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Three Essays on Accounting Disclosure and Information Environment

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Abstract

The first paper investigates the long-run effects of fair value level disclosures on the information environment. SFAS 157 introduced mandatory disclosures about three-level fair values in 2008. Using panel data of firms' quarterly disclosures and quarterly summarized daily stock trades, we find that a higher fraction of fair value levels 2 and 3 to total assets reduces information asymmetry in the equity market. Results are consistent with the view that more disclosures improve the information environment. Furthermore, we investigated the boundaries of the primary effect. The effect is less pronounced for firms with higher-quality ex-ante information environment. The higher is the presence of dedicated institutional investors among the shareholders, the positive effect of disclosure is more pronounced, which confirms the usefulness of SFAS 157 disclosures to the market participants. On the contrary, the effect of the disclosure on the bid-ask spread attenuates with transient institutional holdings, as they are more advantageous in analyzing the newly released sophisticated disclosure contents. Results hold for both financial and non-financial firms and are robust to various specifications and estimation methods.

The second paper examines the effect of Fair value measurement levels according to SFAS 157 on information asymmetry among the U.S. corporate bonds market investors. We find that the bid-ask spread of bonds is positively associated with the ratio of total fair value to total asset, and its magnitude is higher for level 3 and level 2 assets. It implies that information asymmetry is more substantial for firms with more opaque financial assets. These results support the view that bondholders' non-linear payoff function makes them demand more conservative accounting practices. The result holds for both the financial and non-financial sectors and is robust to linear and log-linear specifications.

The third paper studies the effect of financial reporting transparency on the liquidity creation function of banks. Recent theoretical models suggest that banks are secret keepers, and by keeping information about the firms secret, banks can provide money like safe liquidity to depositors. This model implies that transparency harms liquidity creation. The previous empirical literature has treated the asset and the liability sides of banks' balance sheets separately. This study aims at connecting the two sides and measuring the effect of assets transparency on liquidity transformation. Using CALL reports, I find that Delayed Expected Loss Recognition measure of opacity and CAT FAT measure of liquidity creation are negatively associated, most significant for small banks.

Dedication

I would like to express my deepest gratitude to:

My parents and family for their love and support throughout my life;

My supervisor, Professor Peter Pope, for his guidance and patience throughout this study;

The external reviewers, Dr. Aleszczyk and Dr. Correia, for their valuable and constructive comments;

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Finally, all my Ph.D. colleagues for their compassionate friendship.

May the Lord be gracious to us.

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Chapter 1

The Impact of SFAS 157 Fair Value Disclosures on the Information Environment

In this paper, we study the long-run effects of fair value level disclosures on the information environment. SFAS 157 introduced mandatory disclosures about three-level fair values in 2008. Using panel data of firms' quarterly disclosures and quarterly summarized daily stock trades, we find that a higher fraction of fair value levels 2 and 3 to total assets reduces information asymmetry in the equity market. Results are consistent with the view that more disclosures improve the information environment. Furthermore, we investigated the boundaries of the primary effect. The effect is less pronounced for firms with higher-quality ex-ante information environment. The higher is the presence of dedicated institutional investors among the shareholders, the positive effect of disclosure is more pronounced, which confirms the usefulness of SFAS 157 disclosures to the market participants. On the contrary, the effect of the disclosure on the bid-ask spread attenuates with transient institutional holdings, as they are more advantageous in analyzing the newly released sophisticated contents. Results hold for both financial and non-financial firms and are robust to various specifications and estimation methods.

1 Introduction

This paper investigates the effect of the fair value hierarchy of information as mandated by SFAS 157 levels on the firms' information environment, specifically among its equity investors. For fiscal years starting on or after 15 November 2007, FASB introduced three measurement levels for recognized assets at fair value, and firms are required to disclose more details about their models and assumptions in the notes to financial statements quarterly. Level 1 (mark to market) assets and liabilities are directly observable at the market and are the most reliable and easily understandable by investors. Level 2 (mark to inputs) assets and liabilities are not directly observable and are determined by market quotes or models using observable inputs. Level 3 (mark to model) assets and liabilities are based on management assumptions and are calculated using various models such as discounted cash flow.

Prior literature looked at the short-term effects of SFAS 157 and mainly highlighted the adverse effects of the disclosures. It is argued that assets (and liabilities) measured at levels 2 or 3 are less verifiable and more opaque in nature; reliability concerns and the possibility of management discretion entail information risk that negatively impacts the equity market (Black et al., 2017) and the credit market (Arora et al., 2014). Particularly, Liao et al. (2013) hints that SFAS 157 disclosures hit the information environment negatively by increasing the information asymmetry among equity investors. However, our study aims at unfolding the long-term effects of SFAS 157 by analyzing a panel of firm-quarter observations over more than a decade (47 quarters from 2008Q2 to 2019Q4). We proxy the extent of fair value disclosures by the fraction of fair value assets level 2 and 3 to total asset and find it is negatively associated with our proxy for information asymmetry (bid-ask spread).

On the other hand, Fontes et al. (2018) take advantage of a European banking sample to study the effect of fair value assets recognized through net income on the information asymmetry among equity investors. They find that the use of fair value measurement by the European banks significantly reduces the bid-ask spread and the effect is twice more pronounced for banks that recognize Own Credit Risk. However, they emphasize that it is contrary to prior findings in the U.S. setting. We propose that in the U.S. setting in a longer horizon, fair value disclosures afford financial statement users useful information that was otherwise laborious and costly to acquire.

We further contribute to the literature by investigating circumstances under which fair value disclosures impact the information environment. Institutional investors, insiders, and analysts have a different degree of access to private information, accounting expertise, and interest stakes to understand and analyze certain intricate pieces of information. We examine how information asymmetry among investors, analysts' uncertainty, and information content incorporated into the stock price is affected by the fair value disclosure in the long run. We inspect institutional owners' holdings and how their heterogeneous investment orientations and styles moderate the fair value measurement disclosure usefulness.

The remainder of the paper is organized as follows. Section 2 reviews related literature. Section 3 develops our hypotheses. Section 4 explains our empirical strategy, the measurement window, and model specifications. Section 5 explores the sample and presents the descriptive analysis. Section 6 provides the multivariate results and robustness checks. Section 7 summarizes and concludes the paper.

2 Background and Related Literature

Section 2.1 reviews the history of fair value accounting and various studies that considered the effects of fair value accounting in the market outputs such as cost of capital and stock prices. Section 2.2 presents the extant literature of the information environment, its various dimensions, and proxies used in other studies. In Section 2.3, we present previous studies that looked at the effects of fair value accounting on the information environment, and we discuss aspects in which our research complements those studies and provides further insights into the literature.

2.1 Fair Value Accounting

Riedl and Serafeim (2011) investigates the effect of SFAS 157 fair value levels information risk on the cost of capital. They calculate implied betas based on a model that allows for asset-specific estimates. As financial asset opacity increases with a more magnificent appearance of level 3 assets compared to level 1 and 2, they find that implied betas increase. They analyzed contingency to the firms' ex-ante information environment by considering the number of analysts following, analyst forecast error and dispersion, and market capitalization. They find that gap between implied betas is less prominent for firms with higher quality information environment. Their research suggests that analysts' presence—considered as expert users of publicly available information—should decrease information asymmetries among investors appertaining to fair value uncertainties.

2.2 Information Environment

Piotroski and Roulstone (2004) studies the effect of investors' information environment on the stock return synchronicity at the market, industry, and firm level. They suggest that analysts' forecast activities increase intra-industry information transfers, thus positively associated with stock return synchronicity. On the contrary, insider activities increase the share of firm-specific information and reduce stock return synchronicity. Institutional traders' effect on the information environment is in the same direction as insider traders and accelerates the transfer of firm-specific future earning news into prices. They provide evidence that institutional investors' role is more similar to insiders (private information conveyors) relative analysts (public information users).

Florou and Pope (2012) takes the mandatory introduction of IFRS as an instance of improvement in the quality of financial statements and asserts that it increments the demand for equities by institutional investors. They find that in Thomson Financial Ownership (TFO) database from 45 countries averages institutional ownership level ratio of 22%. In addition to mutual funds, their sample includes other informed investors: insurance companies and pension, hedge, private equity, and venture capital funds. Primarily they utilize a difference in difference model, and as a proxy for information environment quality, they control for the number of analyst followings. They find that Percentage Ownership changes significantly from pre-IFRS to post-IFRS (in the first mandatory annual reporting) by 2.2% annually. In the same spirit, the Number of Investors changes significantly by almost 5. This evidence allows us to assume that institutional owners' investment decisions are affected mainly at the introduction of the transparency-changing regime, and in the consequent periods, such confounding effects attenuate. Furthermore, they provide evidence that active, value and growth investors' portfolios experienced the most notable expansion compared to passive, index, and income investing investors. They argue that such investors' style and orientation is essentially based on firm-specific financial accounting numbers and disclosures and heightened comparability by IFRS accommodate them to benefit the most from more distinguished quality financial statements; thus, they have a preference for such attributes.

Ramalingegowda and Yu (2012) examine the type of institutional investors and the circumstance under which they demand conservatism. They cluster institutions with long investment horizons, concentrated shareholdings, and independent from management as Monitoring Institutions. They find that monitoring institutional investors are more prone to conservative financial statements. In circumstances where direct monitoring is more costly—as in the case of more significant information asymmetry—they find that demand for conservatism is even more elevated. In order to address endogeneity concerns, they augmented the Gompers and Metrick (2001) model for residual ownership by various institutions' types and accounted for growth options and information asymmetry. The residual ownership model tries to capture economic determinants of ownership by an institution. Ramalingegowda and Yu (2012) included four categories of factors: 1)preference for prudent investments (firm age, dividend yield, S&P membership, stock price volatility) 2)liquidity and transaction cost (firm size, stock price, share turnover) 3)historical return patterns (firm size, book-to-market ratio, momentum) 4)growth options (Tobin's Q) and information asymmetry (bid-ask spread). In order to determine the direction of causality, they implemented lead-lag tests.

2.3 Fair Value Accounting and Information Environment

Muller et al. (2011) uses IAS 40 to study the effect of mandatory fair value provision in a non-financial setting. IAS 40 in 2005 requires the provision of the fair value of investment properties. Early adopters constitute a control group compared to mandatory adopters. They find that the bid-ask spread of mandatory disclosing firms reduces more than voluntary ones. Their evidence implies that fair value provision of long-lived tangible assets reduces information asymmetry among investors. However, on average, their treatment group shows a higher bid-ask spread, which they believe is associated with the lower reliability of those firms' fair values. Thus, fair value assets reliability is negatively associated with bid-ask spread, while fair value provision reduces asymmetry. In other words, their evidence supports the idea that fair values provide public information in a timelier manner than historical cost and improves the informational gap among the investors. On the flip side, the fair values reliability remains a concern that exacerbates the informational advantages of informed traders.

Ball et al. (2012) exploit how the provision of mandatory mark-to-market for securities in the SFAS No. 115 affects banks' investors' information asymmetry. They suggest that the introduction of fair value accounting affects bid-ask spread in two channels. First, the disclosure channel: MTM, compared to historical cost accounting, features financial statements with more timely disclosure, which should positively affect information asymmetry. However, providing public information may tease private information acquisition, which could affect the information asymmetry negatively. Second, the recognition channel: incorporating fair value gains and losses into earnings could negatively affect information asymmetry. They use an institutional feature of their settings to segregate their sample into 1)banks that voluntarily disclosed but did not recognize MTM, 2)banks that voluntarily disclosed and recognized MTM, and 3)banks that mandatorily used MTM. Finding increased bid-ask spread for group 3 and group 2 banks, whereas the same effect did not appear for group 1, they conclude that MTM does not benefit information asymmetry via timely disclosures and, on the contrary, worsen information asymmetry via recognition of gains and losses into earnings.

Liao et al. (2013) investigates the effect of SFAS 157 on information asymmetry among investors of U.S. banks during the financial crisis. They considered net fair value assets across three levels and find that bid-ask spread among equity investors is an increasing function of the opacity of net financial assets (level three fair values being most opaque and level one fair values being most transparent.) Furthermore, they document a significant correlation between quarterly changes of fair value level 1 and level 2 net assets and changes of bid-ask spread in the period that spread was rising (2008). Their evidence supports the idea that increased disclosure at the introduction of SFAS 157 reduced the information asymmetry while in the consequent periods, assets with more information risk are connotated with higher uncertainty among investors.

Black et al. (2017) augments Ramalingegowda and Yu (2012) study with fair value measurement and investigates effects bearing upon unverifiability of fair value level 2 and level 3 estimations on managerial discretions, which leads to demand and supply of conditional conservatism for banks. They find a positive association between less verifiable fair values with conditional conservatism. They document that the positive relation decreases with higher quality information environment and higher capital ratio through degrading the investors' demand for conservatism. Just meeting or beating the earning targets and CEO's compensation plans that are more tightly anchored to stock price and options holdings decreases the supply of conservatism, and the positive relationship between fair value and conservatism is attenuated. Board monitoring, auditor quality, and monitoring institutional ownership are mechanisms that exacerbate the positive association between less verifiable fair value assets and conditional conservatism.

Fontes et al. (2018) take advantage of a European banking sample to study the effect of fair value assets recognized through net income on the information asymmetry among equity investors. They find that the use of fair value measurement by the European banks significantly reduces the bid-ask spread and the effect is twice more pronounced for banks that recognize Own Credit Risk. They argue that timely disclosure of critical inputs for equity evaluations in an international setting-where the informational environment is less rich than the U.S.-justifies the overall positive effect on information asymmetry. In order to control for quality of information environment, they considered a dummy for the above-median number of analysts' followings and institutional ownership. Our study differs in several aspects. We focus on the role of different types of institutional investors and distinguish them from public information users such as analysts. Moreover, we consider a broader set of industries in the U.S. setting, where information richness confounding effects are substantial.

3 Hypothesis Development

SFAS 157 classifies fair value assets and liabilities into three levels, appertaining to measurement inputs' reliability. These three levels of fair value inputs denote varying levels of reliability and transparency. Fair value level 1 inputs are taken directly from the active markets and are deemed the most transparent valuation inputs by market investors. Fair value level 2 assets and liabilities have values that rely on quoted prices in inactive markets or based on models with directly or indirectly observable inputs. Fair value level 3 assets and liabilities have values discovered based on valuation techniques that demand inputs that are both unobservable and notable to the overall fair value measurement. These inputs reflect management's views about the assumptions a market participant would use in pricing the asset.

The balance sheet recognized values of levels 2 and 3 are estimated through models that rely on management's judgment or assumptions; thus, Arora et al. (2014) and Black et al. (2017) put assets level 2 and 3 together to proxy for asset reliability. The ratio of combined fair value assets 2 and 3 can also be interpreted as measuring the firm's disclosures and footnotes' breadth. The higher the ratio, the longer the section is devoted to discussing the inputs to the models and management assumptions. Such footnotes accommodate financial statement users with an opportunity to uncover more about the management's views and the firm's business model. We combine the fair value levels 2 and 3 and scale to total assets to proxy for fair value disclosures.

3.1 Information Asymmetry

Insofar as level 2 and level 3 assets rely on the managers' evaluation, they potentially have both ability and intent to manipulate such information for opportunistic purposes or excessive optimism (Holthausen, 1990). Nissim (2003)'s evidence suggests that banks manage fair values of loans to inflate the market's perception of the bank's performance. This opportunistic managers' behavior motivated prior research to predict that discretionary fair value exacerbates the information asymmetry. Specifically, traders who are regarded as uninformed and suffer an information disadvantage are less likely to adequately evaluate the information quality of fair value levels 2 and 3 assets. As a result, information asymmetry between uninformed and informed investors would be more stringent when fair value levels 2 and 3 inputs constitute a more significant portion of recognized assets' values.

However, the higher is such a portion of assets, the more information is provided publicly, which provides other investors rather than insiders with further knowledge of the firm. In a European banking setting, Fontes et al. (2018) find that the use of fair value measurement by the European banks significantly reduces the bid-ask spread. However, they emphasize that it is contrary to prior findings in the U.S. setting. We propose that, in the long run, fair value disclosures afford financial statement users useful information that was otherwise laborious and costly to acquire. Thus, we phrase our first hypothesis as follows:

Hypothesis 1a: *Ceteris paribus, information asymmetry decreases with a higher fraction of level 2 and 3 fair value assets.*

Riedl and Serafeim (2011) point out that ex-ante higher-quality information environment alleviates information risk of fair value level three discretionary estimates. In their study, firms with a higher number of analysts' following, lower analyst' forecast error, lower analyst' forecast dispersion, and higher market capitalization show a less pronounced increased cost of capital. Black et al. (2017) find a positive association between less verifiable fair values and conditional conservatism. They document that this positive relation contracts with a higher-quality information environment through diminishing the investors' demand for conservatism.

