role of Comparability," *Journal of Accounting and Economics*, Vol. 51, pp. 240-258.

Diamond, Douglas and Robert Verrecchia (1991), "Disclosure, Liquidity, and the Cost of Capital," *Journal of Finance*, Vol. 46, pp. 1325-1359.

Duffie, Darrell and David Lando (2001), "Term Structure of Credit Spreads with Incomplete Accounting Information," *Econometrica*, Vol. 69, pp. 633-664.

Easton, Peter, Steven Monahan and Florin Vasvari (2009), "Initial Evidence on the Role of Accounting Earnings in the Bond Market," *Journal of Accounting Research*, Vol. 47, pp. 721-766.

Ellahie, Atif (2013), "Capital Market Consequences of EU Bank Stress Tests," *Working paper*, May.

Ennis, Huberto and John Weinberg (2013), "Over-the-Counter Loans, Adverse Selection, and Stigma in the Interbank Market," *Review of Economic Dynamics*, forthcoming.

Fields, Thomas, Thomas Lys and Linda Vincent (2001), "Empirical Research on Accounting Choice," *Journal of Accounting and Economics*, Vol. 31, pp. 255-308.

Flannery, Mark (1998), "Using Market Information in Prudential Bank Supervision: A Review of the U.S. Empirical Evidence," *Journal of Money, Credit and Banking*, Vol. 30, No. 3, pp. 273-305.

Flannery, Mark, Simon Kwan and Mahendrarajah Nimalendran (2010), "The 2007-09 Financial Crisis and Bank Opaqueness," *Federal Reserve Bank of San Francisco Working Paper No. 2010-27*, September.

Furfine, Craig (2001), "The Reluctance to Borrow from the Fed," *Economics Letters*, 72, pp. 209-213.

Furfine, Craig (2003), "Standing Facilities and Interbank Borrowing: Evidence from the Fed's New Discount Window," *International Finance*, No. 3, pp. 329-347.

Gao, Yu, Scott Liao and Xue Wang (2013), "The Economic Implications of the Dodd-Frank Act on Systemically Important Financial Firms: Evidence from Market Reactions," *Working paper*, April.

Gatev, Evan and Philip Strahan (2006), "Banks' Advantage in Hedging Liquidity Risk: Theory and Evidence from the Commercial Paper Market," *Journal of Finance*, Vol. 61, pp. 867-892.

Gigler, Frank, Chandra Kanodia, Haresh Sapra and Raghu Venugopalan (2013), "How Frequent Financial Reporting Can Cause managerial Short-Termism: An Analysis of the Costs and Benefits of Increasing Reporting Frequency," *Working paper*, September.

Glosten, Lawrence and Paul Milgrom (1985), "Bid, Ask and Transaction Prices in a Specialist Market with Heterogeneously Informed Traders," *Journal of Financial Economics*, Vol. 14, pp. 71-100.

Goldstein, Itay and Haresh Sapra (2013), "Should Banks' Stress Test Results be Disclosed? An Analysis of the Costs and Benefits," *Working Paper*, November.

Hail, Luzi, Christian Leuz and Peter Wysocki (2010), "Global Accounting Convergence and the Potential Adoption of IFRS by the U.S. (Part I): Conceptual Underpinnings and Economic Analysis," *Accounting Horizons*, Vol. 24, No. 3, pp. 355-394.

Haltom, Renee C. (2011), "Stigma and the Discount Window," *Federal Reserve, Region Focus, First Quarter*.

Herzberg, Valerie and Peter Praet (2008), "Market Liquidity and Banking Liquidity: Linkages, Vulnerabilities and the Role of Disclosure," in *Financial Stability Review: Special Issue: Liquidity*, 11, Banque de France, February.

Holthausen, Robert and Robert Verrecchia (1990), "The Effect of Informedness and Consensus on Price and Volume Behavior," *The Accounting Review*, Vol. 65, No. 1, pp. 191-208.

Kanodia, Chandra and Deokheon Lee (1998), "Investment and Disclosure: The Disciplinary Role of Periodic Performance Reports," *Journal of Accounting Research*, Vol. 36, No. 1, pp. 33-55.

Kanodia, Chandra, Haresh Sapra and Raghu Venugopalan (2004), "Should Intangibles Be Measured: What Are the Economic Trade-Offs?" *Journal of Accounting Research*, Vol. 42, No. 1, pp. 89-120.

Kashyap, Anil, Raghuram Rajan and Jeremy Stein (2002), "Banks as Liquidity Providers: An Explanation for the Coexistence of Lending and Deposit-taking," *Journal of Finance*, Vol. 57, pp. 33-73.

Kim, Oliver and Robert Verrecchia (1991), "Trading Volume and Price Reactions to Public Announcements," *Journal of Accounting Research*, Vol. 29, pp. 302-321.

Kim, Oliver and Robert Verrecchia (1994), "Market Liquidity and Volume around Announcements," *Journal of Accounting and Economics*, Vol. 17, pp. 41-67.

Kim, Oliver and Robert Verrecchia (1997), "Pre-announcement and Event-period Private Information," *Journal of Accounting and Economics*, Vol. 24, No. 3, pp. 395-419.

Klee, Elizabeth (2011), "The First Line of Defense: The Discount Window during the Early Stages of the Financial Crisis," *Finance and Economics Discussion Series Divisions of Research & Statistics and Monetary Affairs No.2011-23*, Federal Reserve Board, Washington, DC.

Kothari, S.P. (2001), "Capital Markets Research in Accounting," *Journal of Accounting and Economics*, Vol. 31, pp. 105-231.

Kyle, Albert (1985), "Continuous Auctions and Insider Trading," *Econometrica*, Vol. 53, No. 6, pp. 1315-1335.

Lambert, Richard, Christian Leuz and Robert Verrecchia (2012), "Information Precision, Information Asymmetry, and the Cost of Capital," *Review of Finance*, Vol. 16, pp. 1-29.

Landsman, Wayne and Edward Maydew (2002), "Has the Information Content of Quarterly Earnings Announcement Declined in the Past Three Decades?" *Journal of Accounting Research*, Vol. 40, No. 3, pp. 797-808.

Landsman, Wayne, Edward Maydew and Jacob Thornock (2011), "The Information Content of Annual Earnings Announcements and Mandatory Adoption of IFRS," *Journal of Accounting and Economics*, Vol. 34, pp. 34-54.

Larcker, David, Gaizka Ormazabal and Daniel Taylor (2011), "The Market Reaction to Corporate Governance Regulations," *Journal of Financial Economics*, Vol. 101, pp. 431-448.

Lo, Kin (2003), "Economic Consequences of Regulated Changes in Disclosure: The Case of Executive Compensation," *Journal of Accounting and Economics*, Vol. 35, pp. 285-314.

Leuz, Christian and Robert Verrecchia (2000), "The Economic Consequences of Increased Disclosure," *Journal of Accounting Research*, Vol. 38, pp. 91-124.

Madigan, Brian and William Nelson (2002), "Proposed Revision to the Federal Reserve's Discount Window Lending Programs," *Federal Reserve Bulletin*, July 2002, pp. 313-319.

Morgan, Donald and Kevin Stiroh (2001), "Market Discipline of Banks: The Asset Test," *Journal of Financial Services Research*, Vol. 20, No. 2, pp. 195-208.

Owens, Edward and Joanna Wu (2012), "Window Dressing of Short-Term Borrowings," *Simon School Working Paper*, No. FR 11-15, August.

Peristiani, Stavros (1998), "The Growing Reluctance to Borrow at the Discount Window: An Empirical Investigation," *Review of Economics and Statistics*, pp. 611-620.

Peristiani, Stavros, Donald Morgan and Vanessa Savino (2010), "The Information Value of the Stress Test and Bank Opacity," *Federal Reserve Bank of New York Staff Reports*, No. 460, July.

Petacchi, Reining (2012), "Information Asymmetry and Capital Structure: Evidence from Regulation FD," *Working paper*, February 14.

Sapra, Haresh (2002), "Do Mandatory Hedge Disclosures Discourage or Encourage Excessive Speculation?" *Journal of Accounting Research*, Vol. 40, No. 3, pp. 933-964.

Sengupta, Partha (1998), "Corporate Disclosure Quality and the Cost of Debt," *Accounting Review*, Vol. 73, No. 4, pp. 459-474.

Stoll, Hans (1978), "The Pricing of Security Sealer Services: An Empirical Study of NASDAQ Stocks," *Journal of Finance*, Vol. 33, pp. 1153-1172.

Stoll, Hans (1989), "Inferring the Components of the Bid-Ask Spread: Theory and Empirical Tests," *Journal of Finance*, Vol. 44, pp. 115-134.

Thakor, Anjan (2012), "Information Disclosure and Fundamental Disagreement: Implications for Financial and Non-Financial Firms," *Working Paper,* July 18.

Verrecchia, Robert (2001), "Essays on Disclosure," *Journal of Accounting and Economics*, Vo. 32, pp. 97-180.

Verrecchia, Robert and Joseph Weber (2006), "Redacted Disclosure," *Journal of Accounting Research*, Vol. 44, No. 4, pp. 791-814.

Watts, Ross and Jerold Zimmerman (1986), "Positive Accounting Theory," Englewods Cliffs, NJ: Prentice Hall.

Yu, Fan (2005), "Accounting Transparency and the Term Structure of Credit Spreads," *Journal of Financial Economics*, Vol. 75, pp. 53-84.

Zhang, Ivy (2007), "Economic Consequences of the Sarbanes–Oxley Act of 2002," *Journal of Accounting and Economics*, Vol. 44, pp. 74-115.

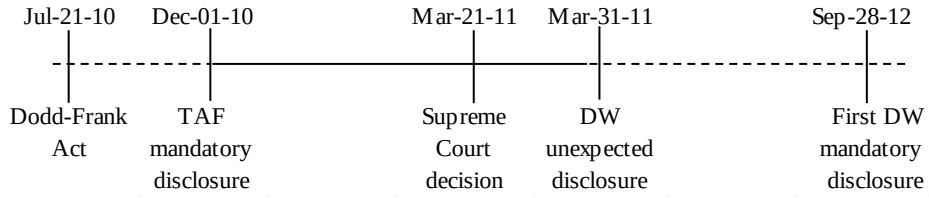
Appendix A: Summary of the main events

This table summarizes the events that led to the disclosure of the TAF and DW access information. The paper focuses specifically on event 8 (DW event).

Panel A: Chronological order of the events leading up to and including the DW disclosure event.

Date	Event ID	Event Description
Oct-25-2008	1	Bloomberg News files FOIA request with the Federal Reserve Board in connection with $2 trillion in loans made to troubled banks.
Dec-12-2008	2	The Federal Reserve refuses Bloomberg's request
Jul-30-2009	3	Judge Alvin Hellerstein of the US District Court in Manhattan rules against FOX News and states that the Federal Reserve Board was within its rights to withhold documents.
Aug-24-2009	4	District Judge Loretta Preska of the Southern District of NY rules in favor of Bloomberg News.
Mar-19-2010	5	US District Court in Manhattan upholds its decision on appeal.
Dec-01-2010	6	Federal Reserve discloses TAF information as required by the Dodd-Frank Act (TAF event).
Mar-21-2011	7	Supreme Court rejects the Federal Reserve appeal and orders release of bank loan data (Supreme Court event).
Mar-31-2011	8	The Federal Reserve releases the Discount Window information (DW event).

Panel B: Timeline of the disclosure events.



Appendix B: Variable definitions

Variable	Definition	Source	Code
Dependent variables			
Asset Risk	Ratio of Risk-Weighted Assets (RWA) to total assets	FR Y-9C	BHCKA223 / BHCK2170
AV	Abnormal volume computed using a market model (in natural logarithms)	CRSP	
AVAR	Abnormal return volatility computed as a ratio of the mean of the squared market-model- adjusted returns divided by the bank's market model residuals during the non-event period.	CRSP	
BA Spread	Relative equity bid-ask spread calculated as (Ask-Bid) / (Ask+Bid)/2	CRSP	
CAR	Cumulative Abnormal Return computed using a market model	CRSP	
$\Delta Credit_t$ / (Commit + Assets) $_{t-1}$	Change in total loans plus undrawn commitments scaled by the sum of total assets and undrawn commitments	FR Y-9C	(BHCK2122 + BHCK3814 + BHCK3816 + BHCK3817 + BHCK6550 + BHCK3411) / BHCK2170
ΔImplicit Interest Rate on Core Deposits	Quarterly change in interest expense on core deposits divided by quarterly average of large time deposits	FR Y-9C	(BHCKA518 + BHCK6761) /(BHCB3187 + BHOD3187 + BHCB2389 + BHOD2389 + BHCB6648 + BHOD664)
ΔImplicit Interest Rate on Large Deposits	Quarterly change in interest expense on large term deposits divided by quarterly average of large term deposits	FR Y-9C	BHCKA517 / (BHCB6648 + BHCB2604)
$\Delta Liquid\ Assets_t$ / $Assets_{t-1}$	Change in liquid assets scaled by total assets	FR Y-9C	(BHCK0081 + BHCK0395 + BHCK0397 + BHCK1754 + BHCK1773) / BHCK2170
$\Delta Loans_t$ / $Assets_{t-1}$	Change in total loans scaled by total assets	FR Y-9C	BHCK2122 / BHCK2170
$\Delta Net\ Fed\ Funds\ and\ Repo_t$ / $Assets_{t-1}$	Change in federal funds and repo lent net of federal funds and repo borrowed scaled by previous quarter total assets	FR Y-9C	(BHDMB987 + BHCKB989 - BHDMB993 - BHCKB995 - BHCK3190) / BHCK2170
$\Delta Other\ Borrowed\ Funds_t$ / $Assets_{t-1}$	Quarterly change in the share of other borrowed funds in total assets from the start of the quarter	FR Y-9C	BHCK3190 / BHCK2170
$\Delta Wholesale\ Funding_t$ / $(Assets)_{t-1}$	Quarterly change in wholesale funds as a share of total assets in the previous quarter, where wholesale funds is a sum of large-time deposits, deposits booked in foreign offices, subordinated debt and debentures, gross federal funds purchased and repo, and other borrowed money.	FR Y-9C	(BHCB2604 + BHFN6631 + BHFN6636 + BHDMB993 + BHCK3190) / BHCK2170
Fed Funds and Repo Borrowed	Federal funds and report borrowed scaled by total assets	FR Y-9C	(BHDMB993 + BHCKB995 + BHCK3190) / BHCK2170
Idiosyncratic Risk	Idiosyncratic Risk is the standard deviation of the residuals from a market model estimated daily over previous year.	CRSP	
Liquid Assets / Assets	Liquid assets as a proportion of total assets	FR Y-9C	(BHCK0081 + BHCK0395 + BHCK0397 + BHCK1754 + BHCK1773) / BHCK2170
Loan - Deposit Gap	Change in loan/deposit gap scaled by previous quarter total assets	FR Y-9C	(BHCK2122 - BHCK2170) / BHCK2170
Offering Yield	Bond's yield to maturity at issuance	Mergent FISD	
Percentage Pledged	Share of pledged assets in total assets	FR Y-9C	BHCK0416 / BHCK2170
Risky Lending	Commercial and industrial loans as a proportion of total assets	FR Y-9C	(BHCK1763 + BHCK2011) / BHCK2170
Systematic Risk	Systematic volatility computed using the market model.	CRSP	
Control and matching variables			
Amount of issue	Total dollar face value of the bond issue	Mergent FISD	
Asset Quality	Provisions divided by average total assets	FR Y-9C	BHCK4230 / BHCK3368
Assets	Total assets of the bank (or natural log of total assets)	FR Y-9C	BHCK2170
Average amount borrowed / Assets	Average amount borrowed from DW facility	DW	