Both results are grounded on the logic that a higher-quality information environment induces higher quality disclosures in general, and particularly in the case of SFAS 157. That is, a higher-quality information environment could potentially reduce unintentional estimation error and management-induced biases in Level 2 and 3 estimates, and to the same extent, uninformed investors will be less concerned about information distortions that they are not adequately able to grasp.

However, in the long run, an ex-ante more prosperous information environment crowds out benefits deriving from an extra piece of the disclosure. Thus, we contemplate that in a higher-quality information environment, the effect of fair value disclosures on information asymmetry would be lower.

Hypothesis 1b: *The negative association between information asymmetry and the fraction of level 2 and 3 fair value assets is less pronounced for firms with ex-ante higher-quality information environments.*

In contrast to outsiders, insiders have superior information about the business, and some investors have data advantages over others. The source of such advantages could be informed investors' access to undisclosed private information or their more foremost expertise and experience to treat complex information more efficiently than uninformed traders (Verrecchia, 1983; Glosten and Milgrom, 1985). Kim and Verrecchia (1994) analytical model hints that the release of financial reporting can confer sophisticated investors with an information advantage. Acquaintances of sophisticated investors will empower them to process and interpret the new information better, which increases information asymmetry between investor types.

In the same spirit, various empirical studies on earnings announcements document an increment in information asymmetry around the news release (Lee et al., 1993; Yohn, 1998; Brown and Hillegeist, 2007). The theoretical work of Barth et al. (2003) allows investors with a higher level of expertise to collect information from disclosures at a lower cost and a faster pace, which leads to obtaining an informational advantage over investors with less expertise. The result is that reliance on disclosed rather than recognized information increases the market participant's information asymmetry.

Bushee (2001) classifies institutional investors by their turnover and diversification strategy into three categories: Dedicated, Transient, and Quasi-Indexer. Dedicated investors' portfolio consists of few large stakes. They are more prone to have business relations with the board and benefit from an informational advantage. Thus, the more dedicated investors hold shares of a firm, market maker, and other investors are at an informational disadvantage; hence, information asymmetry is more considerable. Transient investors trade on a speculative basis; thus, their style and orientation require acquiring private information, though their short horizon and small stakes make them less interested in bearing information acquisition costs. Hence, their presence increases information asymmetry but less severe than the dedicated type.

Finally, quasi-indexer investors' orientation is passive and do not seek specific information about the firm. However, their interest in a firm could act as market mechanisms that improve the information environment quality. Prior literature has used institutional ownership as a proxy for the ex-ante quality of the information environment. Quasi-indexers are the dominant category of institutional investors; hence, it is not surprising to find that institutional investors as a whole decrease information asymmetry. We suggest that only the quasi-indexer category feature such an effect. To sum up, we phrase our third hypothesis as follows:

Hypothesis 1c: *The effect of institutional ownership on information asymmetry is asymmetrical. Information asymmetry is the most positively associated with dedicated ownership, the least positively associated with transient ownership, and negatively associated with quasi-indexer ownership.*

Several studies regarding investor types document that individual investors are typically small, unsophisticated investors. They usually trade for reasons such as liquidity or rank speculation, and their trades are less motivated by an information advantage (e.g. Odean, 1999; Barber et al., 2008). Consequently, It is plausible to assume that individuals are unlikely to be advanced enough to assess footnote disclosures of fair values.

On the contrary, institutional investors are both more sophisticated and more influential price-setters in capital markets (Chan and Lakonishok, 1995; Walther, 1997; Sias et al., 2006)

Florou and Pope (2012) designate institutional investors type by investment orientation into active versus passive investors. They suggest that active investors often explore firm-specific information, including financial reporting numbers and disclosures, to optimize individual stocks' portfolio weights. On the contrary, passive investors do not attempt to acquire security-specific aspects and base their decisions on rules that are less dependent on financial reporting information.

Fiechter and Novotny-Farkas (2017) argues that passive investors do not trade based on fundamentals since passive investment trades rely on following a benchmark index, causing passive institutions' buying and selling behaviors to be closely correlated and less sensitive to the opacity of fair value assets. Thus, we predict that information asymmetry arising from fair value level two and level three assets increases with active investors' ownership holdings.

We contemplate that where dedicated investors are prevalent, the firm's disclosures are the most useful to other investors. However, where there are more quasi-indexer and transient investors, such disclosures can give some of them an informational advantage. Specifically, transients' trade on information on a speculative basis. Their orientation and style could benefit from information processing. Thus, their expertise could help them process footnote disclosures in a way that other investors cannot do so. Our fourth hypothesis comes as following:

Hypothesis 1d: *The negative association between information asymmetry and the fraction of level 2 and 3 fair value assets is moderated asymmetrically by institutional holding types. The effect of fair value disclosures is the strongest for firms with higher dedicated ownership (negative moderation effect). The effect of fair value disclosures is weakest for firms with higher transient ownership (the most positive moderation effect). The moderation effect of quasi-indexer ownership is the least positive.*

3.2 Analysts' Uncertainty

Hypothesis 2a: *Ceteris paribus, analyst uncertainty regarding fair value related forecasts increases with lower asset reliability (higher fraction of level 2 and 3 fair value assets).*

Hypothesis 2b: *Ceteris paribus, analyst uncertainty regarding forecasts not sensitive to fair value is not associated with asset reliability (higher fraction of level 2 and 3 fair value assets).*

Hypothesis 2c: *The positive association between analyst uncertainty regarding fair value-related forecasts and the fraction of level 2 and 3 fair value assets is less pronounced for firms with higher-quality information environments.*

3.3 Price Information Content

Hypothesis 3a: *Ceteris paribus, synchronicity is positively associated with a higher fraction of level 2 and 3 fair value assets.*

Hypothesis 3b: *The positive association between synchronicity and the fraction of level 2 and 3 fair value assets is less pronounced for firms with ex-ante higher-quality information environments.*

Hypothesis 3c: *The positive association between synchronicity and the fraction of level 2 and 3 fair value assets is more pronounced for firms with higher dedicated institutional ownership.*

Hypothesis 3d: *The moderation effect of institutional ownership is the strongest for firms with higher dedicated institutional investors, then quasi-indexers, then transient investors.*

4 Research Design

4.1 Measurement Window

In order to test hypotheses regarding the effect of fair value assets disclosure on information asymmetry (Hypothesis 1a to Hypothesis 1d), we examine how releasing financial statements and their footnotes affect bid-ask spread. Disclosures are made quarterly, while trades can happen daily. We could contemplate three variants of measurement windows:

- *Contemporaneous Quarters:* Some studies take average bid-ask spread over the calendar quarter and match with firm disclosures made at the end of the same quarter (Figure 1.1 panel a). This setup allows the researchers to preserve more quarters in the sample and is used frequently in studies that focus on the banking sector, where fiscal quarters and calendar quarters mostly coincide(see: Liao et al., 2013; Fontes et al., 2018). However, this approach puts the disclosures come after trades, thus, lacks internal validity.

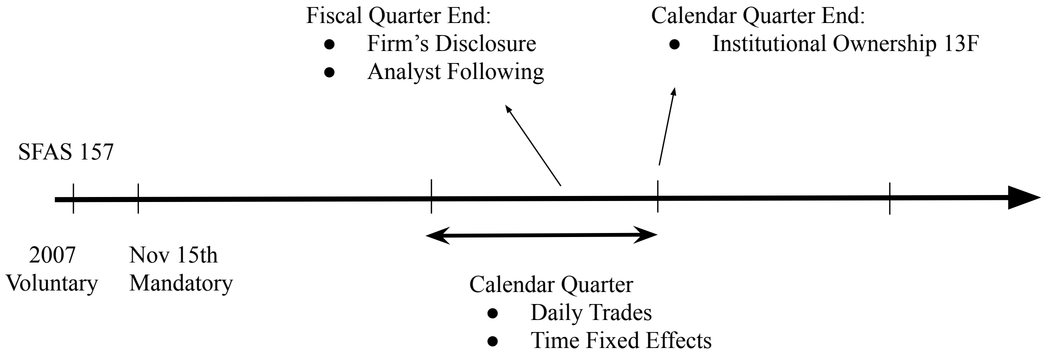
- *Based on Calendar Quarter:* We consider calendar quarters as periods of trades and calculate the average bid-ask spread over each quarter for each firm. Fair value values and other balance-sheet-taken data are from the earliest fiscal quarter before starting the trading quarter (Figure 1.1 panel b). This identification strategy has the advantage of allowing for time fixed effects to control for the same time window for all firms. However, firms' fiscal quarter end is not the same and could be for some firms a new disclosure be released during the trading quarter.

- *Based on Fiscal Quarter:* We allow two months following each fiscal quarter end to be sure that financial statements are made publicly available to market participants, and they could analyze them. Then, we consider a time window of three months for trades and take the average bid-ask spread of all daily trades (Figure 1.1 panel c). In this format, our trading window is not as stable as alternative 1, and time fixed effects are not as accurate, while we are more confident with the internal validity of causality from disclosures into market outputs.

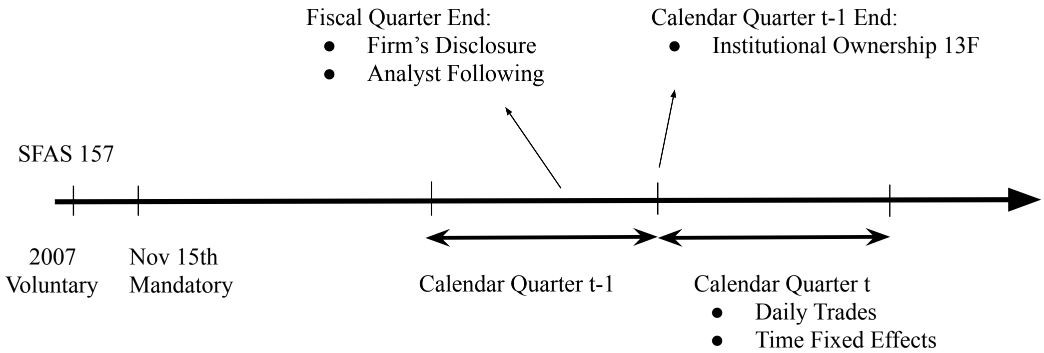
Primarily we present the results based on Calendar Quarters while other measurement window choices are left as a sensitivity analysis.

Figure 1.1: Measurement Windows for Disclosures, Trades and Information Environment

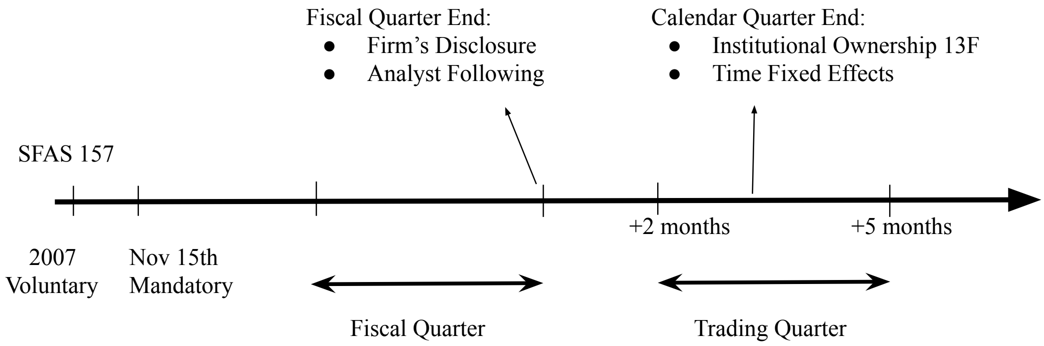
(a) Contemporaneous Quarters



(b) Based on Calendar Quarter



(c) Based on Fiscal Quarter



4.2 Model Specifications

To test our hypothesis that a higher fraction of fair value assets level 2 and 3 is negatively associated with information asymmetry (Hypothesis 1a) and moderator effects (Hypothesis 1b to Hypothesis 1d), we regress the information asymmetry proxy (bid-ask spread) on the ratio of level 2 and level 3 fair value assets to total assets, interaction terms and control variables. Cheng et al. (2011) suggests a linear model to test the informational effects of disclosures on the bid-ask spread. Equation 1.1 is our linear specification (subscripts for firm and quarter are omitted, and the measurement window is discussed in Section 4.1):

$$\begin{aligned}SPREAD = {} & \boldsymbol{\beta_1} FVA23 + \beta_2 SIZE + \beta_3 ANALYST + \beta_4 PROFIT \\ & + \beta_5 LEV + \beta_6 RETVOL + \beta_7 PRICE + \beta_8 TURN \\ & + \boldsymbol{\beta_9} IO\_ded + \boldsymbol{\beta_{10}} IO\_tra + \boldsymbol{\beta_{11}} IO\_qix + \boldsymbol{\beta_{12}} FVA23 * ANALYST \\ & + \boldsymbol{\beta_{13}} FVA23 * IO\_ded + \boldsymbol{\beta_{14}} FVA23 * IO\_tra + \boldsymbol{\beta_{15}} FVA23 * IO\_qix \\ & + FirmFE + QuarterFE + \varepsilon\end{aligned} \tag{1.1}$$

- *SPREAD* is the proxy for information asymmetry. For each firm, it is the mean daily bid-ask spread over the trading days of the quarter. To calculate the daily bid-ask spread, the difference between the daily closing ask price and the daily closing bid price is scaled by their midpoint (see Liao et al., 2013; Fontes et al., 2018).
- *FVA23* is the sum of levels 2 and 3 fair value assets scaled by total assets.
- *SIZE* is the natural logarithm of the book value of assets.
- *ANALYST* is the number of analysts following the firm.
- *PROFIT* is the ratio of net income to total assets.
- *LEV* is the ratio of total liability to book value of equity.

- $RETVOL$ is the return volatility measured as the standard deviation of daily dividend-adjusted stock returns during the trading quarter.

- $PRICE$ is the mean daily stock closing price over the trading quarter.

- $TURN$ is the average daily turnover during the trading quarter (daily turnover is measured as the number of shares traded divided by the number of shares outstanding at the end of each day).

- IO_ded is the number of shares of the firm holding by dedicated institutional owners divided by the total number of shares outstanding at the end of the prior calendar quarter.

- IO_tra is the number of shares of the firm holding by transient institutional owners divided by the total number of shares outstanding at the end of the prior calendar quarter.

- IO_qix is the number of shares of the firm holding by quasi-indexer institutional owners divided by the total number of shares outstanding at the end of the prior calendar quarter.

Hypothesis 1a predicts a negative sign for β_1 and Hypothesis 1b predicts a positive sign for β_{12}. Hypothesis 1c predicts that β_9 and β_{10} to be positive ($\beta_9 > \beta_{10}$) and β_{11} to be negative. Hypothesis 1d predicts that β_{14} and β_{15} to be positive ($\beta_{14} > \beta_{15}$) and β_{13} to be negative.

Prior analytical models (e.g. Glosten and Milgrom, 1985; Stoll, 2000) indicate a multiplicative form between bid-ask spread and explanatory variables. Thus in Equation 1.2 we use continuous variables in the model in natural logarithm to provide OLS (Ordinary Least Squares) estimations both in linear and log-linear specifications (Leuz and Verrecchia, 2000; Leuz, 2003; Liao et al., 2013; Fontes et al., 2018):

$$
\begin{aligned}
lnSPREAD = \boldsymbol{\beta_1} lnFVA23 &+ \beta_2 MKTSIZE + \beta_3 lnANALYST \\
&+ \beta_4 LOSS + \beta_5 lnLEV + \beta_6 lnRETVOL + \beta_7 lnPRICE \\
&+ \beta_8 lnTURN + \boldsymbol{\beta_9} lnIO\_ded + \boldsymbol{\beta_{10}} lnIO\_tra + \boldsymbol{\beta_{11}} lnIO\_qix \\
&+ \boldsymbol{\beta_{12}} lnFVA23 * lnANALYST + \boldsymbol{\beta_{13}} lnFVA23 * lnIO\_ded \\
&+ \boldsymbol{\beta_{14}} lnFVA23 * lnIO\_tra + \boldsymbol{\beta_{15}} lnFVA23 * lnIO\_qix \\
&+ FirmFE + QuarterFE + \varepsilon
\end{aligned}
\tag{1.2}
$$

- *lnSPREAD* is the natural logarithm of 1 plus SPREAD.
- *lnFVA23* is the natural logarithm of 1 plus FVA23.
- *MKTSIZE* is the natural logarithm of the market value of assets (sum of Market capitalization and total liabilities book value).
- *lnANALYST* is the natural logarithm of 1 plus the number of analysts following the firm. If no analyst follows the firm, it is set to 0.
- *LOSS* is a dummy variable that takes a value of 1 when net income is negative, and it takes 0 otherwise.
- *lnLEV* is the natural logarithm of 1 plus the ratio of the total liabilities to the total assets.
- *lnRETVOL* is the natural logarithm of RETVOL.
- *lnPRICE* is the natural logarithm of PRICE.
- *lnTURN* is the natural logarithm of TURN.
- *lnIO_ded* is the natural logarithm of 1 plus IO_ded
- *lnIO_tra* is the natural logarithm of 1 plus IO_tra

- *lnIO_qix* is the natural logarithm of 1 plus IO_qix

To account for the decreasing trend in the bid-ask spread over time, we include quarter fixed effects (Chordia et al., 2008; Ball et al., 2012; Fontes et al., 2018). We include firm fixed effects to control for the firm's business model and other constant unobservable characteristics of the firm. Robust standard errors clustered by firms are performed to adjust for within-firm covariances (Wooldridge, 2003). As a sensitivity analysis, to account for within-quarter correlations, we also present results with two-way clustering across firms and quarters (Petersen, 2008; Gow et al., 2010; Abadie et al., 2017).