Variable	Definition	Source	Code
	as a proportion of total assets	disclosure	
Benchmark Treasury Yield	Benchmark treasury bond or bill yield closely matching the corresponding bond characteristics	Mergent FISD and CRSP	
Book-to-market	The ratio of book value of equity to market value of equity	FR Y-9C, CRSP	BHCP3210
Callable	Indicator variable identifying bonds that are callable	Mergent FISD	
CRE / Assets	Share of commercial real estate in total assets	FR Y-9C	(BHCKF159 + BHCKF160 + BHCKF161) /BHCK2170 Prior to 2007: (BHDM1415 + BHDM1480) / BHCK2170
Deposits / Assets	Total deposits as a proportion of total assets	FR Y-9C	(BHCB2210 + BHOD3189 + BHFN6636 + BHCB3187 + BHOD3187 + BHCB2389 + BHOD2389 + BHCB6648 + BHOD6648) / BHCK2170
DW Event	Indicator variable equal to 1 during the days of the discount window information release (March 31 2011)	DW disclosure	
Leverage	Total liabilities as a proportion of total assets	FR Y-9C	BHCK2948/ BHCK2170
Life of the Bond	Bond maturity in years	Mergent FISD	
Loans / Assets	Proportion of total loans in total assets	FR Y-9C	BHCK2122 / BHCK2170
MBS / Assets	Share of mortgage-backed securities in total assets	FR Y-9C	(BHCK1698 + BHCK1702 + BHCK1703 + BHCK1707 + BHCK1709 + BHCK1713 + + BHCK1714 + BHCK1717 + BHCK1718 + BHCK1732 + BHCK1733 + BHCK1736) / BHCK2170
Momentum	Market-adjusted return over the prior six months	CRSP	
NPL / Assets	Non-performing loans as a proportion of total assets	FR Y-9C	(BHCK5526 - BHCK3507 + BHCK1616 + BHCK5525 - BHCK3506) / BHCK2170
Off-balance sheet assets / Assets	Securitized off-balance sheet assets as a proportion of total assets	FR Y-9C	(BHCK3814 + BHCK3816 + BHCKJ455 + BHCKJ456 + BHCK6550 + BHCKJ457 + BHCKJ458 + BHCKJ459 + BHCK3411) / BHCK2170
ROA	Return on assets (Net Income divided by average total assets)	FR Y-9C	BHCK4340 / BHCK3368
ROE	Return on equity (Net Income divided by shareholders' equity)	FR Y-9C	BHCK4340 / BHCK3210
Size	Natural logarithm of the market value of equity or natural logarithm of total assets	CRSP and FR Y-9C	
Std ROA	Standard deviation of ROA (net income normalized by total Assets) over the prior 12 quarters	FR Y-9C	BHCK4340 / BHCK2170
Tier Ratio	Tier 1 Equity as a proportion of total assets	FR Y-9C	BHCK8274 / BHCK2170
Total number of visits	Number of visits to the discount window or TAF facility during the period of study	DW disclosure	
Treatment: Banks accessing both TAF and DW window	Indicator variable identifying banks that accessed both TAF and DW	DW and TAF disclosure	
Treatment: Banks accessing DW only	Indicator variable identifying banks that accessed DW only	DW and TAF disclosure	
Treatment: Banks accessing the TAF only	Indicator variable identifying banks that accessed the TAF only	DW and TAF disclosure	
Volatility	Standard deviation of stock returns over the prior 12 months estimated on a daily basis using rolling windows.	CRSP	
Volatility	Annualized firm stock return standard deviation (using rolling window daily observations)	CRSP	
Volume Traded	Daily number of shares traded / Freefloat shares outstanding	CRSP	

Appendix C: DW event coverage in the news

The table and figure below illustrate that the DW event was newsworthy. The entire universe of Factiva was searched for news and then filtered to the news on the banking sector and the DW.

	03/31/2011	03/31/2010	03/30/2012
Number of news stories on Factiva (no filters); global news	34,670	30,562	34,923
US news	8,050	8,188	3,678
US Banking sector	345	65	245
Discount window	164	0	0
Dow Jones News	862	809	690
US Banking sector	100	63	54
Discount window	80	0	0

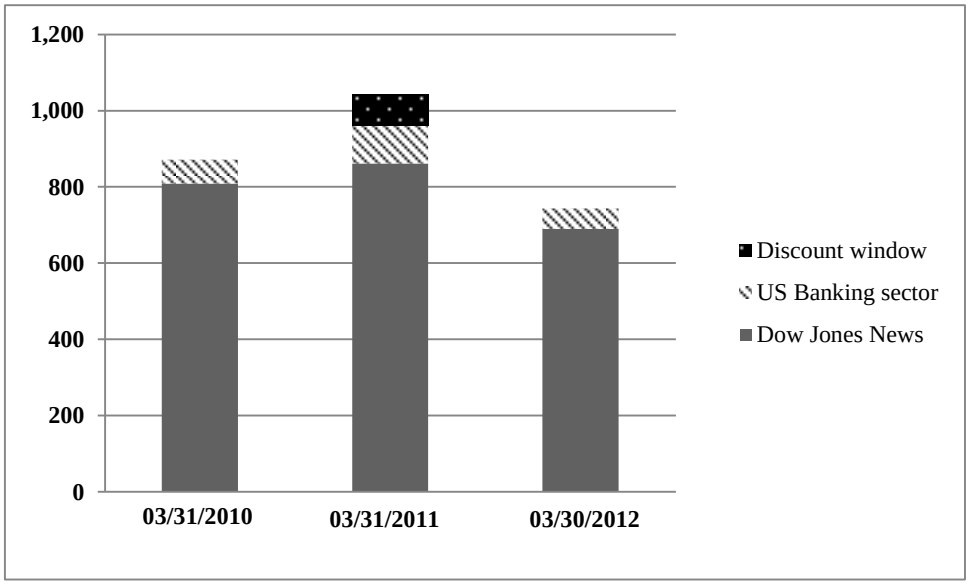


Table 1: Descriptive statistics

The tables below present summary statistics for the main dependent and control variables used in the analysis of the matched sample. Panel A presents quarterly variables computed using quarterly data for the period of 2009Q2 to 2012Q3. Panel B shows the main variables used for the equity bid-ask spread analysis over a shorter horizon of 2010Q3 to 2011Q3 (controls are in natural logarithms at a monthly frequency). Panel C presents variables used for debt issuance analysis using the time period of 2010Q3 to 2011Q3. Panel D presents the variables used in the propensity score estimation and the resulting matched sample using the data for the period of 2004Q1 to 2006Q4. All observations apart from equity returns, bid-ask spreads, abnormal volumes, and volatility are winsorized at the utmost 1% tails of their respective distributions to adjust for the effects of extreme observations. Variables are defined in Appendix B. ***, **, * designate significance at 1%, 5% and 10% levels respectively. *T*-statistics (reported in parenthesis) are estimated using the differences in means test.

Panel A: Matched quarterly sample

Variable	N	Mean	SD	P25	P50	P75
Asset Quality	3,017	0.006	0.007	0.001	0.003	0.009
Asset Risk	3,017	0.714	0.101	0.647	0.722	0.782
CI Loans / Assets	3,017	0.102	0.066	0.054	0.087	0.136
ΔCredit t / (Commit + Assets) t-1	3,017	-0.002	0.041	-0.018	-0.005	0.008
ΔImplicit Interest Rate on Core Deposits	3,017	-0.703	1.961	-0.347	0.270	0.365
ΔImplicit Interest Rate on Large Deposits	3,017	-0.697	1.882	-0.173	0.263	0.362
ΔLiquid Assets t / Assets t-1	3,017	0.008	0.033	-0.010	0.005	0.022
ΔLoans t / Assets t-1	3,017	-0.001	0.039	-0.016	-0.004	0.007
ΔNet Fed Funds and Repo t / Assets t-1	3,017	-0.001	0.008	-0.002	0.000	0.001
ΔOther Borrowed Funds t / Assets t-1	3,017	-0.003	0.014	-0.006	0.000	0.000
ΔWholesale Funding t / (Assets) t-1	3,017	-0.011	0.035	-0.026	-0.009	0.008
Deposits / Assets	3,017	0.774	0.098	0.733	0.793	0.834
Idiosyncratic Risk	3,017	0.522	0.367	0.280	0.404	0.665
Liquid Assets / Assets	3,017	0.264	0.110	0.187	0.248	0.324
Loans / Assets	3,017	0.643	0.110	0.591	0.654	0.714
(Loans - Deposits) / Assets	3,017	-0.133	0.123	-0.207	-0.126	-0.057
Log (Assets)	3,017	14.877	1.379	13.834	14.564	15.663
Net Federal Funds and Repo / Assets	3,017	0.030	0.034	0.002	0.019	0.046
Net Wholesale Funding / Assets	3,017	-0.193	0.125	-0.262	-0.186	-0.110
NPL / Assets	3,017	0.002	0.004	0.000	0.000	0.002
Off-balance sheets Assets/Assets	3,017	0.122	0.067	0.070	0.112	0.165
Other Borrowed Funds / Assets	3,017	0.060	0.055	0.019	0.047	0.085
Percentage of Assets Pledged	3,017	0.112	0.076	0.060	0.100	0.149
ROA	3,017	0.001	0.008	0.000	0.002	0.005
Systematic Risk	3,017	0.225	0.172	0.081	0.210	0.316
Tier Ratio	3,017	0.092	0.025	0.080	0.092	0.106
Volatility	3,017	0.600	0.358	0.374	0.485	0.727

Panel B: Variables used in the equity bid-ask spread analysis

Variable	N	Mean	SD	P25	P50	P75
BA Spread	3,724	0.029	0.036	0.004	0.013	0.041
Size	3,724	12.386	2.052	10.833	12.190	13.693
Volume Traded	3,724	0.372	1.413	-0.571	0.519	1.464
Volatility $_{t-1}$	3,724	-0.407	0.447	-0.739	-0.378	-0.089