We split our sample between financial firms (SIC code between 6000 and 7000) and non-financial firms. In each sample, all covariates are winsorized at 1% and 99% to mitigate that extreme values bias our results. Many firms report 0 fair value assets. To prevent a specific high-frequency value from driving our results, we further divide the sample into three types. Looking at all periods:

1. Firms that never report any fair value
2. Firms that in some quarters report 0 fair value and other quarters report positive values
3. Firms that report strictly positive values for fair value assets in all quarters

First, We run the analysis for All firms, then we exclude type 1 firms, and then we exclude type 2 firms and repeat the regressions for them.

Institutional Ownership classfications

Bushee (2001) classifies institutional investors by their turnover and diversification strategy into three categories of Dedicated, Quasi-Indexer, and Transient:

- *Dedicated*: low turnover and low diversification. They have a long investment horizon, their portfolio consists of few large stakes, and their investment orientation is considered active.

- *Transient*: have a short horizon with many small stakes. Their investment orientation is considered to be active but on a speculative basis rather than a fundamental basis.

- *Quasi-indexer*: low turnover but high diversification. They have a long investment horizon, but their portfolio is populated by many small stakes. Their investment orientation is considered to be passive similar to index funds.

5 Data and Descriptive Statistics

5.1 Sample Selection

We obtained firms' data and fair value disclosures from COMPUSTAT North America based on a quarterly frequency. Common stock trades and characteristics are primarily from CRSP with a daily frequency and are summarized on a quarterly basis. Institutional ownership holdings are from Thomson Reuters 13F filers with calendar quarter frequency. Analysts' forecast statistics are taken from I/B/E/S summary history files with a monthly frequency. FASB mandated SFAS 157 for fiscal years starting on or after 15 November 2007, although, through 2007, it was a voluntary practice. We focus on mandatory disclosures to prevent sample selection related to voluntary disclosure choices confound our long-run analysis. Thus, we start investigating trades from 2008 Q1 to 2019 Q4. In this 48 quarters, there are 36,007 firm-quarters belonging to 1,277 financial sector firms (SIC 6000 to 7000).

We apply several criteria to trades and disclosures, summarized in Table 1.1. First, we exclude quarters that match with disclosures older than three months ago to isolate an immediate financial information release effect on the trades. 2 financial firms have at least one quarter with total fair value assets greater than total assets. Such fair values do not reflect SFAS 157 levels. Manual investigations of disclosure notes indicate that databases have incorporated fair value disclosures of assets recognized at historical cost into the total fair value asset variable. We exclude such firms and their quarters from the sample to focus on SFAS 157. 10 financial firms have issued multiple common stocks. We keep the common stock with the highest market capitalization and exclude quarters belonging to less outstanding issues such that the final sample contains one observation per firm-quarter unit. Then we exclude any trading quarter with a negative mean bid-ask spread and any quarter with stock split and other corporate actions adjustment (price and share) factors equal to zero (*CRSP cfacpr=0*). Each quarter can have at most around 60 trading days. We require that there is at least one actual trade and more than or equal to 25 quotes. Applying such filters, no observation in 2008 Q1 is valid.

In the period of 2008 Q2 to 2019 Q4, looking at the time series of trading quarters for each firm, there are 1 to 47 observations. We keep only firms with more than or equal to 25 quarters to have valid inferences. Eventually, there are 31 financial firms that exhibit negative book value equity in any of the remaining quarters. Such firms with book value assets less than liabilities are likely to be in financial distress, and their bid-ask spread reflects more their credit risk than information asymmetry. Excluding such firms we are left with 27,356 quarters that belong to 651 financial firms.

In our main analysis we exclude firms that never reported any positive fair value assets (26,908 quarters and 640 financial firms). Then we restrict our sample further to firms that never have any zero total fair value assets in any of the quarters (21,960 quarters and 517 financial firms). Also, we repeat the analysis for all the valid firm-quarters regardless of their fair value type.

Table 1.1: Sample Selection

Criteria	**Firm_Quarters**				**Firms**	
			Fin	*Non Fin*	*Fin*	*Non Fin*
0 CRSP since 2008 Q1 to 2019 Q4	175,265	100%	36,007	139,258	1,277	5,398
1 more than 3 months ago	420	0%	62	358	40	196
2 FVa not reliable	91	0%	32	59	2	6
3 secondary stock	2,182	1%	228	1,954	10	89
4 negative spread	2	0%	1	1	1	1
5 split not reliable	57	0%	0	57	0	2
6 less than 25 quote	1,159	1%	207	952	206	945
7 no trade in quarter	5	0%	2	3	2	3
8 less than 25 quarter	37,839	22%	6,882	30,957	585	2,745
9 distressed firm	20,799	12%	1,237	19,562	31	512
valid since 2008 Q2	112,711	64%	27,356	85,355	651	2,087
excluding always 0 FVa firms	99,789	57%	26,908	72,881	640	1,774
always positive FVa firms	50,363	29%	21,960	28,403	517	705

[a] U.S. stock trades succeeding mandatory SFAS 157 disclosures.

[b] Data Source: CRSP, COMPUSTAT North America.

5.2 Descriptive Analysis

The final sample consists of 27,356 firm-quarters that belong to 651 financial sector institutions and 85,355 firm-quarters belonging to 2,087 non-financial sector firms. We winsorized the final sample (before excluding zero fair value asset firms) for each financial and non-financial sectors at 1% and 99% level to prevent extreme values affect our analysis.

Table 1.2 reports distribution of the covariates separately for financial and non-financial sectors. Each firm's time-series consist of at least 25 quarters, though more than 50% of firms have 47 quarters. Number of firms per quarter for financial sector varies between 492 and 650. The measure of information asymmetry (SPREAD) is in range of 1.38 to 1120.11 basis points. The fair value measure (FVA23) is in range of 0 to 94.53 percentage point. Almost 10% of observations have 0 or close to zero fair value assets level two and three. Median of 15.76%, mean of 22.14% and standard deviation of 21.85%.

Turning to the institutional ownership measures, all three dedicated, transient, and quasi-indexers have lower median, mean, and standard deviation of ownership percentages in the financial sector than non-financial sector firms. For financial firms, Dedicated institutional ownership is on average 3.92% while transient is 7.86% and quasi-indexer is 27.22%. It implies that most of the institutional ownership is passive and long-run, with small stakes.

Our panel analysis includes firm and quarter fixed effects; therefore, it is insightful to look at within and between variations. Our primary analysis considers financial firms excluding firms with always zero fair value assets. Thus, Table 1.3 provides the summary statistics for firms with at least one quarter of positive total fair value assets. It looks at the time series of each firm and calculates the mean values across the quarters. The overall mean among all firm-quarters and range of mean values among firms is reported. Furthermore, the overall standard deviation of all firm-quarters is broken into between firms and within firms standard deviations.

Total fair value assets to total assets ratio (FVA) is in the range of 0.01% to 96.03% and within variation of 8.92% which is much smaller than the between variation of 22.63%.

Apart from the total fair value measure, the combination of fair value assets level two and three has the highest within variation (8.25%) compared to other fair value measures, supporting us in choosing FVA23 as the main fair value measure.

Table 1.4 provides the correlation matrix of covariates in the final sample (before excluding zero fair value firms) separately for financial and non-financial firms. Correlation of bid-ask spread and fair value assets 2 and 3 for financial firms is low but negative in both sectors, though, it is stronger for financial firms (-0.15 compared to -0.03). There is no sign of multicollinearity, though, as it is expected there is a strong correlation between the number of analysts following and the firm size (0.69).

Table 1.2: Descriptive Statistics

Variables	**Sector**	**n**	**min**	**p01**	**p10**	**p25**	**p50**	**p75**	**p90**	**p99**	**max**	**mean**	**sd**
SPREAD	fin	27,356	1.38	1.38	3.23	7.4	24.01	135.62	366.91	1119.86	1120.11	119.39	209.16
	non fin	85,355	1.25	1.25	2.26	4.17	10.41	40.45	183.64	620.79	620.81	56.11	111.34
FVA23	fin	27,356	0	0	0.01	6.98	15.76	29.4	55.68	94.53	94.53	22.14	21.85
	non fin	85,355	0	0	0	0	0	1.24	14.29	62.31	62.32	4.32	11.37
SIZE	fin	27,356	3.31	3.31	5.83	6.64	7.61	9.01	10.45	13.64	13.64	7.9	1.92
	non fin	85,355	2.35	2.35	3.88	5.24	6.69	8.14	9.41	11.46	11.46	6.69	2.06
MKTSIZE	fin	27,356	3.48	3.48	5.94	6.71	7.71	9.11	10.56	13.62	13.62	8	1.91
	non fin	85,355	2.58	2.58	4.26	5.7	7.24	8.67	9.94	12.1	12.1	7.18	2.13
LEV	fin	27,356	0.09	0.09	0.82	3.07	7.18	9.4	11.49	22.08	22.09	6.78	4.3
	non fin	85,355	0.06	0.06	0.2	0.43	0.9	1.67	2.77	8.78	8.79	1.32	1.42
PROFIT	fin	27,356	-4.75	-4.75	-0.13	0.11	0.23	0.38	1.27	5.89	5.89	0.37	1.2
	non fin	85,355	-24.3	-24.29	-4.01	-0.3	0.95	2.04	3.4	8.52	8.52	0.02	4.65
PRICE	fin	27,356	1.75	1.75	5.69	10.1	17.67	32.61	57.3	221.47	221.51	28.29	33.77
	non fin	85,355	0.91	0.91	3.75	9.29	22.15	44.86	79.38	394.24	394.29	37.86	54.28
TURN	fin	27,356	1.44	1.44	5.07	11.72	30.67	62.96	105.89	275.05	275.58	46.29	49.19
	non fin	85,355	4.1	4.1	16.55	36.79	65.9	109.77	176.64	468.81	468.82	87.07	79.29
RETVOL	fin	27,356	70.34	70.34	107.23	134.77	179.21	274.66	445.98	971.85	972.04	237.02	166.79
	non fin	85,355	75.54	75.55	121.8	163.41	230.73	333.15	472.34	995.92	996.06	274.05	164.81
ANALYST	fin	27,356	0	0	0	0	2	7	14	28	28	4.87	6.31
	non fin	85,355	0	0	0	1	5	11	19	33	33	7.47	7.76

Table 1.2: Descriptive Statistics *(continued)*

Variables	**Sector**	**n**	**min**	**p01**	**p10**	**p25**	**p50**	**p75**	**p90**	**p99**	**max**	**mean**	**sd**
IO_ded	fin	27,356	0	0	0	0	0.29	6.17	12.02	28.16	28.18	3.92	5.94
	non fin	85,355	0	0	0	0	1.55	7.6	15.29	31.26	31.26	4.93	6.79
IO_tra	fin	27,356	0	0	0	0.35	5.42	12.6	19.92	35.2	35.23	7.86	8.33
	non fin	85,355	0	0	0	2.9	10.16	18.23	26.3	41	41.01	11.79	10.17
IO_qix	fin	27,356	0	0	0	5.62	25.85	45	57.42	76.59	76.59	27.22	21.83
	non fin	85,355	0	0	0	12.84	40.89	56.12	66.87	83.24	83.24	36.44	24.67
n_quarter	fin	27,356	25	25	32	42	47	47	47	47	47	43.28	6.31
	non fin	85,355	25	25	31	41	45	47	47	47	47	42.55	6.26
n_firm	fin	27,356	492	492	511	556	591	624	642	650	650	585.9	46.55
	non fin	85,355	1208	1208	1611	1739	1881	1987	2033	2055	2055	1839.2	188.53

Note:

Descriptive Statistics of pooled firm-quarters in the final sample by sector.

[a] n: number of observations

[b] min-max: minimum and maximum value in the sector.

[c] p01-p99: 1 percentile to 99 percentile in the sector.

[d] mean: overall mean value in the sector.

[e] sd: overall standard deviation of values in the sector.

Table 1.3: Within-Between Descriptive Statistics

Variable	Mean			Standard Deviation		
	Overall	*Min*	*Max*	*Overall*	*Between*	*Within*
SPREAD	118.58	2.15	922.77	208.54	166.52	129.49
FVA	26.2	0.01	96.03	24.21	22.63	8.92
FVA1	3.97	0	51.24	9.53	8.2	4.88
FVA2	19.4	0	75.81	18.21	16.66	6.95
FVA3	3.02	0	89.86	13.35	13.14	4.56
FVAd	-0.14	-8.99	0.26	1.02	0.93	0.33
FVA23	22.51	0	94.42	21.84	20.36	8.25
FVA23d	22.15	0	94.4	21.48	20.11	7.98
SIZE	7.93	3.31	13.64	1.91	1.86	0.37
MKTSIZE	8.03	3.48	13.62	1.89	1.84	0.39
LEV	6.85	0.09	21.33	4.28	3.96	1.67
PROFIT	0.36	-3.68	5.02	1.18	0.8	0.88
PRICE	28.38	2.07	221.51	33.95	28.17	17.76
TURN	46.27	2.46	229.63	49.1	39.4	29.66
RETVOL	235.83	96.45	692.08	165.57	80.6	146.79
ANALYST	4.89	0	25.5	6.32	5.62	2.66
IO_ded	3.94	0	27.16	5.95	3.41	4.93
IO_tra	7.89	0	32.49	8.32	6.25	5.56
IO_qix	27.35	0	68.85	21.8	18.4	11.75

Note:

Sample of financial firms excluding always zero FV assets firms.

[a] Overall standard deviation: standard deviation of pooled firm-quarters

[b] Between standard deviation: standard deviation of mean values for each firm over its quarters

[c] Within standard deviation: mean of standard deviations for each firm over its quarters

Table 1.4: Correlation Matrix

	SPREAD	FVA23	SIZE	MKTSIZE	LEV	PROFIT	PRICE	TURN	RETVOL	ANALYST	IO_ded	IO_tra	IO_qix
SPREAD	1	-0.03	-0.55	-0.09	-0.25	-0.32	-0.16	0.05	-0.45	0.19	-0.06	0.15	0.29
FVA23	-0.15	1	-0.6	-0.26	0.44	-0.39	0.05	-0.01	0.64	-0.48	0.1	0.25	0.1
SIZE	-0.47	0.23	1	-0.12	-0.36	-0.09	0.07	0.97	0.2	0.69	0.09	0.05	-0.27
MKTSIZE	-0.5	0.2	0.99	1	-0.19	-0.03	0.07	0.35	0.18	0.23	0.02	-0.16	-0.19
LEV	0.22	-0.06	0.23	0.18	1	-0.13	0.09	0.33	0.37	0.2	0.01	0.2	-0.13
PROFIT	-0.15	0.01	0.01	0.09	-0.26	1	0.02	0.25	0.32	0.39	0.06	0.11	-0.28
PRICE	-0.22	0.09	0.38	0.43	-0.12	0.21	1	0.18	0.35	0.02	-0.06	-0.07	0.15
TURN	-0.38	0.12	0.41	0.44	-0.14	0.07	0.14	1	0.31	0.03	-0.4	0.02	0.25
RETVOL	0.51	-0.08	-0.21	-0.22	0.16	-0.2	-0.19	0.19	1	0.06	0.19	0.3	0.36
ANALYST	-0.37	0.12	0.69	0.72	-0.08	0.15	0.29	0.49	-0.14	1	0.05	0.31	0.19
IO_ded	-0.24	0.04	0.26	0.28	-0.12	0.08	0.25	0.11	-0.22	0.19	1	0.03	0.22
IO_tra	-0.36	0.04	0.27	0.3	-0.17	0.11	0.11	0.44	-0.11	0.38	0.25	1	0.51
IO_qix	-0.45	0.06	0.42	0.46	-0.15	0.16	0.24	0.4	-0.19	0.51	0.33	0.63	1

[a] Pearson Correlation in the pooled sample of firm-quarters excluding always zero FV asset Firms.

[b] Upper triangle: Non Financial firms (72,881 observations).

[c] Lower triangle: Financial Firms (26,908 observations).

6 Results and Discussion

6.1 Fair Value and Information Asymmetry

Table 1.5 to Table 1.9 present results and sensitivity analysis for Hypothesis 1a to Hypothesis 1d. Table 1.5 provides results for regression of the quarterly average of bid-ask spread on the ratio of fair value levels 2 and 3 and other controls variables as specified linearly in Equation 1.1. The analysis is performed for the sample of financial firms excluding firms with always zero fair value assets.

Main Results

Table 1.5 column (6) contains all the coefficients of the interests. The coefficient of FVA23 (percentage of fair value level 2 and 3 to total assets) is negative and significant, confirming Hypothesis 1a. Controlling for time-invariant firm characteristics using firm fixed effects and time trend of bid-ask spread using quarter dummies, the OLS coefficient is -0.572. Standard errors are clustered at the firm level to make the inference robust to heteroskedasticity and within-firm error correlations. That is, one percent increase in fair values leads to almost 0.6 basis point decrease in the bid-ask spread. Firms that a higher proportion of their assets is reported at fair values level 2 and 3 are supposed to provide more disclosures to the public about their underlying models and assumptions, which leads to a lower asymmetry of information among equity investors.

The coefficient of SIZE is negative and significant as expected. Larger firms receive more attention from the market, which requires them to enhance their disclosures, thus, have a higher quality information environment and should show minor information asymmetry among investors. The coefficient of the number of analysts following the firm (ANALYST) is not significant due to its high correlation with SIZE. Surprisingly, the net income ratio to total assets (PROFIT) also does not show any significant effect.

Leverage (LEV) is our proxy for credit risk. The higher is the ratio of liabilities to equity, the common stocks of the firm are riskier, and the credit component of the bid-ask spread should increase. We find a positive and significant effect on leverage. Stock Return

Volatility (RETVOL) is a proxy for the market maker's price risk of holding inventory. We find a positive effect on inventory holding risks in line with prior research.

PRICE is a proxy for fixed order processing costs. It has a negative correlation with SPREAD (-0.22). Surprisingly, in the multivariate analysis controlling for firm and time fixed effects, we find a significant positive effect. Prior research, without a two-way fixed effect specification, suggests a negative effect in line with the correlation sign (see: Cheng et al., 2011; Fontes et al., 2018).

TURN is a proxy for stock liquidity. It is expected that higher stock turnover measured as the average of daily traded stocks to outstanding shares be negatively associated with the bid-ask spread. Stocks with higher turnover are more liquid; thus, market makers' opportunity cost of holding security is lower. We also find a positive and significant coefficient for this measure.

Hypothesis 1b states that higher ex-ante information environment quality moderates effects of fair value disclosures on information asymmetry. Specifically, we find that the coefficient of FVA23 is negative, and the coefficient of the interaction of FVA23 and ANALYST is positive. The higher the proportion of fair value level 2 and 3 firms has to disclosure more in the footnotes. However, more analysts' ex-ante presence makes some new information release less surprising and less useful to firms' outsiders. This result infers that SFAS 157 disclosures provide useful information to the investors, especially when other sources of information are scarce.

Hypothesis 1c suggests that institutional ownership orientation an asymmetric effect on the bid-ask spread. Dedicated and transient investors are considered active. Specifically, dedicated investors' high stakes motivate them to obtain private information, which puts market makers at an informational disadvantage. To compensate for their expected loss in trading with informed traders, market makers increase the bid-ask spread. Transients also are active and might seek some private information, though their short-horizon undermine such costly activities. We find that the coefficient of both IO_ded and IO_tra are positive, though only significant for dedicated investors.

On the contrary, Quasi-indexer owners are passive. Thus, they are not motivated to trade on the information. However, their presence plays a role as market attention to the firm. Similar to SIZE, we find a positive and significant coefficient for IO_qix, suggesting that higher holding by passive investors improves the information environment quality, which leads to lower information asymmetry among investors.

Hypothesis 1d looks at the institutional ownership types as moderators to the effect of fair value disclosures on information asymmetry. Dedicated investors have access to private information and give them an information advantage compared to the market maker and other traders. Fair value footnotes give access to information that was hard and costly for other investors to obtain otherwise. The higher is the presence of more informed investors; we expect the benefits of disclosing to the users of the financial statements to be more notable. When there are more advantageous players with information rent, benefits to public disclosures are more substantial. We find that the coefficient of interaction between FVA23 and IO_ded is negative and significant, while the coefficient of interaction between FVA23 and IO_tra and between FVA23 and IO_qix is positive and significant. This evidence supports the idea that more extensive disclosures decrease information asymmetry further if shareholders with big stakes are more present ex-ante. On the contrary, such disclosures provide more experienced and expert investors with informational advantages when such investors hold small stakes (transient and quasi-indexer), thus increasing information asymmetry.

Sensitivity Analysis

Prior analytical models (e.g. Glosten and Milgrom, 1985; Stoll, 2000) indicate a multiplicative form between bid-ask spread and explanatory variables. Thus, some empirical studies used a log-linear specification (Leuz and Verrecchia, 2000; Leuz, 2003; Liao et al., 2013; Fontes et al., 2018). Table 1.5 provides results for regression of the logarithm of 1 plus the quarterly average of bid-ask spread on the ratio of 1 plus fair value levels 2 and 3 and other controls variables in logarithm as specified in Equation 1.2. The analysis is performed for the sample of financial firms excluding firms with always zero fair value assets.

Looking at Table 1.5 column (6), one can confirm that our results are robust to the model specification. Coefficient of lnFVA23 is negative and significant, confirming Hypothesis 1a. Interaction of lnFVA23 and lnANALYST is also positive, though not significant. In columns (4) and (5), we removed institutional investors variables, and the coefficient of interest becomes larger and significant. It hints that the lack of significance in column (6) could be due to multicollinearity. It is expected that firms with more institutional investors also have more analysts following-though not a perfectly linear relationship.

Turning to institutional holdings and their stakes, we again find an asymmetric effect. Coefficients of both IO_ded and IO_tra are significantly positive, and the magnitude of the effect is stronger for the dedicated type. The coefficient of IO_qix is negative and significant. Thus, Hypothesis 1c is confirmed. The coefficient of interactions with FVA23 also shows an asymmetrical trend. The positive effect of fair value on information asymmetry is less prominent as quasi-indexer investors' holdings increase (statistically significant) while the effect is intensified by dedicated investors' holdings (though not statistically significant). Overall, this evidence is in line with predictions of Hypothesis 1d.

To estimate Equation 1.1 we included firm fixed effects and quarter fixed effects. Thus, OLS coefficients estimate within-firm effects controlling for time trends. Table 1.7 provide results for the sample of financial firms excluding firms with always zero fair value assets using alternative estimation methods. Column (1) is our main specification where standard errors are clustered at the firm level to make the inference robust to heteroskedasticity and within-firm error correlations.

Petersen (2008) emphasizes that in case of regressing bid-ask spread on stock price, volatility, and trade volume, it is expected that the residuals to be correlated across observations on the same firm in different time units. Cameron and Miller (2015) illustrates that in such case, only including firm fixed effects still results in downward biased standard errors. Thus, in our primary analysis, we used one-way clustering for within-firm correlations to mitigate such concerns. However, a valid concern could be that residuals might also be correlated across observations on the same quarter for different firms. However, it is plausible to assume that clustering is due to shocks that are the same across all observations in a given quarter, in which case, Cameron and Miller (2015) suggest including quarter dummies in the regression will absorb within-quarter clustering.

Though we believe including quarter-fixed effects absorbs within quarter clustering, Table 1.7 column (2) provides standard errors of two-way clustering at firm and quarter clusters (see: Thompson, 2011; Cameron, Gelbach, et al., 2012). While our results survive such a stringent test, we lose some efficiency in the inference (standard errors are inflated in two-way clustering compared to one-way clustering).

Our primary measure of fair value disclosures is the ratio of the combination of fair values level 2 and 3 assets to total assets. Fair Value Level 2 assets and liabilities have values that rely on quoted prices in inactive markets or based on models with directly or indirectly observable inputs. Fair Value Level 3 assets and liabilities have values discovered based on valuation techniques that demand inputs that are both unobservable and notable to the overall fair value measurement. These inputs reflect management's views about the assumptions a market participant would use in pricing the asset. Arora et al. (2014) and Black et al. (2017) put together both level 2 to measure for asset reliability since the recognized value of both on the balance sheet is estimated through models that rely on management's judgment or assumptions. The ratio of combined Fair Value assets 2 and 3 can also be interpreted as measuring the firm's disclosures and footnotes' breadth. The higher the ratio, the longer the section is devoted to discussing the inputs to the models and management assumptions. Such footnotes provide readers with an opportunity to know more about the view of management and the firm's business model. Table 1.8 presents results for alternative fair value measures.

Our primary analysis focused on the sample of financial firms excluding firms with always zero fair value assets. We chose such a sample to mitigate a cluster of zero values derives or bias our result. Table 1.9 provides the result for other sample choices, which are based on OLS estimation of linear specification of Equation 1.1. Firm and quarter fixed effects are included in the model. Standard errors are clustered at the firm level to correct for correlated errors within-firm across different quarters.

Column (1) repeats the primary analysis of the sample of all financial firms. Column (2) excludes firms with always zero fair value assets, thus is our leading benchmark. Column (3) further restricts the sample to firms with positive total fair values across all quarters. Column (4) switches the sample to all non-financial firms. Column (5) excludes non-financial firms with always zero fair value assets, and column (6) restricts the sample to non-financial firms that have positive total fair value assets across all quarters. Looking at column (5), we confirm that our results also hold for non-financial firms, which is surprising given the very low correlation between SPREAD and FVA23 among non-financial firms (excluding always-zero-fair-value-asset firms, the correlation is -0.07 while keeping all non-financial firms correlation is -0.03).

Table 1.5: Linear model for Financial Institutions excluding always zero FV assets firms

	Bid-Ask Spread					
	(1)	(2)	(3)	(4)	(5)	(6)
FVA23	−0.595**		−0.140	−0.285	−0.374*	−0.572**
	(0.238)		(0.170)	(0.195)	(0.197)	(0.249)
SIZE		−15.495**	−15.185**	−15.585**	−14.982**	−15.401**
		(6.860)	(6.854)	(6.868)	(6.799)	(6.793)
ANALYST		0.558	0.548	−0.353	−0.118	0.273
		(0.353)	(0.353)	(0.494)	(0.497)	(0.502)
PROFIT		1.825	1.847	1.874	1.783	1.783
		(1.445)	(1.439)	(1.437)	(1.445)	(1.446)
LEV		4.263***	4.259***	4.288***	4.323***	4.323***
		(1.229)	(1.227)	(1.225)	(1.211)	(1.205)
RETVOL		0.575***	0.575***	0.575***	0.563***	0.562***
		(0.031)	(0.031)	(0.031)	(0.031)	(0.031)
PRICE		0.214**	0.211**	0.225**	0.153	0.163*
		(0.101)	(0.101)	(0.102)	(0.099)	(0.099)
TURN		−1.429***	−1.427***	−1.428***	−1.364***	−1.366***
		(0.078)	(0.078)	(0.078)	(0.075)	(0.075)
IO_ded					2.814***	3.323***
					(0.469)	(0.530)
IO_tra					0.352	0.073
					(0.220)	(0.293)
IO_qix					−0.775***	−0.996***
					(0.151)	(0.186)
FVA23:ANALYST				0.035***	0.044***	0.027**
				(0.012)	(0.012)	(0.013)
FVA23:IO_ded						−0.019**
						(0.010)
FVA23:IO_tra						0.013*
						(0.007)
FVA23:IO_qix						0.010**
						(0.004)
Observations	26,908	26,908	26,908	26,908	26,908	26,908
Adjusted R^2	0.682	0.768	0.768	0.768	0.772	0.772

Note: Firm-Quarter observations are pooled and coefficients are estimated by OLS including firm and quarter fixed effects. Clustered standard errors at firm level are reported in the paranthesis. *p<0.1; **p<0.05; ***p<0.01

Table 1.6: Log-Linear model for Financial Institutions excluding always zero FV assets firms

	log Bid-Ask Spread					
	(1)	(2)	(3)	(4)	(5)	(6)
lnFVA23	−78.294**		−46.536**	−73.914***	−82.645***	−107.606***
	(31.017)		(20.541)	(28.173)	(27.989)	(31.827)
MKTSIZE		13.001*	13.557*	13.246*	12.453*	12.705*
		(7.100)	(7.075)	(7.053)	(7.073)	(7.067)
lnANALYST		−0.393	−0.464	−5.437	−4.970	−2.038
		(3.106)	(3.116)	(4.131)	(4.134)	(4.170)
LOSS		2.317	1.948	1.961	2.046	1.828
		(3.612)	(3.630)	(3.629)	(3.588)	(3.587)
lnLEV		−60.897	−59.112	−58.983	−51.219	−52.789
		(44.486)	(44.405)	(44.344)	(44.453)	(44.478)
lnRETVOL		150.273***	150.001***	150.040***	147.868***	147.757***
		(7.343)	(7.373)	(7.379)	(7.249)	(7.252)
lnPRICE		−16.390**	−16.771**	−16.399**	−17.512**	−17.457**
		(7.525)	(7.557)	(7.535)	(7.452)	(7.473)
lnTURN		−100.142***	−100.003***	−99.985***	−97.796***	−97.819***
		(4.015)	(4.016)	(4.015)	(3.908)	(3.902)
lnIO_ded					268.180***	289.584***
					(46.563)	(54.157)
lnIO_tra					76.705***	62.034**
					(20.180)	(27.134)
lnIO_qix					−70.370***	−105.725***
					(16.228)	(20.779)
lnFVA23:lnANALYST				24.129**	29.345***	13.161
				(9.957)	(9.908)	(10.522)
lnFVA23:lnIO_ded						−93.411
						(113.680)
lnFVA23:lnIO_tra						77.389
						(90.587)
lnFVA23:lnIO_qix						192.068***
						(63.001)
Observations	26,908	26,908	26,908	26,908	26,908	26,908
Adjusted R^2	0.690	0.801	0.802	0.802	0.804	0.804

Note: Firm-Quarter observations are pooled and coefficients are estimated by OLS including firm and quarter fixed effects. Clustered standard errors at firm level are reported in the paranthesis. *p<0.1; **p<0.05; ***p<0.01

Table 1.7: Alternative Estimation Methods for the Linear Model of Spread

	Within OLS		FGLS	FD		Between
	(1)	(2)	(3)	(4)	(5)	(6)
FVA23	−0.572**	−0.572*	−0.466***	−0.107	−0.107	−0.942***
	(0.249)	(0.292)	(0.054)	(0.134)	(0.141)	(0.343)
SIZE	−15.401**	−15.401**	−21.557***	−10.421**	−10.421**	−47.452***
	(6.793)	(6.991)	(1.221)	(4.985)	(4.134)	(4.598)
ANALYST	0.273	0.273	−0.111	−0.182	−0.182	9.432***
	(0.502)	(0.550)	(0.158)	(0.385)	(0.194)	(1.699)
PROFIT	1.783	1.783	−0.523*	1.027**	1.027*	4.076
	(1.446)	(1.617)	(0.297)	(0.457)	(0.578)	(5.565)
LEV	4.323***	4.323***	4.517***	1.058*	1.058	10.295***
	(1.205)	(1.375)	(0.224)	(0.604)	(0.725)	(1.293)
RETVOL	0.562***	0.562***	0.415***	0.306***	0.306***	0.773***
	(0.031)	(0.056)	(0.004)	(0.005)	(0.020)	(0.059)
PRICE	0.163*	0.163	−0.035*	0.436***	0.436***	0.412***
	(0.099)	(0.108)	(0.020)	(0.106)	(0.134)	(0.154)
TURN	−1.366***	−1.366***	−0.803***	−0.654***	−0.654***	−1.549***
	(0.075)	(0.116)	(0.012)	(0.022)	(0.045)	(0.165)
IO_ded	3.323***	3.323***	−0.204	0.235	0.235	−0.229
	(0.530)	(0.769)	(0.127)	(0.326)	(0.260)	(2.020)
IO_tra	0.073	0.073	−0.288***	0.823***	0.823***	−1.889
	(0.293)	(0.384)	(0.067)	(0.211)	(0.169)	(1.640)
IO_qix	−0.996***	−0.996***	−0.609***	−0.417***	−0.417***	−1.897***
	(0.186)	(0.252)	(0.047)	(0.117)	(0.090)	(0.609)
FVA23:ANALYST	0.027**	0.027*	−0.009**	0.002	0.002	0.033
	(0.013)	(0.015)	(0.004)	(0.010)	(0.005)	(0.036)
FVA23:IO_ded	−0.019**	−0.019*	0.001	−0.007	−0.007	0.034
	(0.010)	(0.010)	(0.003)	(0.008)	(0.007)	(0.045)
FVA23:IO_tra	0.013*	0.013	0.005***	0.006	0.006*	0.038
	(0.007)	(0.009)	(0.002)	(0.006)	(0.004)	(0.048)
FVA23:IO_qix	0.010**	0.010**	0.010***	0.001	0.001	0.017
	(0.004)	(0.005)	(0.001)	(0.003)	(0.002)	(0.017)
(Intercept)				−11.618***	−11.618***	318.286***
				(4.348)	(1.449)	(35.861)
Firm FE	Yes	Yes	Yes	Yes	Yes	
Quarter FE	Yes	Yes	Yes	Yes	Yes	
Firm Cluster	Yes	Yes	Yes		Yes	
Quarter Cluster		Yes				
Observations	26908	26908	26908	26908	26908	640
Adjusted R^2	0.77	0.77	0.76	0.19	0.19	0.69