Panel C: Variables used in the cost of debt issuance analysis

Variable	N	Mean	SD	P25	P50	P75
Offering Yield (%)	1,077	12.064	5.189	9.000	11.950	15.200
Benchmark Treasury Yield (%)	1,077	0.621	1.008	0.169	0.264	0.354
Log (1+ Bond Life)	1,077	5.551	1.155	4.585	5.242	5.916
Log (Bond Amount of Issue)	1,077	6.944	2.025	5.665	6.597	8.085
Callable	1,077	0.023	0.148	0.000	0.000	0.000
Log (Assets)	1,077	20.522	1.440	18.137	21.474	21.511
Asset Risk (%)	1,077	52.931	5.137	49.578	53.353	54.640
Tier Ratio (%)	1,077	6.784	0.629	6.570	6.698	6.847
Deposits / Assets (%)	1,077	31.827	13.315	30.571	32.427	44.785
ROA (%)	1,077	0.333	0.286	0.035	0.253	0.585
Rating	1,077	5.219	0.660	5.000	5.000	5.000

Panel D: Variables used in propensity score matching (pre-matched and matched values)

Treatment: Banks accessing DW (full sample)

Variable	N	Mean	SD	P25	P50	P75	t-statistic	
Assets (US$ bn)	197	8.5799	20.1000	0.6896	1.5667	4.5028	(2.1332)	**
Tier Ratio	197	0.0876	0.0170	0.0757	0.0851	0.0961	(-0.9965)	
Std ROA	197	0.0036	0.0014	0.0028	0.0034	0.0042	(0.6377)	
CRE / Assets	197	0.2937	0.1377	0.1864	0.2794	0.3904	(0.5850)	
MBS / Assets	197	0.1034	0.0822	0.0351	0.0893	0.1554	(0.4376)	
ROE	197	0.0776	0.0295	0.0615	0.0784	0.0945	(5.7358)	***
Liquid Assets / Assets	197	0.2436	0.1159	0.1631	0.2263	0.2967	(-0.4322)	
Leverage	197	0.9112	0.0188	0.9012	0.9136	0.9248	(1.5559)	

Control Group: Banks that did not access DW (full sample)

Variable	N	Mean	SD	P25	P50	P75
Assets (US$ bn)	371	5.1389	14.3000	0.4455	0.8688	2.1518
Tier Ratio	371	0.0892	0.0187	0.0776	0.0861	0.0956
Std ROA	371	0.0035	0.0020	0.0025	0.0032	0.0039
CRE / Assets	371	0.2866	0.1354	0.1896	0.2741	0.3837
MBS / Assets	371	0.1002	0.0830	0.0343	0.0873	0.1433
ROE	371	0.0607	0.0394	0.0421	0.0663	0.0843
Liquid Assets / Assets	371	0.2480	0.1156	0.1637	0.2328	0.3181
Leverage	371	0.9083	0.0248	0.8969	0.9119	0.9255

Treatment: Banks accessing DW (matched sample)

Variable	N	Mean	SD	P25	P50	P75	t-statistic
Assets (US$ bn)	197	8.5799	20.1000	0.6896	1.5667	4.5028	(0.7319)
Tier Ratio	197	0.0876	0.0170	0.0757	0.0851	0.0961	(-0.4546)
Std ROA	197	0.0036	0.0014	0.0028	0.0034	0.0042	(-0.4739)
CRE / Assets	197	0.2937	0.1377	0.1864	0.2794	0.3904	(-0.1157)
MBS / Assets	197	0.1034	0.0822	0.0351	0.0893	0.1554	(0.1224)
ROE	197	0.0776	0.0295	0.0615	0.0784	0.0945	(0.0462)
Liquid Assets / Assets	197	0.2436	0.1159	0.1631	0.2263	0.2967	(-0.2308)
Leverage	197	0.9112	0.0188	0.9012	0.9136	0.9248	(-0.4693)

Control Group: Banks that did not access DW (matched sample)

Variable	N	Mean	SD	P25	P50	P75
Assets (US$ bn)	197	7.1902	17.5000	0.4934	1.0599	3.4572
Tier Ratio	197	0.0884	0.0184	0.0775	0.0855	0.0951
Std ROA	197	0.0037	0.0016	0.0028	0.0035	0.0041
CRE / Assets	197	0.2953	0.1485	0.1858	0.2817	0.4206
MBS / Assets	197	0.1024	0.0882	0.0318	0.0893	0.1432
ROE	197	0.0774	0.0293	0.0614	0.0802	0.0947
Liquid Assets / Assets	197	0.2464	0.1248	0.1597	0.2260	0.3118
Leverage	197	0.9121	0.0216	0.9022	0.9151	0.9281

Table 2: Event study results: Cumulative Abnormal Returns, Abnormal Volumes and Abnormal Returns Volatility (matched sample)

This table presents univariate and multivariate event study results using the matched sample. *Treatment* refers to banks that accessed the DW and *Control* refers to banks that did not access the DW. Panel A shows the univariate comparisons for cumulative abnormal returns (*CAR*), abnormal volumes (*AV*) and abnormal return volatility (*AVAR*) over a short (0, +3) window computed using the market model. The difference column shows the difference between control and sample banks. Panel B presents the short-window OLS estimation results of the cumulative abnormal returns (*CAR*), abnormal volumes (*AV*) and abnormal volatility (*AVAR*) following the DW disclosures on March 31, 2011. The estimation period for the market model is 125 trading days prior to the TAF event on December 1, 2010. Abnormal volume is calculated as $AVOL_{it} = ln(\overline{V}_{it}/V_i)$, where $\overline{V}_{it}$ is the mean event-period volume for bank *i* and V_i is the mean estimation-period volume measured over a period of 30 trading days before the TAF event. Abnormal return volatility is calculated as $AVAR_i = ln\left(\overline{u_{it}^2}/\sigma_i^2\right)$, where $u_{it} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{mt})$, R_{it} is bank *i*'s stock return, R_{mt} is the value-weighted return for the US stock market and $\hat{\alpha}_i$ and $\hat{\beta}_i$ are bank *i*'s estimation-period market model parameter estimates. σ_i^2 is the variance of the market-model residuals in the non-event period. All variables are presented in decimals and are computed as mean values over a four-day period following the DW disclosure event on March 31, 2011, including the event date. Control banks are matched to the banks accessing the DW using propensity score matching based on the pre-crisis quarterly data for 2004Q1 to 2006Q4. All variables are defined in Appendix B. ***, **, * designate significance at 1%, 5% and 10% levels respectively. *T*-statistics (reported in parenthesis) are computed based on robust standard errors. Inferences are similar with bootstrapped p-values.

Panel A: Univariate cross-sectional tests following the DW disclosures

		Control sample: Other banks		**Treatment sample: Banks accessing DW**		**Difference**	
Variable	**Days**	**Mean**	**t-statistic**	**Mean**	**t-statistic**	**Mean**	**t-statistic**
CAR	4	0.0010	(0.411)	0.0105***	(4.188)	0.0095*	(1.871)
AV	4	-0.2241**	(-2.578)	-0.4464***	(-6.752)	-0.2222**	(-2.037)
AVAR	4	-9.0894***	(-32.553)	-9.0885***	(-52.483)	0.0009	(0.003)

Panel B: Multivariate cross-sectional tests following the DW disclosures

This table presents the short-window (0, +3) OLS estimation results of the cumulative abnormal returns (*CAR*), abnormal volumes (*AV*) and abnormal volatility (*AVAR*) following the DW disclosures on March 31, 2011.

	CAR	**CAR**	**CAR**	**CAR**	**CAR**	**AV**	**AV**	**AVAR**	**AVAR**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treatment: Banks accessing DW	0.0095*	0.0096*	0.0110**			-0.2607**		0.0364	
	(1.873)	(1.829)	(2.041)			(-2.262)		(0.104)	
Treatment: Banks accessing DW only				0.0070	0.0079		-0.3495***		0.1155
				(1.239)	(1.398)		(-2.674)		(0.310)
Treatment: Banks accessing TAF only				-0.0017	-0.0016		-0.1959		-0.0613
				(-0.116)	(-0.109)		(-1.283)		(-0.070)
Treatment: Banks accessing both DW and TAF				0.0157**	0.0200***		-0.0514		-0.0137
				(2.191)	(2.648)		(-0.340)		(-0.026)
Size		-0.0002	-0.0000	-0.0009	-0.0011	-0.0260	-0.0507	-0.0502	-0.0356
		(-0.068)	(-0.017)	(-0.377)	(-0.469)	(-0.804)	(-1.491)	(-0.502)	(-0.318)
Book-to-Market		-0.0032	-0.0032	-0.0031	-0.0031	-0.0135	-0.0125	-0.0068	-0.0070
		(-1.396)	(-1.398)	(-1.454)	(-1.497)	(-0.391)	(-0.375)	(-0.079)	(-0.082)
Momentum		-1.2176	-1.2158	-1.1827	-1.1988	1.4795	2.5648	59.5014	58.5385
		(-0.804)	(-0.817)	(-0.784)	(-0.818)	(0.034)	(0.060)	(0.653)	(0.643)
Leverage		-0.0539	-0.0550	-0.0679	-0.0756	1.0119	0.4251	-5.2141	-5.1261
		(-0.373)	(-0.382)	(-0.469)	(-0.528)	(0.420)	(0.180)	(-0.840)	(-0.799)
Average amount borrowed / Assets		-0.0016*		-0.0016*		-0.0501*	-0.0354	-0.0219	0.0252
		(-1.967)		(-1.894)		(-1.874)	(-1.407)	(-0.849)	(0.352)
Total number of visits			-0.0001**		-0.0001***	0.0038*	0.0026		-0.0034
			(-2.524)		(-3.012)	(1.830)	(1.358)		(-0.584)
Intercept	0.0010	0.0562	0.0024	0.0782	0.0876	-0.8082	0.0376	-3.7567	-4.0048
	(0.216)	(0.385)	(0.098)	(0.528)	(0.598)	(-0.342)	(0.016)	(-0.607)	(-0.617)
Observations	250	250	250	250	250	250	250	250	250
Adjusted R-squared	0.012	0.027	0.030	0.026	0.037	0.010	0.018	-0.016	-0.026