Note: Various estimation methods for the linear model of bid ask spread on the sample of financial firms excluding always zero FV assets firms.
Column 1: OLS Within firm estimator and standard errors clustered at firm level.
Column 2: OLS Within firm estimator and twoway standard errors clustered at firm and quarter levels.
Column 3: General Feasible GLS Within firm estimator using pggls R command. Standard errors clustered at firm level.
Column 4: First difference estimator with OLS standard errors.
Column 5: First difference estimator with clustered standard errors at firm level.
Column 6: OLS Between firm estimator
Standard errors reported in paranthesis. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Table 1.8: Linear model of Spread on Fair Value Assets ratios

	Bid-Ask Spread					
	(1)	(2)	(3)	(4)	(5)	(6)
FV_ratio	0.060	−0.453	−0.750**	−0.572**	−0.585**	−0.454*
	(0.571)	(0.318)	(0.324)	(0.249)	(0.252)	(0.260)
SIZE	−14.743**	−15.777**	−14.389**	−15.401**	−15.241**	−15.436**
	(6.969)	(6.838)	(6.741)	(6.793)	(6.777)	(6.798)
ANALYST	1.374***	0.341	0.991***	0.273	0.391	0.770
	(0.413)	(0.518)	(0.367)	(0.502)	(0.496)	(0.533)
PROFIT	1.811	1.769	1.751	1.783	1.788	1.722
	(1.437)	(1.458)	(1.441)	(1.446)	(1.446)	(1.490)
LEV	4.255***	4.338***	4.293***	4.323***	4.331***	4.261***
	(1.207)	(1.215)	(1.205)	(1.205)	(1.204)	(1.203)
RETVOL	0.564***	0.563***	0.563***	0.562***	0.562***	0.563***
	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)
PRICE	0.132	0.168*	0.141	0.163*	0.159	0.155
	(0.099)	(0.100)	(0.098)	(0.099)	(0.099)	(0.099)
TURN	−1.369***	−1.366***	−1.365***	−1.366***	−1.365***	−1.367***
	(0.075)	(0.075)	(0.074)	(0.075)	(0.075)	(0.075)
IO_ded	2.781***	3.142***	2.862***	3.323***	3.319***	3.295***
	(0.481)	(0.508)	(0.489)	(0.530)	(0.530)	(0.540)
IO_tra	0.269	0.040	0.346	0.073	0.095	−0.004
	(0.237)	(0.290)	(0.225)	(0.293)	(0.293)	(0.306)
IO_qix	−0.800***	−0.954***	−0.795***	−0.996***	−0.997***	−1.030***
	(0.162)	(0.189)	(0.154)	(0.186)	(0.185)	(0.196)
FV_ratio:ANALYST	−0.057**	0.026*	0.016	0.027**	0.024*	0.006
	(0.029)	(0.014)	(0.027)	(0.013)	(0.014)	(0.012)
FV_ratio:IO_ded	0.001	−0.015	−0.017	−0.019**	−0.019**	−0.016*
	(0.019)	(0.011)	(0.016)	(0.010)	(0.010)	(0.009)
FV_ratio:IO_tra	0.014	0.017**	0.001	0.013*	0.012	0.013**
	(0.014)	(0.008)	(0.011)	(0.007)	(0.007)	(0.007)
FV_ratio:IO_qix	0.009	0.009*	0.008	0.010**	0.010**	0.010**
	(0.008)	(0.005)	(0.007)	(0.004)	(0.004)	(0.004)
Observations	26,908	26,908	26,908	26,908	26,908	26,908
Adjusted R^2	0.771	0.772	0.771	0.772	0.772	0.772

Note: Firm-Quarter observations for Financial Institutions excluding always zero FV assets firms are pooled.
Coefficients are estimated by OLS including firm and quarter fixed effects.
Clustered standard errors at firm level are reported in the paranthesis. *p<0.1; **p<0.05; ***p<0.01.
Column 1: ratio of FV assets level 1 to Total Assets.
Column 2: ratio of FV assets level 2 to Total Assets.
Column 3: ratio of FV assets level 3 to Total Assets.
Column 4: ratio of FV assets levels 2 and 3 to Total Assets.
Column 5: ratio of FV assets levels 2 and 3 and derivatives positions to Total Assets.
Column 6: ratio of total FV assets (levels 1, 2 and 3 net of derivatives positions) to Total Assets.

Table 1.9: Linear model for Financial and Non Finanical firms

	Bid-Ask Spread					
	Financial Firms			Non Financial Firms		
	(1)	(2)	(3)	(4)	(5)	(6)
FVA23	−0.554**	−0.572**	−0.334	−0.421***	−0.370**	−0.391**
	(0.247)	(0.249)	(0.294)	(0.158)	(0.163)	(0.159)
SIZE	−17.672***	−15.401**	−9.126	−19.918***	−19.735***	−15.697***
	(6.697)	(6.793)	(6.585)	(1.956)	(2.008)	(2.787)
ANALYST	0.378	0.273	0.301	0.525***	0.450***	0.222**
	(0.496)	(0.502)	(0.509)	(0.091)	(0.089)	(0.087)
PROFIT	1.422	1.783	3.589**	−1.332***	−1.218***	−0.882***
	(1.414)	(1.446)	(1.477)	(0.145)	(0.151)	(0.204)
LEV	4.405***	4.323***	4.988***	2.730***	1.887***	0.476
	(1.190)	(1.205)	(1.267)	(0.550)	(0.528)	(0.637)
RETVOL	0.560***	0.562***	0.526***	0.190***	0.171***	0.105***
	(0.030)	(0.031)	(0.035)	(0.007)	(0.008)	(0.011)
PRICE	0.151	0.163*	0.105	−0.062***	−0.034	−0.043*
	(0.099)	(0.099)	(0.106)	(0.021)	(0.022)	(0.024)
TURN	−1.360***	−1.366***	−1.322***	−0.360***	−0.305***	−0.167***
	(0.073)	(0.075)	(0.086)	(0.014)	(0.015)	(0.018)
IO_ded	3.334***	3.323***	3.161***	0.400***	0.387***	−0.014
	(0.520)	(0.530)	(0.587)	(0.118)	(0.118)	(0.152)
IO_tra	0.121	0.073	0.102	−0.152**	−0.119**	−0.016
	(0.287)	(0.293)	(0.325)	(0.061)	(0.057)	(0.082)
IO_qix	−0.978***	−0.996***	−1.081***	−0.160***	−0.121***	−0.092*
	(0.184)	(0.186)	(0.228)	(0.035)	(0.034)	(0.048)
FVA23:ANALYST	0.027**	0.027**	0.017	0.002	0.001	0.0002
	(0.013)	(0.013)	(0.013)	(0.005)	(0.005)	(0.005)
FVA23:IO_ded	−0.019**	−0.019**	−0.020**	0.0005	−0.001	0.0002
	(0.010)	(0.010)	(0.009)	(0.004)	(0.004)	(0.004)
FVA23:IO_tra	0.012*	0.013*	0.010	0.007**	0.005*	0.003
	(0.007)	(0.007)	(0.008)	(0.003)	(0.003)	(0.003)
FVA23:IO_qix	0.010**	0.010**	0.010**	0.003	0.002	0.004**
	(0.004)	(0.004)	(0.005)	(0.002)	(0.002)	(0.002)
Observations	27,356	26,908	21,960	85,355	72,881	28,403
Adjusted R^2	0.772	0.772	0.775	0.786	0.765	0.731

Note: Firm-Quarter observations are pooled and coefficients are estimated by OLS including firm and quarter fixed effects.
Clustered standard errors at firm level are reported in the paranthesis. *p<0.1; **p<0.05; ***p<0.01 .
Column 1: Financial Firms, All.
Column 2: Financial Firms, Exclude always zero FV Firms.
Column 3: Financial Firms, only Firms with always positive FV.
Column 4: non Financial Firms, All.
Column 5: non Financial Firms, Exclude always zero FV asset Firms.
Column 6: non Financial Firms, only Firms with always positive FV asset.

7 Summary and Concolusion

In this paper, we investigated the long-run effects of fair value level disclosures on the information environment. Our empirical evidence infers that a higher fraction of fair value levels 2 and 3 to total assets reduces information asymmetry in the equity market. Results are consistent with the view that more disclosures improve the information environment. Furthermore, we examined the moderators of the primary effect. The effect is less notable for firms with higher-quality ex-ante information environment. The higher is the presence of dedicated institutional investors among the shareholders, the positive effect of disclosure is more pronounced, which confirms the usefulness of SFAS 157 disclosures to the market participants. On the contrary, the effect of the disclosure on the bid-ask spread attenuates with transient institutional holdings, as they are more advantageous in analyzing the newly released sophisticated disclosure contents. Results hold for both financial and non-financial firms and are robust to various specifications and estimation methods.

Appendix

Appendix 1.A Variable Definitions

Table 1.10: Variable Descriptions

Information Environment Variables	
SPREAD	The proxy for information asymmetry. For each firm-quarter, it is the mean daily bid-ask spread over the trading days of the quarter. The difference between the daily closing ask price and the daily closing bid price is scaled by their midpoints to calculate the daily bid-ask spread. Scaled to basis points. Source: CRSP Daily Stock File.
lnSPREAD	10000 times the natural logarithm of 1 plus mean daily bid-ask spread over the trading days of the quarter. Source: CRSP Daily Stock File.

SIZE	The natural logarithm of the book value of total assets in millions of dollars. Source: COMPUSTAT (CRSP/Compustat Merged Database - Fundamentals Quarterly)
MKTSIZE	The natural logarithm of the market value of assets in millions of dollars (sum of Market capitalization and total liabilities book value). Source: COMPUSTAT.
ANALYST	The number of analysts following the firm. Source: I/B/E/S Summary Statistics.
lnANALYST	The natural logarithm of 1 plus the number of analysts following the firm. If no analyst follows the firm, it is set to 0. Source: I/B/E/S Summary Statistics.
IO_ded	Number of shares holding by "Dedicated" institutional owners at the end of the prior calendar quarter divided by total number of shares outstanding at the same date, scaled to percentage points. Source: Thomson Reuters 13f Holdings. Dedicated institutional owners is defined based on classifications provided on Brian Bushee's website.
IO_tra	Number of shares holding by "Transient" institutional owners at the end of the prior calendar quarter divided by total number of shares outstanding at the same date, scaled to percentage points. Source: Thomson Reuters 13f Holdings. Transient institutional owners is defined based on classifications provided on Brian Bushee's website.
IO_qix	Number of shares holding by "Quasi-indexer" institutional owners at the end of the prior calendar quarter divided by total number of shares outstanding at the same date, scaled to percentage points. Source: Thomson Reuters 13f Holdings. Quasi-indexer institutional owners is defined based on classifications provided on Brian Bushee's website.

lnIO_ded	The natural logarithm of 1 plus number of shares holding by dedicated institutional owners divided by total number of shares outstanding. Source: Thomson Reuters 13f Holdings and Brian Bushee's website.
lnIO_tra	The natural logarithm of 1 plus number of shares holding by transient institutional owners divided by total number of shares outstanding. Source: Thomson Reuters 13f Holdings and Brian Bushee's website.
lnIO_qix	The natural logarithm of 1 plus number of shares holding by quasi-indexer institutional owners divided by total number of shares outstanding. Source: Thomson Reuters 13f Holdings and Brian Bushee's website.

Fair Value Variables

FVA	Total fair value assets scaled by total assets. Scaled to percentage points. Source: COMPUSTAT.
FVA1	Fair value level 1 assets scaled by total assets. Scaled to percentage points. Source: COMPUSTAT.
FVA2	Fair value level 2 assets scaled by total assets. Scaled to percentage points. Source: COMPUSTAT.
FVA3	Fair value level 3 assets scaled by total assets. Scaled to percentage points. Source: COMPUSTAT.
FVAd	Net derivative assets position scaled by total assets (net position = total fair value assets - level 1 assets - level 2 assets - level 3 assets). Scaled to percentage points. Source: COMPUSTAT.
FVA23	The sum of levels 2 and 3 fair value assets scaled by total assets. Scaled to percentage points. Source: COMPUSTAT.
FVA23d	The sum of levels 2, 3 and net derivative fair value assets scaled by total assets. Scaled to percentage points.

lnFVA23	The natural logarithm of 1 plus ratio of fair value assets 2 and 3 to total assets. Source: COMPUSTAT.

Control Variables

LEV	Ratio of book value of total liabilities to book value of total equity. Source: COMPUSTAT.
lnLEV	The natural logarithm of 1 plus ratio of book value of total liabilities to book value of total assets. Source: COMPUSTAT.
PROFIT	The ratio of the quarterly net income to the total assets. Source: COMPUSTAT.
LOSS	A dummy variable that takes a value of 1 when net income is negative, and it takes 0 otherwise. Source: COMPUSTAT.
PRICE	Mean daily stock closing price over the trading quarter. Source: CRSP Daily Stock File.
lnPRICE	The natural logarithm of PRICE. Source: CRSP Daily Stock File.
TURN	Average daily turnover during the trading quarter (daily turnover is measured as number of shares traded divided by number of shares outstanding at the end of each day). Scaled to basis points. Source: CRSP Daily Stock File.
lnTURN	The natural logarithm of TURN before scaling. Source: CRSP Daily Stock File.
RETVOL	Return volatility measured as the standard deviation of daily dividend-adjusted stock returns during the trading quarter. Scaled to basis points. Source: CRSP Daily Stock File.
lnRETVOL	The natural logarithm of RETVOL before scaling. Source: CRSP Daily Stock File.

Note: Datasets are obtained via Wharton Research Data Services.

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Chapter 2

Fair Value Measurement and Information Asymmetry in the U.S. Corporate Bonds Market

This paper examines the effect of Fair value measurement levels according to SFAS 157 on information asymmetry among the U.S. corporate bonds market investors. We find that the bid-ask spread of bonds is positively associated with the ratio of total fair value to total asset, and its magnitude is higher for level 3 and level 2 assets. It implies that information asymmetry is more substantial for firms with more opaque financial assets. These results support the view that bondholders' non-linear payoff function makes them demand more conservative accounting practices. The result holds for both the financial and non-financial sectors and is robust to linear and log-linear specifications.

1 Introduction

This paper contributes to the extant literature of fair value reporting usefulness to capital market participants. Prior research has studied the relevance and usefulness of fair value accounting compared to historical cost accounting to equity market investors. Liao et al. (2013) has considered associations between fair value net assets measured according to SFAS 157 levels with asymmetry information reflected in the bid-ask spread in the stock prices for U.S. banks during the financial crisis. We aim to study the role of fair value disclosures and measurements according to SFAS 157 on asymmetry information in the U.S. corporate bond market. We use the bid-ask spread for bonds as a proxy for information asymmetry.

2 Literature Review

2.1 Fair Value Accounting

The history of fair value accounting goes back to the late 1920s. For supervisory purposes, financial institutions and banks were mandated to measure their investment portfolios at market value. FASB issued SFAS 157 Fair Value Measurement in 2006 to improve fair value applications' consistency and comparability. Before SFAS 157, several pronouncements were issued by FASB regarding fair value. These pronouncements mainly determined fair value measurement subjects, while SFAS 157 was issued to determine how to measure fair values and did not change the measurement regime for any asset or liability.

Furthermore, SFAS 157 focused on providing a consistent and precise definition of fair value, which was missing in previous pronouncements. SFAS 157 is effective from the fiscal year beginning on or after November 15, 2007. Assets and liabilities that are subject to fair value measurement by other pronouncements are subject to the framework provided by this standard. It defines fair value as the exit price-"the price that would be received to sell an asset or transfer a liability in an orderly transaction between market participants at the measurement date" (SFAS 157, paragraph 5). Such a definition has not been left without critiques. Benston (2008) debates that applying fair values not based on actual market prices will be costly. Despite SFAS 157's intent, value-in-use and entry values will be permitted, and transaction costs will be held in fair values. Also, fair values levels 2 and 3 could be easily managed and are not readily verifiable. Finally, there are concerns with applying fair value to business combinations.

SFAS 157 prominent feature is the introduction of the Fair Value three-level hierarchy.

Based on this hierarchy, inputs of fair value measurement are ranked based on their reliability. Paragraph 24 of SFAS 157 defines Fair value level 1 as inputs directly observed from liquid asset markets-quoted prices in active financial markets. They have to be publicly available without management manipulations; thus, they could be considered the most transparent assets and liabilities. For cases that an active market does not exist, FASB has introduced fair value level 2 and level 3. fair value level 2 consists of three subcategories: 1)quoted market prices for similar assets and liabilities traded in active markets, 2)quoted market prices for identical assets and liabilities in inactive markets, and 3)prices corroborated by market-based measures which are sufficient to allow the fair values to be estimated. (SFAS 157, paragraph 28). Level 1 and level 2 share the feature that inputs directly or indirectly are observable. However, fair value level 3 denotes unobservable inputs. Price models, discounted cash flow methodologies and information regarding firms' own assumptions are such data (SFAS 157, paragraph 30).

2.2 Information Asymmetry and Bid-Ask spread

Asymmetric information is the possibility that one trader has private information regarding the security value while other trading partners do not have that information. In a security market, there is the potential that a more informed trader picks less-informed investors. A trader with a buy or sell limit price strategy is concerned that a better-informed picks him off by hitting his limit prices just when the prices are not aligned with the asset's intrinsic value. Copeland and Galai (1983) and Glosten and Milgrom (1985) proposed information-based models of the bid-ask spread.

One can contemplate two types of investors based on their trading purposes. Investors that sell their assets for reasons that we can label as "non-informational" drives. It could be the need to raise cash for a more significant purchase or just pure portfolio rebalancing. Such traders are called liquidity traders as liquidity necessities drive their transactions, and such trades are called noise trades as their main motive is not private information about the value of traded security. When Dealers transact with such traders, they make a profit from the bid-ask spread. Other types of traders believe that they have access to information, implying that the security is mispriced. An information advantage to such traders comes with a cost to the other party in the transaction, which is born by both dealers and less informed investors with a limit order strategy. Thus, dealers expect to gain from bid-ask spread transacting with noise traders, whereas they expect to lose against information traders. Too, traders with limit orders are subject to similar risk from information traders, and as compensation for such risk, they tend to raise limit-ask prices and lower limit-bid orders, which increases the spread. The effect on widening the spread would be more substantial where information traders are relatively more prominent, and the potential risks to be compensated are more. Moreover, information asymmetry costs are born mainly by liquidity traders as the bid-ask spread paid by them is also widening when such asymmetries are more severe.

Boone (1998), Leuz and Verrecchia (2000), Mohd (2005) are among research that used the bid-ask spread as a measure of information asymmetry. Such research supports the idea that information asymmetry decreases by more publicly available information. It is important for investors since they believe that more disclosure enhances security transactions' fairness and improves security liquidity. In line with this stream of literature Diamond and Verrecchia (1991), Kim and Verrecchia (1994) and Welker (1995) find some evidence that bid-ask spreads decrease with analysts' ratings of firms' disclosures.

2.3 Fair value reporting and Information Asymmetry

Information asymmetry is more likely to happen in the case of opaque assets and liabilities. The opacity of assets gives some investors informational advantages. Particularly, institutional investors with a closer relationship with managers might have skills that allow them to access and analyze relatively private information. In banks, the very nature of assets such as securitized assets and derivatives exacerbates the informational gap. Cheng et al. (2011) study suggests that bid-ask spreads and analyst forecasts dispersion is higher among banks with securitizations. Muller et al. (2011) studies relations between fair value assets measured under SFAS with equity betas. They find a significant positive effect for all three fair value measurement levels and find that level 3 asset has the most notable coefficient. They explain the empirical evidence by arguing that fair value assets, remarkably level 3, are less transparent with a higher information risk—such risk results in a higher cost of capital, most evident in the case of level 3 assets. Liao et al. (2013) studies the role of fair value accounting on the bid-ask spread of banks' stocks as the measure of information asymmetry during the financial crisis. Our work extends this literature by studying such effects on a longer horizon and the debt market rather than just the equity market. Furthermore, our sample contains all financial and non-financial firms and compare the result among them.

3 Hypotheses Development

Assets and liabilities that should be recognized at Fair value are specific financial instruments with an opaque nature. Reporting a higher fair value indicates that a firm's business model inherits more opacity. Thus we expect that information asymmetry increases with the ratio of total fair values assets to total assets.

Hypothesis 1: *A higher total fair value asset ratio is associated with higher information asymmetry in the bond market.*

SFAS 157, Fair Value measurement disclosures, provide the market participants with more information regarding financial instruments. It is argued that such assets and liabilities are more opaque in nature. Firms that report such details provide more information to the user, leading to lower information asymmetry among participants. Most liquid items are observable in the market and are more transparent. However, The least liquid items should be measured according to models and are less reliable to market participants. We expect that asset reliability alleviates information asymmetries.

Hypothesis 2: *Fair value assets' reliability is negatively associated with information asymmetry in the bond market.*

4 Research Design

4.1 Model specifications

In order to test Hypothesis 1 we use Equation 2.1.

$$\begin{aligned} Spread_{it} = \beta_0 + \beta_1 * FVa_{it-1} \\ + \beta_2 * Size_{it-1} + \beta_3 * Leverage_{it-1} \\ + \beta_4 * rating_{it} + \beta_5 * maturity_{it} + \beta_6 * volume_{it} + \varepsilon_{it} \end{aligned} \tag{2.1}$$

Modifying the basic specification for fair value levels, we test Hypothesis 2 using Equation 2.2

$$\begin{aligned} Spread_{it} = \beta_0 + \beta_{11} * FVa1_{it-1} + \beta_{12} * FVa2_{it-1} + \beta_{13} * FVa3_{it-1} \\ + \beta_2 * Size_{it-1} + \beta_3 * Leverage_{it-1} \\ + \beta_4 * rating_{it} + \beta_5 * maturity_{it} + \beta_6 * volume_{it} + \varepsilon_{it} \end{aligned} \tag{2.2}$$

We pool bond-months and estimate the above equations with OLS (primarily including month fixed effects and leaving firm fixed effects to robustness checks). "i" stands for the bond and "t" stands for the month. Fair value disclosures and firm characteristics that are reported quarterly are brought forward for three months. Variables are defined as follows:

- *Spread*: is the proxy for information asymmetry. it is measured as the trading volume-weighted average of daily bid-ask spreads over the trading month. Scaled to basis point
- *FVa*: is the ratio of total fair value assets to total assets, scaled to percentage points.
- *FVa1*: is the ratio of fair value level 1 assets to total assets, scaled to percentage points.

- *FVa2*: is the ratio of fair value level 2 assets to total assets, scaled to percentage points.
- *FVa3*: is the ratio of fair value level 3 assets to total assets, scaled to percentage points.
- *size*: is the natural logarithm of the book value of assets.
- *leverage*: is the ratio of total liability to total assets, scaled to percentage points.
- *rating*: is a numerical credit rating of the bond. 1 denotes the highest grade, and 22 denotes the lowest grade bond.
- *maturity*: is the number of months left till the maturity of the bond.
- *volume*: total dollar volume traded in a given month, scaled to millions of dollars.

Feldhütter and Poulsen (2018) analyzed determinants of bid-ask spread in the bond market and provided empirical tests for various channels proposed in the literature. Their study suggests that bid-ask spread is negatively associated with firm size and trade volume. Leverage, maturity, and ratings (investment grade to speculative grade) are positively associated with the spread. We estimate the models with OLS and include month fixed effects to control for time-trends of spread.

4.2 Sample selection

Firms disclose their financial statements and footnotes that contain fair value details every quarter. Each firm can have multiple bonds, which could be traded multiple times during the day. However, since bonds are not traded frequently, these trades could be summarized monthly. We allow at least two months for financial disclosures to be fully available to the public and then we consider grouped trades at the end of each month at the bond level. Some firms suspend reporting duty while still their bonds trade for several months. In order to mitigate the confounding effects of survival, we allow five months difference. In this way, only trades that come immediately after a reporting quarter are considered. Figure 2.1 demonstrates timeline of disclosures and bond tradings in our sample.

Figure 2.1: Timeline of Firm Disclosures and Bond Trades

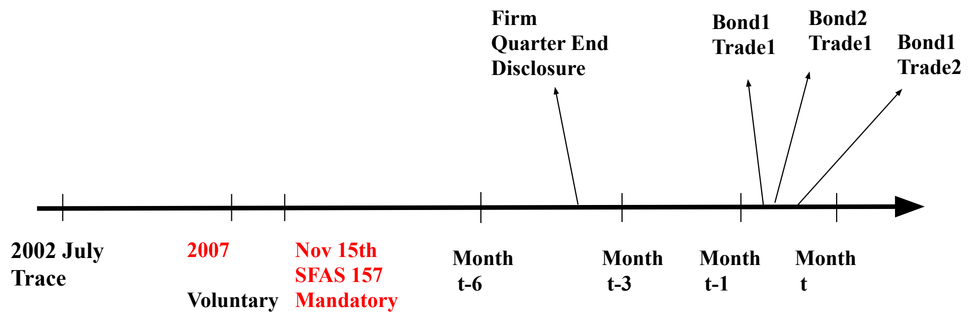


Table 2.1 summarized our sampling sources and criteria. We start with MERGENT as the universe of bond issues and use TRACE provided by WRDS Bond Database for monthly trades since 2002 July. The universe of firms disclosure comes from COMPUSTAT North America. We join disclosures to trades on a rolling basis and allow at least two months and a maximum of five months.

Firm Data

Fair value levels and firm-level data are obtained from Compustat North America. SFAS 157 was effective for fiscal years beginning on or after November 15, 2007, and interim periods within those fiscal years. An earlier application was encouraged, provided that the reporting entity has not yet issued financial statements for that fiscal year, including financial statements for an interim period within that fiscal year. Thus, earliest disclosures goes back to 2007-02-28. Quarterly Compustat North America is available through WRDS, contains quarterly firm disclosures. In addition to usual items, it contains following fair value disclosure items pursuant of SFAS 157: tfvaq (total fair value assets quarterly), aqpl1q (level 1 fair value assets), aol2q (level 2 fair value assets), aul3q (level 3 fair value assets), tfvlq (total fair value liabilities), lqpl1q (level 1 fair value liabilities),

Table 2.1: Sample Selection

Criteria	Entities	Bonds	Quarters	Trading-Month
MERGENT				
issued after 1950-01-11	15,431	444,349		
	(29%)	(84%)		
maturity after 2002-07-01	13,907	399,363		
	(30%)	(85%)		
maturity after 2007-02-28	11,865	338,814		
	(30%)	(86%)		
TRACE				
trading since 2002-07-01	4,812	79,911		1,734,248
	(22%)	(76%)		(39%)
trading after 2007-02-28	3,775	72,670		1,367,799
	(23%)	(80%)		(41%)
no NA	3,589	23,688		981,744
	(23%)	(40%)		(28%)
COMPUSTAT AMERICA				
since 2002-01-01	24,665		805,694	
	(34%)		(33%)	
valid FV reporters	19,629		616,831	
	(18%)		(20%)	
since 2007-02-28	15,782		426,844	
	(18%)		(20%)	
TRACE & COMPUSTAT				
trading since 2002-07-01	1,853	12,703	57,001	673,251
	(18%)	(25%)	(18%)	(21%)
trading after 2007-02-28	1,446	10,526	40,818	533,560
	(19%)	(25%)	(19%)	(20%)
valid Trades	1,317	9,516	36,033	450,345
	(18%)	(20%)	(17%)	(18%)

Note: Numbers in the parantheses represent percentage of Financial Institutions.

lol2q (level 2 fair value liabilities), lul3q (level 3 fair value liabilities). We applied several filters to clean Compustat fair values. We started with quarters from the beginning of 2002 till the end of 2019. To prevent duplicated observations in case of change of fiscal year, we removed observations with empty "datacqtr". We removed quarters with total assets less or equal to zero. Fair value disclosures are mandatory for fiscal years starting from November 15, 2007. However, from the beginning of 2007, it was voluntary to report fair values quarterly. We assigned disclosures as voluntary for firms with a fiscal year-end month before November if the fiscal year is before 2009 (for $\leq$ 10 and fyearq $\leq$ 2008), whereas, for firms with the fiscal year-end month of November and December if the fiscal year is before 2007 (for $>$ 10 and fyearq $<$ 2008). In mandatory period Compustat in some firm-quarters assign N.A. and in some firm-quarters assign 0. Manual checks in Edgar verifies that we can convert N.A.'s to 0. Some firm-quarters report Fair Value Assets more than Total assets. Manual investigation of footnotes to such firms' financial disclosures verify that those fair values are not subjects of SFAS 157 but subjects of SFAS 107. In other words, they are not the value of assets recognized at fair value but fair value disclosures of financial assets recognized at historical cost. We removed observations of those firms entirely from our sample to have consistent treatment of fair values. Manual checks verify that Compustat is reliable in other cases and does not mix these values and reports fair values of assets and liabilities measured at fair value on a recurring basis. To prevent survivorship bias, we removed firms that do not have any reporting after introducing SFAS 157.

Bond data

We obtained a sample of bonds issued and traded in the U.S. corporate bond market from the WRDS Bond Database. The WRDS Bond Database allows researchers to quickly and effectively access cleaned datasets of corporate bond transactions, sourced from TRACE Standard and TRACE Enhanced datasets, along with a separate dataset for the monthly price, return, coupon, and yield information for all corporate bonds traded since July 2002. Mergent Fixed Income Securities Database (FISD) is a comprehensive database of

Table 2.2: Valid Trades by source

Type	trading_month	percentage	fin_issuer	non_fin_issuer
0 Trace since 2007-02-28	1,309,201	100%	833	2,756
1 issuer not in compu	777,849	59%	596	1,758
2 no match in compu	1,116	0%	2	10
3 more than five month ago	28,480	2%	50	215
4 TA is missing	452	0%	1	0
5 FVa not reliable	388	0%	1	0
6 missing Spread	45,854	4%	221	917
7 missing volume or rating	4,569	0%	107	370
8 not in mergent	148	0%	0	1
9 valid trades	450,345	34%	254	1,063

[a] U.S. bond trades succeeding SFAS 157 disclosures.

[b] Data Source: TRACE, COMPUSTAT North America.

publicly offered U.S. bonds since 1950-01-11. We obtained Mergent FISD via WRDS and use it to augment to Trace database other issue characteristics, especially the SIC code of issuer. It is also used to compare trading bonds with all bonds issued. There are 9 issues in Trace that do not have information in MERGENT

Bonds are not traded as frequently as stocks and for this reason WRDS Bond Database summarizes Trace at monthly frequency. Starting from 2002-07-01 till 2019-09-30, WRDS Bond Database includes 79,911 unique bonds issued by 4,812 unique firms. In such a period, there are 207 months which contains 1,734,248 trading-bond-month observations. Mergent contains 444,349 issues from 15,431 since 1950-01-11. Bonds with maturity after 2002-07-01 are 399,363 from 13,907 firms. Among trading bonds, 22 of firms, 76% of bonds and 39% of trading-months belong to financial sector (SIC code between 6000 and 7000).

Final Sample

Compustat identifies firms uniquely based on GVKEY. The Global Company Key or GVKEY is a unique six-digit number key assigned to each company (issue, currency, index) in the Capital IQ COMPUSTAT database. Trace utilizes “issuer id” to identify issuer firms uniquely. Both databases contain 6 digit CUSIP, which are not unique over time. We matched firms in COMPUSTAT into the TRACE, starting with issuer CUSIP in trace and identify the same CUSIP in COMPUSTAT. Duplicates were checked manually based on “prospectus issuer name” and “company legal name.” We removed trades that do not have information on Compustat (no GVKEY) in the final sample.