Table 3: Univariate difference-in-difference tests of main dependent variables

This table presents univariate comparison between *Treated* banks (banks that accessed the DW) and *Control* banks (banks that did not access the DW) for all dependent variables used in this paper. The difference column shows the difference between control and sample banks. Control banks are matched to the banks accessing the DW using propensity score matching based on the pre-crisis quarterly data for 2004Q1 to 2006Q4. All variables are defined in Appendix B. ***, **, * designate significance at 1%, 5% and 10% levels respectively. *T*-statistics (reported in parenthesis) are computed based on robust standard errors.

	Before DW Disclosures				**After DW Disclosures**				**Difference - in - Differences**	
	Control	**Treated**	**Difference**	**t-statistic**	**Control**	**Treated**	**Difference**	**t-statistic**		**t-statistic**
Variable	**(1)**	**(2)**	**(3) = (2) - (1)**	**(4)**	**(5)**	**(6)**	**(7) = (6) - (5)**	**(8)**	**(9) = (7) - (3)**	**(10)**
BA Spread (long horizon)	-4.047	-4.536	-0.489	(-7.56)***	-4.180	-4.678	-0.498	(-4.86)***	-0.009	(-0.09)
BA Spread (short horizon)	-4.312	-4.762	-0.450	(-3.89)***	-4.326	-4.806	-0.480	(-5.29)***	-0.030	(-0.2)
Offering bond yield	13.557	10.613	-2.944	(-12.75)***	10.466	6.450	-4.016	(11.2)***	-1.072	(3.04)***
Idiosyncratic Risk	0.602	0.641	0.039	(2.08)**	0.426	0.395	-0.031	(-3.52)***	-0.070	(-2.58)***
Systematic Risk	0.208	0.260	0.052	(5.72)***	0.180	0.218	0.038	(-2.38)***	-0.014	(-1.08)
Asset Risk	0.721	0.733	0.012	(2.4)***	0.681	0.704	0.023	(4.24)***	0.011	(1.49)
Risky Lending	0.094	0.106	0.012	(3.71)***	0.089	0.108	0.019	(3)***	0.007	(1.22)
Liquid Assets	0.252	0.245	-0.007	(-1.37)	0.292	0.277	-0.015	(-1.82)*	-0.008	(-0.88)
Pct. Pledged	0.104	0.115	0.011	(2.81)***	0.111	0.113	0.002	(-2.04)**	-0.009	(-1.48)
Fed Funds and Repo Borrowed	0.028	0.033	0.005	(3.35)***	0.028	0.029	0.001	(-2.33)***	-0.004	(-1.69)*
Loan - Deposit Gap	-0.121	-0.102	0.019	(3.02)***	-0.170	-0.148	0.022	(9.14)***	0.003	(0.26)
ΔLiquid Assets$_t$ / Assets$_{t-1}$	0.013	0.007	-0.006	(-3.43)***	0.007	0.007	0.000	(5.41)***	0.006	(2.27)**
ΔLoans$_t$ / Assets$_{t-1}$	-0.001	-0.005	-0.004	(-2.13)**	0.000	0.004	0.004	(3.83)***	0.008	(2.78)***
ΔCredit$_t$ / (Commit + Assets)$_{t-1}$	-0.003	-0.007	-0.004	(-2)**	0.000	0.004	0.004	(3.91)***	0.008	(2.83)***
ΔNet Fed Funds and Repo$_t$ / Assets$_{t-1}$	0.000	-0.001	-0.001	(-2.23)**	-0.001	0.000	0.001	(2.31)**	0.002	(1.67)*
ΔOther Borrowed Fund $_t$ / Assets$_{t-1}$	-0.003	-0.004	-0.001	(-1.09)	-0.002	-0.001	0.001	(1.58)	0.002	(1.14)
ΔWholesale Funding$_t$ /Assets$_{t-1}$	-0.016	-0.012	0.004	(2.35)***	-0.009	-0.008	0.001	(-1.76)*	-0.003	(-1.27)
ΔImplicit Interest Rate on Large Deposits	-0.514	-0.489	0.025	(0.26)	-0.869	-0.939	-0.070	(-0.92)	-0.095	(-0.68)
ΔImplicit Interest Rate on Core Deposits	-0.419	-0.397	0.022	(0.22)	-1.065	-1.011	0.054	(0.33)	0.032	(0.22)

Table 4: Cost of capital: daily equity bid-ask spreads (matched sample)

This table presents the difference-in-difference estimation results of the impact on the cost of capital as measured by the adverse selection component of the bid-ask spread using the matched sample.

$$BA\ Spread_{it} = \beta_0 + \beta_1 Event_t + \beta_2 Treated_i + \beta_3 Event_t \times Treated_i + \beta_4 Size_{i,t-1} + \beta_5 Volume_{i,t-1} + \beta_6 Volatility_{i,t-1} + \sum_n \beta_n Controls_{it} + \epsilon_{it}$$

where $BA\ Spread_{it}$ is the natural logarithm of the relative equity bid-ask spread for each bank deflated by the average price, $Event_t$ is an indicator variable for the window following the disclosure of the DW information. $Treated_i$ refers to indicator variables for each category of banks accessing the DW or TAF (DW only access, TAF only access and DW and TAF). $Size_{i,t-1}$ is the natural logarithm of daily market capitalization of each bank to take into account the size of the bank, $Volume_{i,t-1}$ is the volume of shares trading as a proportion of the shares outstanding, and $Volatility_{i,t-1}$ is the rolling standard deviation of daily stock returns in the previous trading year. The treatment effect is captured by the coefficient β_3 on the difference-in-differences estimator. Columns (1) and (2) present the results for all banks in the matched sample. Columns (3) and (4) provide results for the banks in the top quartile of average DW borrowing as a proportion of total assets. Banks in columns (5) and (6) are in the top quartile of borrowers by frequency. Finally columns (7) and (8) show the results for banks with negative abnormal returns on the DW disclosure event. All other variables are defined in Appendix B; ***, **, * designate significance at 1%, 5% and 10% levels respectively. *T*-statistics (reported in parenthesis) are computed based on robust standard errors clustered at the BHC level. Inferences remain unchanged using bootstrapped p-values. Control banks are matched to the banks accessing the DW using propensity score matching based on the pre-crisis quarterly data for 2004Q1 to 2006Q4. The regression is estimated using daily values over a seven-day period around the DW disclosure event on March 31, 2011, to match the cross-section market tests on the (0,+3) window.

	All banks		**Top quartile DW Borrowers (by amount)**		**Top quartile DW Borrowers (by frequency)**		**Banks with negative CARs on DW Disclosure Event**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treatment: Banks accessing DW	-0.0661						-0.0118	
	(-0.858)						(-0.090)	
DW Event	0.1183**	0.1594***	0.0769	0.0890	0.0758	0.0132	0.1128	0.1404**
	(2.556)	(3.289)	(1.007)	(1.565)	(1.103)	(0.082)	(1.590)	(2.122)
Banks accessing DW * DW Event	-0.0522						-0.1493*	
	(-0.957)						(-1.668)	
Treatment: Banks accessing DW only		-0.0399		0.5115**		0.3605*		0.0838
		(-0.494)		(2.309)		(1.802)		(0.650)
Banks accessing DW only * DW Event		-0.1115*		-0.0542				-0.2123**
		(-1.748)		(-0.389)				(-2.218)
Treatment: Banks accessing TAF only		0.0184						-0.0375
		(0.123)						(-0.152)
Banks accessing TAF only * DW Event		-0.3691***						-0.3881
		(-2.817)						(-1.645)
Treatment: Banks accessing both DW and TAF		-0.1551						-0.7117**
		(-1.101)						(-2.297)
Banks accessing both DW and TAF * DW Event		-0.0575				0.0937		-0.0850
		(-1.003)				(0.565)		(-0.997)
$Size_{t-1}$	-0.4620***	-0.4491***	-0.5153***	-0.4724***	-0.4967***	-0.4677***	-0.4237***	-0.3723***
	(-10.203)	(-8.538)	(-8.506)	(-10.286)	(-11.206)	(-11.718)	(-6.754)	(-5.891)
Volume traded $_{t-1}$	-0.3610***	-0.3598***	-0.3541***	-0.3123***	-0.3505***	-0.3291***	-0.3131***	-0.2785***
	(-7.495)	(-7.153)	(-5.427)	(-4.248)	(-5.376)	(-4.725)	(-5.204)	(-5.465)

$Volatility_{t-1}$	0.5964***	0.6009***	0.5980***	0.6759***	0.5183***	0.5556***	0.7156***	0.8356***
	(5.362)	(5.717)	(3.096)	(3.424)	(2.781)	(3.027)	(4.417)	(4.862)
Average amount borrowed / Assets	0.0030	-0.0013	-0.0102	-0.0274*	-0.0043	-0.0136	0.0213	-0.0081
	(0.219)	(-0.091)	(-0.855)	(-2.013)	(-0.322)	(-0.947)	(0.924)	(-0.394)
Total number of visits	-0.0008	-0.0004	0.0002	0.0015	-0.0001	0.0005	-0.0028	-0.0005
	(-0.932)	(-0.456)	(0.227)	(1.494)	(-0.102)	(0.486)	(-1.405)	(-0.280)
Intercept	1.5541***	22.6046	2.0642***	1.2306**	1.8244***	1.2908**	1.1826*	0.6571
	(3.199)	(0.206)	(2.889)	(2.030)	(3.376)	(2.442)	(1.767)	(0.997)
Observations	1,682	1,682	254	254	275	275	621	621
Adjusted R-squared	0.808	0.809	0.822	0.840	0.859	0.866	0.786	0.800

Table 5: Cost of capital: monthly equity bid-ask spreads (matched sample)

This table presents the difference-in-difference estimation results of the impact on the cost of capital as measured by the adverse selection component of the bid-ask spread using the matched sample.

$$BA\ Spread_{it} = \beta_1 Event_t \times Treated_i + \beta_2 Size_{i,t-1} + \beta_3 Volume_{i,t-1} + \beta_4 Volatility_{i,t-1} + \sum_n \beta_n Controls_{it} + T_t + B_i + \epsilon_{it}$$

where $BA\ Spread_{it}$ is the natural logarithm of the monthly median relative equity bid-ask spread for each bank deflated by the average price, *Event* is an indicator variable for the window following the disclosure of the DW information. $Event_t$ *x* $Treated_i$ refers to the interaction that takes the value of one for banks that access the DW and the effect of this information post-disclosure of March 31, 2011. This is the difference-in-difference estimator. $Size_{i,t-1}$ is the natural logarithm of daily market capitalization of each bank to take into account the size of the bank, $Volume_{i,t-1}$ is the volume of shares trading as a proportion of the shares outstanding, and $Volatility_{i,t-1}$ is the rolling standard deviation of daily stock returns in the previous trading year. T_t reflects the year and month fixed effects and B_i refers to the holding company fixed effects. The treatment effect is captured by the coefficient β_1 on the difference-in-differences estimator. This analysis uses bank and time fixed effects and therefore only the difference-in-differences operator is identified. Columns (1) and (2) present the results for all banks in the matched sample. Columns (3) and (4) provide results for the banks in the top quartile of average DW borrowing as a proportion of total assets. Banks in columns (5) and (6) are in the top quartile of borrowers by frequency. Finally columns (7) and (8) show the results for banks with negative abnormal returns on the DW disclosure event. Variables are defined in Appendix B; ***, **, * designate significance at 1%, 5% and 10% levels respectively. *T*-statistics (reported in parenthesis) are computed based on robust standard errors clustered at the BHC level. Inferences remain unchanged using bootstrapped p-values. Control banks are matched to the banks accessing the DW using propensity score matching based on the pre-crisis quarterly data for 2004Q1 to 2006Q4. The regression is estimated using monthly medians of daily relative bid-ask spread values over a five-quarter period following the passage of the Dodd-Frank Act from 2010Q3 to 2011Q3.

	All banks		**Top quartile DW Borrowers (by amount)**		**Top quartile DW Borrowers (by frequency)**		**Banks with negative CARs on DW Disclosure Event**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Banks accessing DW * DW Event	0.0677*		0.0125		0.0233		0.1250**	
	(1.804)		(0.092)		(0.153)		(2.042)	
Banks accessing DW only * DW Event		0.0805*		0.0588		0.0360		0.1636**
		(1.909)		(0.428)		(0.237)		(2.517)
Banks accessing TAF only * DW Event		-0.0001						0.1354
		(-0.001)						(1.535)
Banks accessing both DW and TAF * DW Event		0.0414		-0.0637		0.0002		0.0526
		(0.830)		(-0.476)		(0.001)		(0.491)
$Size_{t-1}$	-0.0375	-0.0389	0.0099	0.0076	-0.0097	-0.0104	-0.0196	-0.0236
	(-1.314)	(-1.388)	(0.190)	(0.148)	(-0.181)	(-0.195)	(-0.617)	(-0.795)
$Volume_{t-1}$	-0.1246***	-0.1247***	-0.1080***	-0.1035***	-0.1302***	-0.1289***	-0.1097***	-0.1082***
	(-6.694)	(-6.694)	(-3.008)	(-2.836)	(-3.277)	(-3.121)	(-3.916)	(-3.874)
$Volatility_{t-1}$	0.1260*	0.1145*	-0.0587	-0.0817	-0.0514	-0.0647	0.0230	-0.0021
	(1.912)	(1.679)	(-0.299)	(-0.429)	(-0.254)	(-0.306)	(0.219)	(-0.019)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,724	3,724	565	565	605	605	1,415	1,415
Adjusted R-squared	0.311	0.311	0.316	0.324	0.283	0.282	0.308	0.311

Table 6: Cost of capital: bond offering yields (matched sample)

This table presents the estimation results of the impact of the DW disclosures on banks' cost of borrowing in the bond market.

$$Offering\ Yield_{it} = \alpha_1 Event_t \times Treated_i + \sum_l \alpha_l Controls_{it} + T_t + B_i + v_{it}$$

The dependent variable is the bond-offering yield, which is measured as the bond's yield to maturity at the time of issuance. *Benchmark Treasury Yield* is the yield to maturity of a corresponding US Treasury bill or bond matched to each bond in the sample on maturity and coupon. *Bond Life* is the bond maturity in years. *Amount of Issue* is the total dollar amount of the face value of each bond at issuance. *Callable* is an indicator variable, which takes the value of one if the bond is callable and zero otherwise. *Assets* are the total assets of each bank. *Asset Risk* is the share of risk-weighted assets in total assets, which measures the overall riskiness of a bank's assets. *Tier Ratio* is the share of Tier 1 capital in total assets. *Deposits / Assets* is the ratio of banks' total deposits to total assets. *ROA* measures each bank's return on assets. $Event_t$ *x* $Treated_i$ takes the value of one for bonds issued after the DW disclosure event on March 31, 2011, by banks that have accessed the DW (or TAF and DW). *Rating* is a numerical credit rating for which the lowest value implies higher credit quality. Control banks are matched to the banks accessing the DW using propensity score matching based on the pre-crisis quarterly data for 2004Q1 to 2006Q4. T_t captures the quarterly fixed effects and B_i captures the holding company fixed effects. This analysis uses bank- and time- fixed effects and therefore only the difference-in-differences operator is identified. All continuous variables are in percent and are winsorized at the utmost 1% tails of their respective distributions to adjust for the effects of extreme observations. The regression is estimated over a five-quarter period following the passage of the Dodd-Frank Act from 2010Q3 to 2011Q3. All other variables are defined in Appendix B. ***, **, * designate significance at 1%, 5% and 10% levels respectively. *T*-statistics (reported in parenthesis) are computed based on robust standard errors clustered at the BHC level.