WRDS bond database contains bond trades at monthly frequency. Firm disclosure through COMPUSTAT is at a quarterly frequency. To ensure that firm disclosures are publicly available, we allow at least two months from the disclosure date (“datadate” in COMPUSTAT should be three months before trade end of the month “date” in TRACE). We remove trade-months that spread is N.A.

Since 2007-02-28 there are 1,309,201. Merging with COMPUSTAT on a rolling basis and applying several filters yields in 450,345 valid trades. Table 2.2 summarizes the sources of invalidity of observations. 777,849 trades belong to firms with no information in COMPUSTAT, 1,116 trades did not match with any reporting quarter, and 28,480 trades matched with disclosure dates older than 5 months. These are trades that happen after the suspension of reporting by the entity. 452 trades match with quarters in COMPUSTAT with missing total asset and 388 trades belong to firms with unreliable fair value disclosure (FVa_to_TA of any quarter greater than 100%). 45,854 trades have NA for the spread and 4,569 trades have NA for volume or credit rating. Finally, 148 trades do not have prospectus and bond characteristics that were obtained from MERGENT.

5 Results

5.1 Univariate Analysis

Fair Value Disclosures

Fair value disclosure is required for some financial assets and liabilities. In this section, we describe the reporting behavior of our sample firms. Looking at all quarters for each firm, we can divide firms into three types:

1. Firms with 0 total fair value assets (FVa=0) in all reporting quarters.
2. Firms with 0 total fair value assets in some quarters and positive fair value assets in other quarters.
3. Firms that always have positive FVa.

Though this approach is forward-looking, it allows us to have the most relevant sample. When we use the same approach on a rolling basis only based on the past data, in each quarter, firms with sometimes zero would be divided between the other two groups. Our approach allows us to study the most relevant sample of firms over time in a more consistent manner.

Table 2.3 reports the number of firms and quarters for each type of firm. Trades should have information about the bid-ask spread, volume, and rating number to be considered valid.

Figure 2.2 panel (a) shows the number of financial firms that issued a bond, and the calendar quarter corresponding to fair value disclosure is followed by at least one trade of any bond issue after at least two months. It also divides firms into three types based on all of their fair value disclosures. To examine the representativeness of our sample firms, we compare the firm's total assets in our sample with all firms in COMPUSTAT over the calendar quarter. Financial firms' total asset is between 22% to 38% of the total asset of all firms in the period 2002 to 2019.

Considering bond trades, we can distinguish five categories of financial firms:

1. "non-bonders" are firms that have no trading month in our sample period.

Table 2.3: Firm types by Fair Value disclosures

FVa_freq	firms	quarters	mean_FV	sd_FV	issuers	trade_month	mean.FV	sd.FV
Financial Firms								
0:never_FVa	410	7,717	0%	0%	9	2,840	0%	0%
1:sometimes_FVa	1,118	34,643	18%	30%	60	13,302	12%	22%
2:always_FVa	1,192	35,900	32%	29%	185	78,041	39%	30%
Non Financial Firms								
0:never_FVa	4,827	86,914	0%	0%	126	18,804	0%	0%
1:sometimes_FVa	5,339	166,961	8%	19%	532	158,535	2%	5%
2:always_FVa	1,954	52,641	22%	27%	405	178,823	8%	12%

Note: Mean and Standard deviations are calculated for ratio of total fair value assets to total assets (FVa_to_TA) for each type of firms.

2. "other-bonder" are firms with at least one trading month in the window of 2002-2020, but disclosure of the quarter is not followed by any valid trade where information about spread, volume, and rating is available.)
3. "never FVa" are firms that a trade follows the disclosing quarter after at least two months, but the firm never has fair value assets in none of the periods in our sample.
4. "some FVa" are firms that the disclosing quarter is followed by a trade at least after two months and the firm reports some positive fair value assets in at least one of the periods in our sample.
5. "always FVa" are firms that the disclosing quarter is followed by a trade at least after two months and the firm reports positive fair value assets in all of the periods in our sample.

Total assets expressed in million dollars over the calendar quarter for each category of firms is demonstrated in Figure 2.2 panel (b). Overall, TA is increasing over time, and the sample of firms with positive fair value assets represents a meaningful portion of the overall population of firms.

Focusing on financial firms that in all quarters have F.V. assets more than zero and disclosing quarter at least after two months is followed by a bond trade, Figure 2.3 panel

(a) demonstrates the distribution of the ratio of Fair value assets scaled by total assets over calendar quarters. Figure 2.3 panel (b) decompose total fair value assets (FVa) by fair value levels. "FVa1 to FVa" is the ratio of level one assets to total fair value assets. "FVa2 to FVa" is the ratio of level two assets to total fair value assets."FVa3 to FVa" is the ratio of level three assets to total fair value assets. "FVad to FVa" is the ratio of net derivative asset positions to total fair value assets. The latter value is obtained by subtracting the sum of three levels from total fair value assets. The quarterly mean of ratios is calculated over the same sample as panel (a). Four ratios together in each quarter add up to 1 though aggregate netted derivative positions are negative in all quarters (for a single firm, it can be positive or negative).

Figure 2.4 demonstrates cross-sectional analysis of fair value level ratios over the firm. For each firm, we calculated the mean and standard deviation of all disclosed fair value ratios that are followed by a valid trade.

Bid-Ask Spread

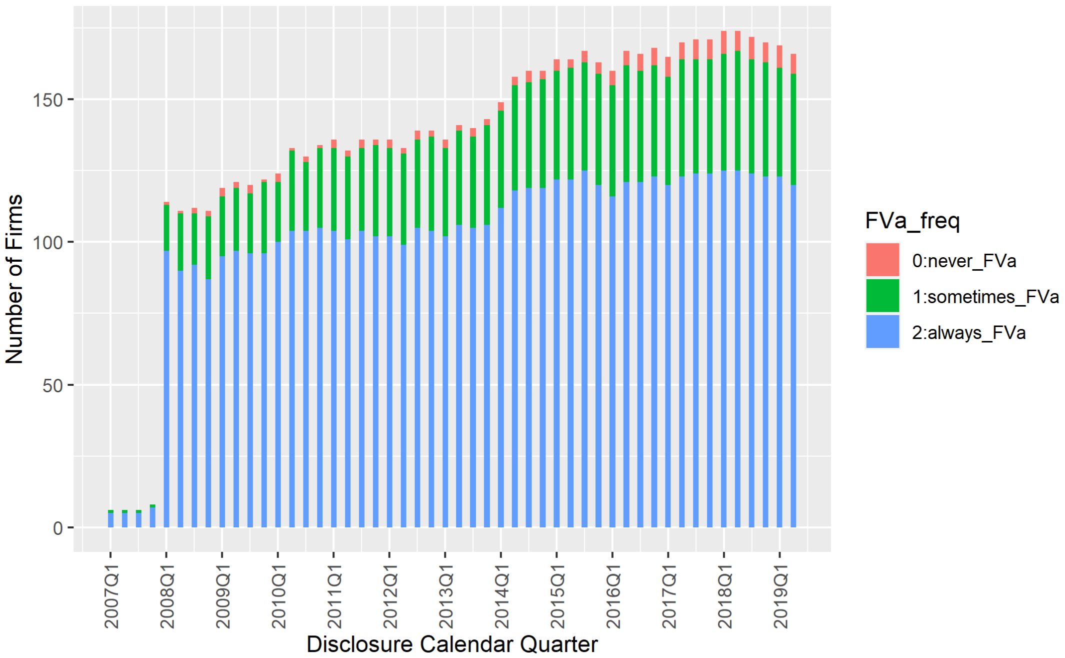
Bid-Ask spread is our primary measure of information asymmetry among bond market investors. The majority of trade observations have information about the bid-ask spread, trading volume, and credit ratings of the bond. Since 2002 July, Trace contains 1,734,248 trading months that after removing observations with missing data, we obtain 594,945 qualified trades. We use the dollar value of the trade volume to calculate the monthly weighted average of spreads for each firm sector and month. Figure 2.5 shows a timely pattern of monthly spread in our sample for financial and non-financial sectors.

Descriptive Statistics

This section presents summary statistics for the main covariates, which are winsorized at 1% and 99%. Table 2.4 contains descriptive statistics and distribution of covariates for financial and non-financial firms separately. Table 2.5 lower triangle contains the Pearson correlations for the sample of financial firms, while, upper triangle contains the correlation coefficients for the sample of non-financial firms.

Figure 2.2: Quarterly Frequency and TA of Financial Firms by FVa and Bond categories

(a) Quarterly Frequency of Bond issuers by FVa frequency category



(b) Quarterly Total Assets of firms by Bond trading category

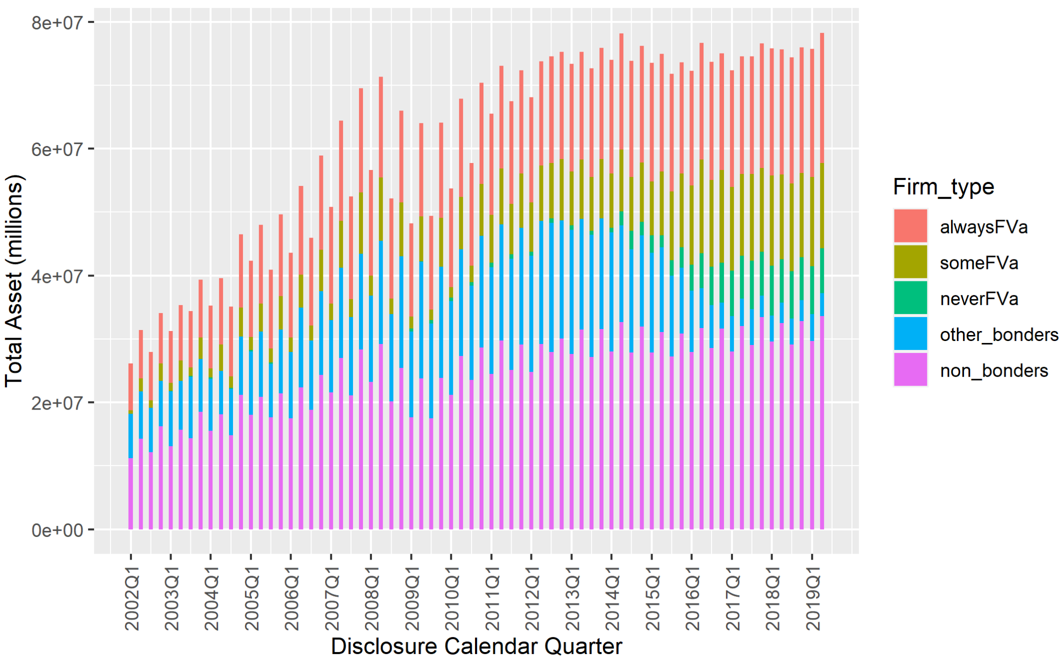
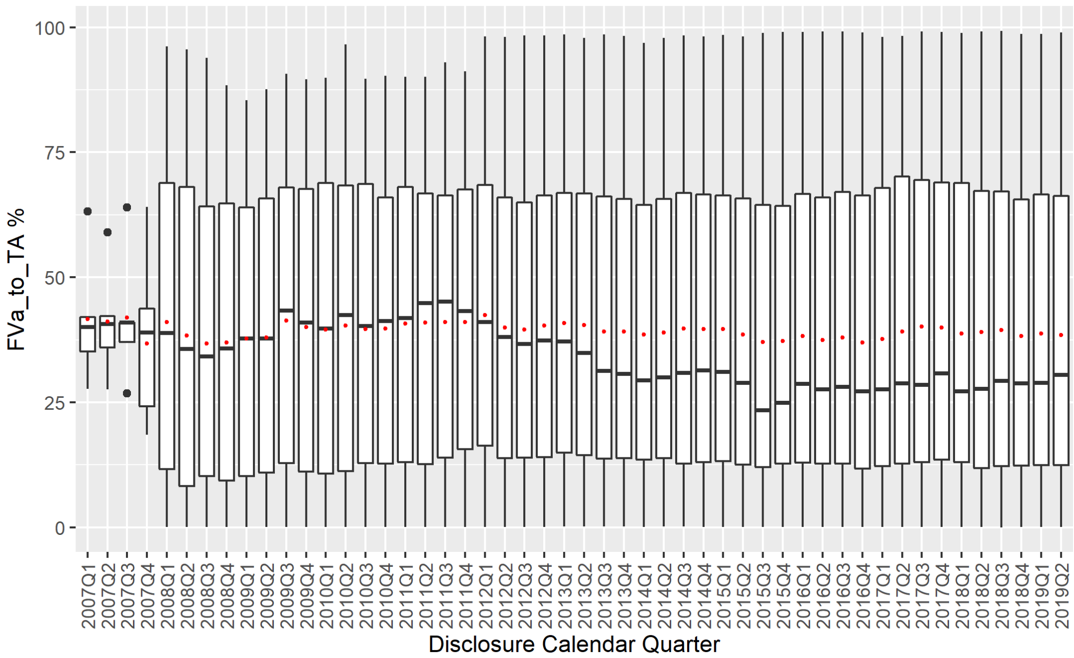


Figure 2.3: FVa ratios over time for Financial Bond issuers with always positive FVa