	(1)	**(2)**
Banks accessing DW * DW Event	-1.1595*	
	(-1.869)	
Banks accessing DW only * DW Event		-1.8945**
		(-1.967)
Banks accessing both DW and TAF * DW Event		-0.1568
		(-0.133)
Benchmark Treasury Yield	2.1716***	2.1592***
	(8.816)	(8.755)
Log (1+ Bond Life)	-3.7870***	-3.7795***
	(-18.154)	(-18.106)
Log (Bond Amount of Issue)	-0.3889***	-0.3900***
	(-5.745)	(-5.760)
Callable	-1.4117**	-1.3909**
	(-2.551)	(-2.512)
Log (Assets)	-4.8050	0.6762
	(-0.307)	(0.041)
Asset Risk	-0.6619**	-0.4134
	(-2.392)	(-1.110)
Tier Ratio	-1.3991*	-3.0201*
	(-1.939)	(-1.699)
Deposits / Assets	0.3720	0.1456
	(1.469)	(0.428)
ROA	-1.3164	-0.8208
	(-1.167)	(-0.666)
Rating	-0.3967	-0.4169
	(-0.749)	(-0.786)
Time fixed effects	Yes	Yes
Bank fixed effects	Yes	Yes
Observations	1,077	1,077
Adjusted R-squared	0.636	0.636

Table 7: Real effects results: Risk (matched sample)

This table presents the estimation results of the DW disclosure on proxies of risk using the difference-in-difference methodology and a matched sample:

$$y_{it} = \delta_1 Event_t \times Treated_i + \sum_m \delta_m Controls_{it} + T_t + B_i + \vartheta_{it}$$

$Event_t$ x $Treated_i$ refers to the interaction that takes the value of one in the period following March 31, 2011, for banks that access the DW. This is the difference-in-difference estimator. T_t refers to the quarterly fixed effects and B_i captures the holding company fixed effects. This analysis uses bank and time fixed effects and therefore only the difference-in-differences operator is identified. Columns (1) and (2) present the effects of disclosure on banks' idiosyncratic risk following the DW event. Columns (3) and (4) focus on the balance sheet measure of risk computed as a proportion of risk-weighted assets in total assets. Finally, columns (5) and (6) show the results for risky lending proxied by the proportion of commercial and industrial loans in total assets. Control sample banks are matched to the banks accessing the DW using propensity score matching based on the pre-crisis quarterly data for 2004Q1 to 2006Q4. All continuous variables are winsorized at the utmost 1% tails of their respective distributions to adjust for the effects of extreme observations. All other variables are defined in Appendix B. Control variables are computed using quarterly data for the period of 2009Q3 to 2012Q3. ***, **, * designate significance at 1%, 5% and 10% levels respectively. *T*-statistics (reported in parenthesis) are computed based on robust standard errors clustered at the BHC level.

	Idiosyncratic risk		**Asset Risk**		**Risky Lending**	
	(1)	(2)	(3)	(4)	(5)	(6)
Banks accessing DW * DW Event	-0.0786***		-0.0051**		0.0027**	
	(-6.984)		(-2.310)		(2.058)	
Banks accessing DW only * DW Event		-0.0263		0.0033		-0.0102*
		(-1.113)		(0.837)		(-1.783)
Banks accessing TAF * DW Event		0.0431		-0.0087		-0.0010
		(1.024)		(-0.779)		(-0.293)
Banks accessing both DW and TAF * DW Event		-0.0524**		-0.0014		0.0084***
		(-1.992)		(-0.277)		(2.874)
Log $(Assets)_{t-1}$	-0.0890	-0.0797	-0.0053	-0.0052	0.0212**	0.0199**
	(-1.447)	(-1.276)	(-0.371)	(-0.372)	(2.234)	(2.203)
Tier $Ratio_{t-1}$	-0.4755**	0.4231**	-0.0719*	0.0185	-0.0103	-0.0015
	(-2.471)	(2.411)	(-1.731)	(0.470)	(-0.466)	(-0.065)
$(Deposits / Assets)_{t-1}$	0.5235***	-0.1634	0.5715***	0.4982***	0.1333***	0.1235***
	(3.046)	(-1.007)	(15.869)	(13.170)	(9.141)	(8.095)
$(Loans / Assets)_{t-1}$	-2.8885	-3.2643	-0.8390*	-0.8425*	-0.1625	-0.1712
	(-1.117)	(-1.368)	(-1.857)	(-1.739)	(-0.693)	(-0.731)
$(NPL / Assets)_{t-1}$	-3.3694***	-2.8096***	0.0402	0.0956	0.0352	0.0250
	(-8.537)	(-6.461)	(0.461)	(1.094)	(0.899)	(0.605)
$(Off\text{-}balance\ Sheet\ Assets / Assets)_{t-1}$	-1.3962***	-0.4627***	-0.0460**	0.0871**	-0.0018	0.0133
	(-10.932)	(-2.892)	(-2.248)	(2.559)	(-0.169)	(0.796)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,017	3,017	3,017	3,017	3,017	3,017
Adjusted R-squared	0.374	0.482	0.410	0.444	0.143	0.174

Table 8: Real effects results: Liquidity (matched sample)

This table presents the estimation results of the DW disclosure on proxies of liquidity using the difference-in-difference methodology and a matched sample:

$$y_{it} = \delta_1 Event_t \times Treated_i + \sum_m \delta_m Controls_{it} + T_t + B_i + \vartheta_{it}$$

$Event_t$ *x* $Treated_i$ refers to the interaction that takes the value of one in the period following March 31, 2011, for banks that access the DW. This is the difference-in-difference estimator. This analysis uses bank and time fixed effects and therefore only the difference-in-differences operator is identified. Columns (1) and (2) present the effects of disclosure on banks' balance sheet liquidity measured as a proportion of liquid assets in total assets. Columns (3) and (4) show the results for the proportion of pledged assets in total assets as a measure of collateralized borrowing. Columns (5) and (6) present the results for net borrowed Federal Funds and Repos as a proportion of total assets as a proxy for banks' access to the federal funds market. Columns (7) and (8) present the loan-deposit funding gap as a proportion of total assets as a proxy for a liquidity shortfall. T_t refers to the quarterly fixed effects and B_i is the holding company fixed effects. All other variables are defined in Appendix B. Control variables are computed using quarterly data for the period of 2009Q3 to 2012Q3. Control sample banks are matched to the banks accessing the DW using propensity score matching based on the pre-crisis quarterly data for 2004Q1 to 2006Q4. All continuous variables are winsorized at the utmost 1% tails of their respective distributions to adjust for the effects of extreme observations. ***, **, * designate significance at 1%, 5% and 10% levels respectively. *T*-statistics (reported in parenthesis) are computed based on robust standard errors clustered at the BHC level.

	Liquid Assets		**Pct. Pledged**		**Fed Funds and Repo Borrowed**		**Loan - Deposit Gap**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Banks accessing DW * DW Event	0.0068***		-0.0057***		-0.0021**		-0.0113***	
	(3.969)		(-3.063)		(-2.207)		(-5.346)	
Banks accessing DW only * DW Event		-0.0017		-0.0110***		-0.0031*		-0.0049
		(-0.567)		(-2.893)		(-1.864)		(-1.469)
Banks accessing TAF * DW Event		-0.0014		0.0001		-0.0065*		-0.0050
		(-0.135)		(0.008)		(-1.763)		(-0.405)
Banks accessing both DW and TAF * DW Event		-0.0038		-0.0023		-0.0029		0.0011
		(-1.121)		(-0.491)		(-1.351)		(0.259)
Log $(Assets)_{t-1}$	-0.0337***	-0.0378***	-0.0082	-0.0071	-0.0088**	-0.0080**	0.0440***	0.0465***
	(-4.240)	(-4.520)	(-1.005)	(-0.916)	(-2.428)	(-2.230)	(4.836)	(4.933)
Tier $Ratio_{t-1}$	0.0761	0.0334	0.0619	0.0743	-0.0270	-0.0223	-0.0980	-0.0537
	(1.202)	(0.498)	(0.772)	(0.946)	(-1.047)	(-0.911)	(-1.288)	(-0.659)
$(Deposits / Assets)_{t-1}$	0.0441*	0.0191	-0.1198***	-0.0941**	-0.1057***	-0.1032***	-0.6873***	-0.6333***
	(1.663)	(0.684)	(-3.497)	(-2.495)	(-5.471)	(-5.220)	(-17.935)	(-15.109)
$(Loans / Assets)_{t-1}$	-0.7041***	-0.6884***	-0.1354***	-0.1569***	-0.0111	-0.0111	0.6793***	0.6371***
	(-23.710)	(-22.390)	(-4.900)	(-5.310)	(-1.149)	(-1.084)	(16.766)	(14.757)
$(NPL / Assets)_{t-1}$	-1.2635***	-1.2041***	-0.4219	-0.4871*	-0.1916	-0.2017	0.7270	0.6937
	(-2.915)	(-2.722)	(-1.534)	(-1.755)	(-1.069)	(-1.158)	(1.029)	(0.959)
$(Off\text{-}balance\ Sheet\ Assets / Assets)_{t-1}$	-0.0053	-0.0155	-0.0086	0.0162	-0.0052	-0.0118	0.0032	0.0577**
	(-0.312)	(-0.598)	(-0.622)	(0.731)	(-0.707)	(-1.006)	(0.163)	(2.112)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,017	3,017	3,017	3,017	3,017	3,017	3,017	3,017
Adjusted R-squared	0.556	0.568	0.070	0.089	0.118	0.123	0.557	0.571

Table 9: Real effects results: Changes in liquidity and lending (matched sample)

This table presents the estimation results of the DW disclosure on proxies of liquidity using the difference-in-difference methodology and a matched sample:

$$y_{it} = \delta_1 Event_t \times Treated_i + \sum_m \delta_m Controls_{it} + T_t + B_i + \vartheta_{it}$$

$Event_t$ *x* $Treated_i$ refers to the interaction that takes the value of one in the period following March 31, 2011, for banks that access the DW. This is the difference-in-difference estimator. This analysis uses bank and time fixed effects and therefore only the difference-in-differences operator is identified. *Tt* is the quarterly fixed effect and *Bi* is the holding company fixed effect. Columns (1) and (2) show quarterly growth in liquid assets as a proportion of total assets at the beginning of the quarter. Columns (3) an (4) show growth in loans as a percentage of total assets and columns (5) to (6) show growth in credit as a proportion of total committed assets. All variables are defined in Appendix B. Control variables are computed using quarterly data for the period of 2009Q3 to 2012Q3. Control sample banks are matched to the banks accessing the DW using propensity score matching based on the pre-crisis quarterly data for 2004Q1 to 2006Q4. All continuous variables are winsorized at the utmost 1% tails of their respective distributions to adjust for the effects of extreme observations. ***, **, * designate significance at 1%, 5% and 10% levels respectively. *T*-statistics (reported in parenthesis) are computed based on robust standard errors clustered at the BHC level.

	ΔLiquid Assets$_t$ / Assets$_{t-1}$		**ΔLoans$_t$ / Assets$_{t-1}$**		**ΔCredit$_t$ / (Commit + Assets)$_{t-1}$**	
	(1)	(2)	(3)	(4)	(5)	(6)
Banks accessing DW * DW Event	0.0058**		0.0047*		0.0060**	
	(2.429)		(1.658)		(1.979)	
Banks accessing DW only * DW Event		0.0051*		0.0018		0.0025
		(1.724)		(0.575)		(0.762)
Banks accessing TAF * DW Event		0.0093		-0.0053		-0.0050
		(0.803)		(-0.557)		(-0.514)
Banks accessing both DW and TAF * DW Event		0.0040		0.0089**		0.0114***
		(1.111)		(2.450)		(2.874)
Log (Assets)$_{t-1}$	-0.0645***	-0.0644***	-0.0937***	-0.0937***	-0.0987***	-0.0987***
	(-6.527)	(-6.544)	(-6.603)	(-6.640)	(-6.625)	(-6.681)
Tier Ratio$_{t-1}$	0.0348	0.0352	0.2548***	0.2504***	0.2792***	0.2735***
	(0.481)	(0.487)	(3.063)	(3.046)	(3.209)	(3.181)
(Deposits / Assets)$_{t-1}$	0.0329	0.0320	-0.0922***	-0.0925***	-0.0902***	-0.0908***
	(1.014)	(0.989)	(-3.114)	(-3.144)	(-2.924)	(-2.965)
(Loans / Assets)$_{t-1}$	0.2949***	0.2953***	-0.1188***	-0.1198***	-0.1413***	-0.1425***
	(10.288)	(10.298)	(-4.229)	(-4.290)	(-4.819)	(-4.913)
(NPL / Assets)$_{t-1}$	-0.5968	-0.5987	-1.0683	-1.0882	-1.0388	-1.0647
	(-1.295)	(-1.272)	(-1.517)	(-1.551)	(-1.406)	(-1.448)
(Off-balance Sheet Assets / Assets)$_{t-1}$	-0.0049	-0.0039	0.1733***	0.1663***	0.1478***	0.1390***
	(-0.219)	(-0.172)	(5.856)	(5.520)	(4.847)	(4.464)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,017	3,017	3,017	3,017	3,017	3,017
Adjusted R-squared	0.157	0.158	0.120	0.121	0.120	0.122

Table 10: Real effects results: Changes in access to funding and funding costs (matched sample)

This table presents the estimation results of the DW disclosure on proxies of liquidity using the difference-in-difference methodology and a matched sample:

$$y_{it} = \delta_1 Event_t \times Treated_i + \sum_m \delta_m Controls_{it} + T_t + B_i + \vartheta_{it}$$

$Event_t$ *x* $Treated_i$ refers to the interaction that takes the value of one in the period following March 31, 2011, for banks that access the DW. This is the difference-in-difference estimator. This analysis uses bank and time fixed effects and therefore only the difference-in-differences operator is identified. T_t refers to the quarterly fixed effects and B_i to the holding company fixed effects. Columns (1) and (2) show quarterly changes in net federal funds and repo borrowing as a proportion of total assets at the beginning of the quarter. Columns (3) and (4) show growth in other borrowed funds as a proportion of total assets. Columns (5) and (6) show growth in net wholesale funding as a proportion of total assets. Finally, columns (7) through (10) show the quarterly change in the implicit interest rate banks pay on large and core deposits. All other variables are defined in Appendix B. Control variables are computed using quarterly data for the period of 2009Q3 to 2012Q3. Control sample banks are matched to the banks accessing the DW using propensity score matching based on the pre-crisis quarterly data for 2004Q1 to 2006Q4. All continuous variables are winsorized at the utmost 1% tails of their respective distributions to adjust for the effects of extreme observations. ***, **, * designate significance at 1%, 5% and 10% levels respectively. *T*-statistics (reported in parenthesis) are computed based on robust standard errors clustered at the BHC level.

	ΔNet Fed Funds and Repo$_t$ / Assets$_{t-1}$		**ΔOther Borrowed Funds$_t$ / Assets$_{t-1}$**		**ΔWholesale Funding$_t$ / Assets$_{t-1}$**		**ΔImplicit Interest Rate on Large Deposits**		**ΔImplicit Interest Rate on Core Deposits**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Banks accessing DW * DW Event	0.0006		0.0005		-0.0027		-0.0984**		-0.0236	
	(1.183)		(0.503)		(-0.937)		(-2.136)		(-0.584)	
Banks accessing DW only * DW Event		0.0002		-0.0004		-0.0049*		-0.1173**		0.0092
		(0.325)		(-0.432)		(-1.655)		(-2.260)		(0.202)
Banks accessing TAF * DW Event		-0.0013		0.0008		-0.0091		-0.1991***		0.1327
		(-0.709)		(0.409)		(-0.834)		(-2.709)		(1.365)
Banks accessing both DW and TAF * DW Event		0.0012		0.0025		-0.0007		-0.1164**		-0.0520
		(1.649)		(1.519)		(-0.183)		(-1.975)		(-0.988)
Log (Assets)$_{t-1}$	-0.0017	-0.0017	-0.0106***	-0.0106***	0.0550***	0.0550***	0.3880***	0.3873***	0.2713**	0.2714**
	(-1.234)	(-1.249)	(-2.762)	(-2.803)	(5.897)	(5.889)	(3.264)	(3.250)	(2.472)	(2.478)
Tier Ratio$_{t-1}$	0.0489***	0.0483***	0.1338***	0.1318***	0.1128	0.1104	2.8943**	2.9014**	0.2660	0.3012
	(3.869)	(3.821)	(4.047)	(3.984)	(1.570)	(1.535)	(2.250)	(2.249)	(0.240)	(0.270)
(Deposits / Assets)$_{t-1}$	0.0444***	0.0444***	0.1873***	0.1869***	0.2141***	0.2146***	2.4886***	2.5100***	0.8906*	0.8837*
	(4.987)	(5.016)	(10.718)	(10.758)	(5.238)	(5.269)	(3.723)	(3.752)	(1.773)	(1.739)
(Loans / Assets)$_{t-1}$	0.0004	0.0002	0.0045	0.0042	-0.3195***	-0.3202***	0.0678	0.0610	-0.0950	-0.0839
	(0.079)	(0.046)	(0.406)	(0.378)	(-10.241)	(-10.179)	(0.177)	(0.160)	(-0.285)	(-0.252)
(NPL / Assets)$_{t-1}$	0.0397	0.0373	-0.3549**	-0.3647**	0.1658	0.1575	1.9611	2.0725	10.5782*	10.7006*
	(0.578)	(0.536)	(-2.230)	(-2.344)	(0.369)	(0.342)	(0.326)	(0.347)	(1.692)	(1.693)
(Off-balance Sheet Assets/ Assets)$_{t-1}$	0.0052	0.0042	0.0330***	0.0301***	0.0547**	0.0507**	0.4939	0.4944	0.0147	0.0743
	(1.016)	(0.821)	(2.994)	(2.758)	(2.245)	(2.043)	(0.931)	(0.948)	(0.039)	(0.199)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,017	3,017	3,017	3,017	3,017	3,017	3,017	3,017	3,017	3,017
Adjusted R-squared	0.018	0.018	0.122	0.123	0.178	0.178	0.683	0.713	0.887	0.891