(a) Quarterly Distribution of FVa to TA



(b) Quarterly Mean of each Level to FVa

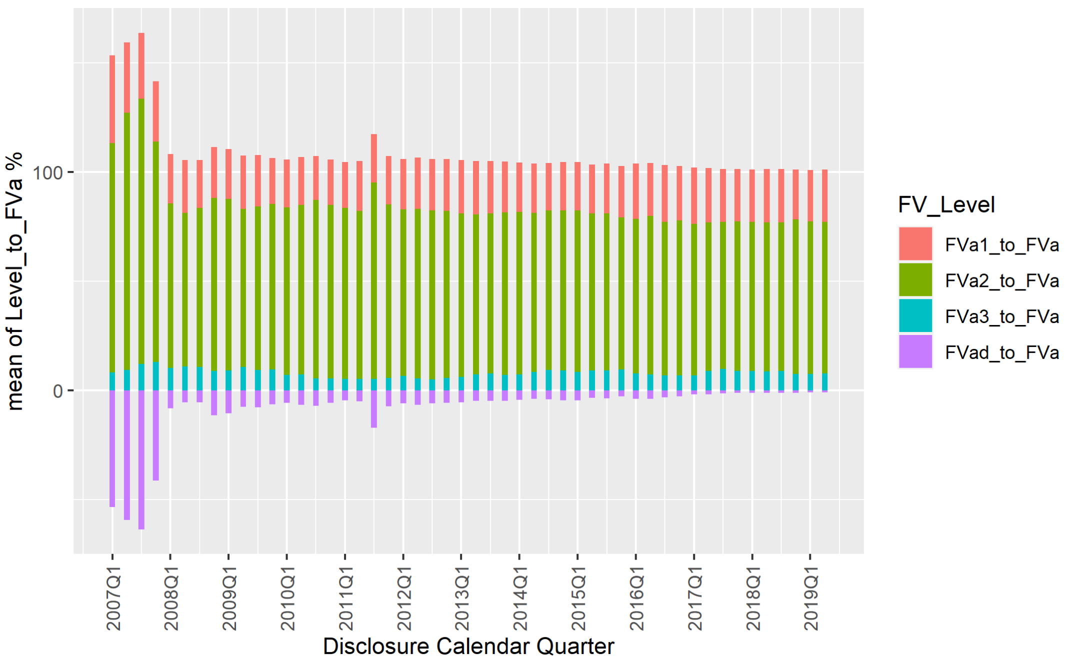


Figure 2.4: Cross sectional analysis of Fair Value Assets for the main subsample

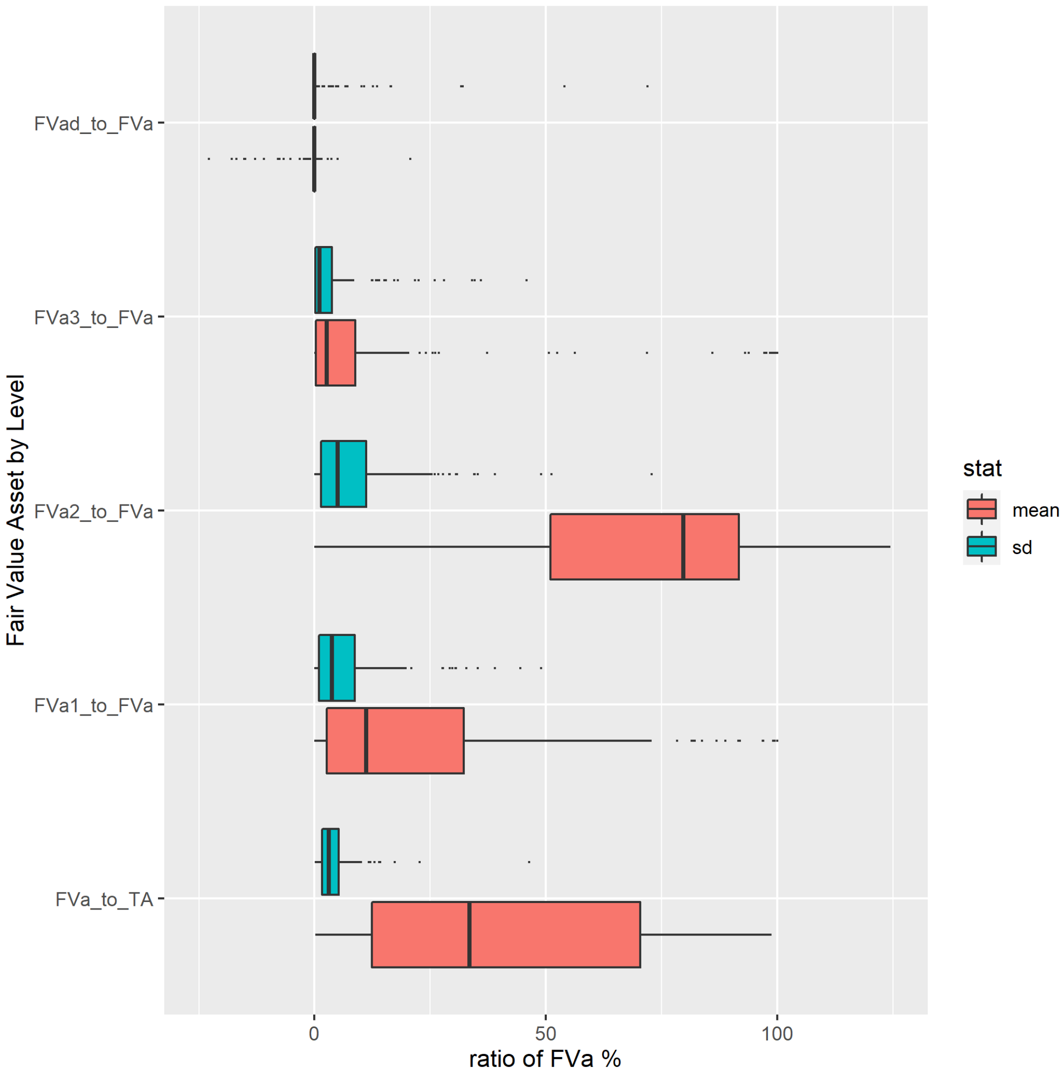


Figure 2.5: Monthly Spread over time

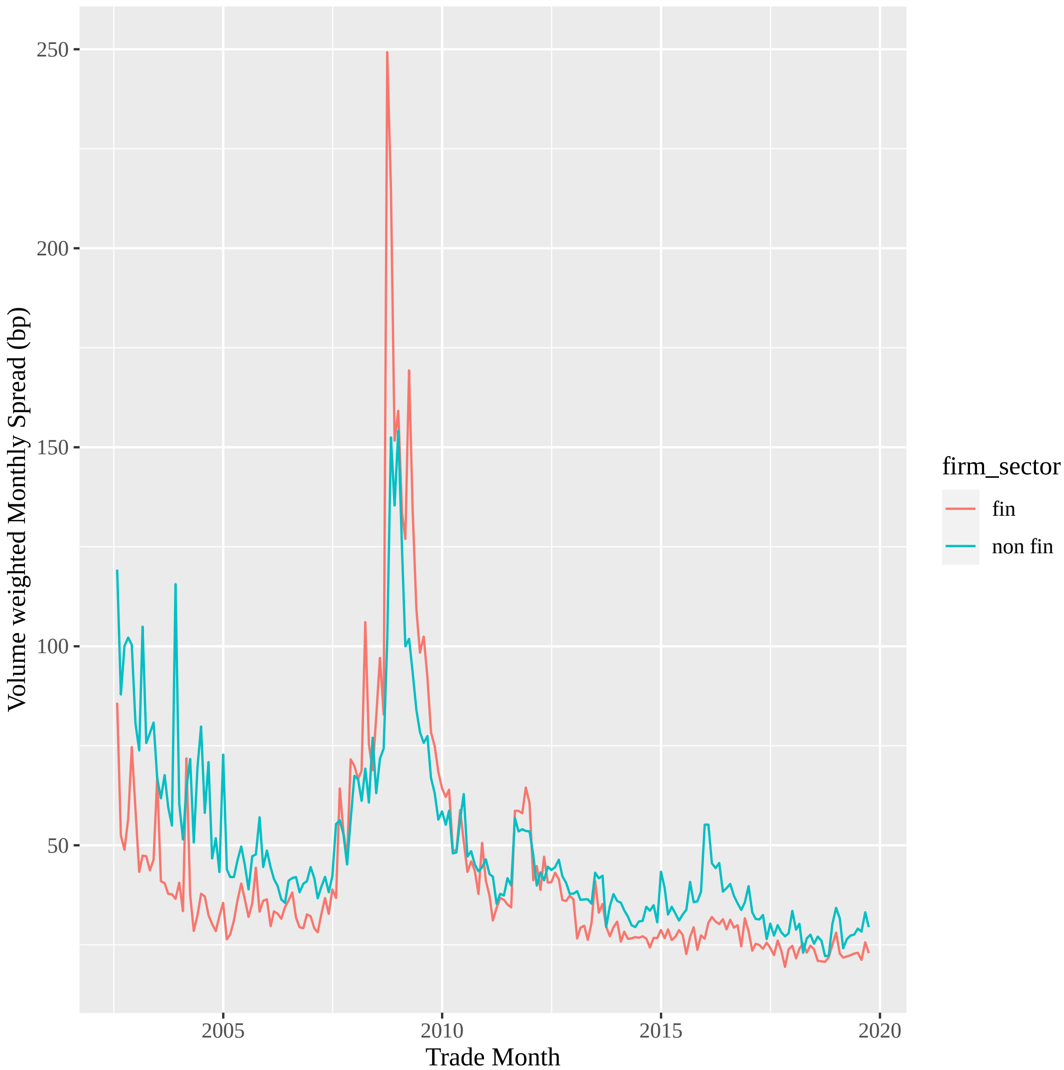


Table 2.4: Descriptive Statistics

Variables	Sector	n	min	p01	p10	p25	p50	p75	p90	p99	max	mean	sd
Spread	fin	85,547	0	0	10.68	20	37.93	71.86	130.05	367.23	367.26	58.6	63.24
	non fin	279,335	0	0	9.79	20.01	37.59	68.07	115.9	296.71	296.71	53.57	52.58
Volumes	fin	85,547	0.04	0.04	1.13	6.33	24.37	69	155.49	818.31	818.46	65.32	121.49
	non fin	279,335	0.04	0.04	0.99	5.15	18.87	51.56	116.42	601.73	601.74	48.4	88.08
Months	fin	85,547	1	1	12	29	58	104	267	355	355	89.56	91.97
	non fin	279,335	2	2	19	41	77	169	318	365	365	118.39	107.94
Rating	fin	85,547	3	3	5	6	7	9	11	16	16	7.87	2.44
	non fin	279,335	1	1	5	6	8	9	12	17	17	8.16	3.02
TA	fin	85,547	2.11	2.11	9.53	32.06	121.89	799.62	1912.33	2563.07	2563.07	512.73	744.39
	non fin	279,335	1.22	1.22	4.49	9.02	22.9	49.3	128.59	406.79	406.79	49.47	73.01
Size	fin	85,547	7.66	7.66	9.16	10.38	11.71	13.59	14.46	14.76	14.76	11.76	1.9
	non fin	279,335	7.11	7.11	8.41	9.11	10.04	10.81	11.76	12.92	12.92	10.04	1.26
Leverage	fin	85,547	41.08	41.08	60.26	76.76	88.39	91.33	93.18	97.01	97.01	82.38	13.32
	non fin	279,335	32.58	32.58	47.11	56.33	65.74	75.01	86.17	124.97	124.97	66.73	16.37
FVa1_TA	fin	85,547	0	0	0.01	0.68	6.04	14.07	19.31	42.54	42.54	8.46	9.22
	non fin	279,335	0	0	0	0.02	0.47	3.13	8.34	34.19	34.19	2.92	5.75

Table 2.4: Descriptive Statistics *(continued)*

Variables	**Sector**	**n**	**min**	**p01**	**p10**	**p25**	**p50**	**p75**	**p90**	**p99**	**max**	**mean**	**sd**
FVa2_TA	fin	85,547	0	0	0.2	6.78	28.05	53.42	68.24	100.24	100.24	32.55	26.59
	non fin	279,335	0	0	0	0.11	0.56	2.67	10.55	46.89	46.89	3.69	8.1
FVa3_TA	fin	85,547	0	0	0	0.03	0.73	2.91	5.47	45.01	45.85	2.36	5.18
	non fin	279,335	0	0	0	0	0	0.03	0.34	3.61	3.61	0.15	0.52
FVad_TA	fin	85,547	-83.88	-83.88	-35.5	-2.84	0	0	0	0.77	0.77	-7.84	17.61
	non fin	279,335	-2.16	-2.16	-0	0	0	0	0	0.25	0.25	-0.04	0.26
FVa_TA	fin	85,547	0.05	0.05	0.97	11.85	35.07	61.14	76.07	89.49	89.49	36.2	26.96
	non fin	279,335	0.01	0.01	0.14	0.46	1.78	7.1	20.56	62.01	62.01	6.95	12.22
FVa23_TA	fin	85,547	0	0	0.33	8.97	32.99	57.97	72.93	107.04	107.04	35.37	28.24
	non fin	279,335	0	0	0.01	0.16	0.63	3.01	11.24	46.9	46.9	3.87	8.17
FVa23_FA	fin	85,547	0	0	48.79	72.22	92.21	100	165.24	284.2	284.2	95.79	52
	non fin	279,335	0	0	1.52	24.16	67.64	99.16	100	242.55	242.55	61.89	43.47
Year	fin	85,547	2007	2007	2009	2011	2014	2017	2018	2019	2019	2013.98	3.37
	non fin	279,335	2007	2008	2010	2012	2015	2017	2018	2019	2019	2014.26	3.14

Note: Descriptive Statistics of pooled bond-months in the final sample by sector.

[a] n: number of observations

[b] min-max: minimum and maximum value in the sector.

[c] p01-p99: 1 percentile to 99 percentile in the sector.

[d] mean: overall mean value in the sector.

[e] sd: overall standard deviation of values in the sector.

Table 2.5: Correlation Matrix

	Spread	volume	month_to_maturity	rating_num	TA	size	lev	FVa1_to_TA	FVa2_to_TA	FVa3_to_TA	FVad_to_TA	FVa_to_TA	FVa23_to_TA	FVa23_to_FVa
Spread	1	-0.13	0.27	-0.08	-0.04	-0.07	0.23	0	-0.01	-0.41	-0.04	-0.04	0.06	0.85
volume	-0.13	1	0.14	-0.11	-0.06	-0.05	0.22	0.1	0	-0.56	0.79	0.08	-0.14	1
month_to_maturity	0.25	0.01	1	0.05	0.07	0.02	-0.01	0.12	0.01	0.21	-0.01	0.25	-0.14	0.17
rating_num	0.08	-0.03	-0.08	1	-0.03	0.08	0.03	0.03	0	-0.17	0.09	0.01	-0.06	-0.1
TA	-0.02	0.26	0.02	-0.33	1	-0.03	0.12	-0.15	0	-0.29	0.24	-0.02	0.3	0.17
size	-0.04	0.27	0.04	-0.43	0.82	1	-0.02	0.09	0.01	0.02	0.03	0.23	0.17	0.16
lev	0.06	0.15	-0.07	-0.08	0.4	0.62	1	0.16	0.01	0.01	0	0.25	-0.02	0.07
FVa1_to_TA	0.04	0.03	0.15	-0.2	0.22	0.31	0.11	1	0.02	-0.3	0.25	0.05	0.73	0.03
FVa2_to_TA	0.11	0.1	0.18	-0.27	0.55	0.52	0.3	0.35	1	-0.28	0.24	-0.09	0.31	-0.04
FVa3_to_TA	0.15	0.02	-0.01	0.01	0.09	0.03	-0.06	0.07	0.11	1	0.03	-0.14	-0.34	-0.28
FVad_to_TA	-0.01	-0.23	0.02	0.25	-0.83	-0.62	-0.28	-0.17	-0.62	-0.1	1	-0.04	0.08	0.86
FVa_to_TA	0.14	-0.04	0.23	-0.17	0.08	0.2	0.11	0.59	0.71	0.38	-0.03	1	-0.03	-0.07
FVa23_to_TA	0.13	0.09	0.16	-0.24	0.52	0.47	0.23	0.33	0.95	0.42	-0.59	0.77	1	0.18
FVa23_to_FVa	0.05	0.19	-0.03	-0.19	0.74	0.57	0.4	-0.07	0.62	0.13	-0.86	0.04	0.61	1

[a] Pearson Correlation in the pooled sample of bond-months.

[b] Upper triangle: Non Financial firms.

[c] Lower triangle: Financial Firms.

5.2 Multivariate Analysis

This section presents and discusses various specifications used to test our hypotheses. First, we perform the analysis for the sample of financial firms.

To test Hypothesis 1 we pool bond-months observations of financial institutions. Equation 2.1 is estimated using OLS. To control for trends of bid-ask spread over time, we include month dummies. Errors could be correlated across bonds, firms, and months. We choose the higher level (firms) between bond clustering and firm clustering to incorporate between bond error covariances in our clustering method. To account for both firm and months clustering, we implement two-way clustering standard errors.

Table 2.6 column (5) contains the coefficients of the interest. The coefficient of FVa_to_TA is positive (0.161) and is significant. Thus our first hypothesis is confirmed. Firms with a higher proportion of fair value assets illustrate a wider bid-ask spread. Such assets are more opaque in nature, and their presence increases the information asymmetry among bond market investors.

Table 2.6 presents the result using log transformation of spread and fair value ratio. Looking at column (5), again coefficient of L_FVa_to_TA is significantly positive, supporting Hypothesis 1.

Turning to Hypothesis 2, we estimate Equation 2.2 using OLS, including month fixed effects and standard errors clustered at firm and month level. Looking at column (5), one can see that the coefficient of FVa3_to_TA is the most positive and significant (0.854). The coefficient of FVa2_to_TA is still significant and positive but smaller (0.107). Finally, the coefficient of FVa1_to_TA is still positive but statistically insignificant. Fair value level 3 assets are the least reliable, and our evidence shows that the sensitivity of bid-ask spread to such assets is the most pronounced. Thus, Hypothesis 2, is confirmed.

Table 2.9 provides alternative identification strategies. Including firm fixed effects, the sign of coefficients change. Firm fixed effects, also called within-firm estimators, control for the firm's unobservable time-invariant characteristics, such as its business model. Changes in fair value ratios for a firm across various quarters could be associated with the extent of its footnote disclosures rather than the degree of transparency or asset reliability. Thus, higher fair value ratios imply greater disclosures to financial statement users, which reduces the degree of information asymmetry among them.

Table 2.10 extends the same analysis to a sample of non-financial firms. The coefficient of FVa_to_TA is positive and significant, even with including firm fixed effects. Thus, Hypothesis 1 holds also for the non-financial sector. The magnitude of the coefficient of FVa3_to_TA is larger than FVa2_to_TA and FVa1_to_TA, which implies Hypothesis 2 also holds for non-financial firms.

Table 2.6: Spread on Fair Value Assets for Financial Institutions

	Bid-Ask Spread				
	(1)	(2)	(3)	(4)	(5)
size	-4.410^{***}		-0.729		-1.139
	(1.664)		(1.002)		(0.999)
lev	0.305		0.206^{*}		0.200^{**}
	(0.191)		(0.109)		(0.097)
rating_num		4.847^{***}	4.661^{***}		4.796^{***}
		(0.658)	(0.729)		(0.625)
month_to_maturity		0.198^{***}	0.200^{***}		0.190^{***}
		(0.016)	(0.015)		(0.014)
volume		-0.079^{***}	-0.079^{***}		-0.075^{***}
		(0.006)	(0.007)		(0.007)
FVa_to_TA				0.258^{***}	0.161^{***}
				(0.068)	(0.046)
Observations	85,547	85,547	85,547	85,547	85,547
Adjusted R^2	0.302	0.420	0.421	0.303	0.425

Note: Bond-months observations are pooled for sample of financial institutions . Coefficients are estimated by OLS including month fixed effects. Standard errors reported in parantheses are two-way clustered across firms and across months . *p<0.1; **p<0.05; ***p<0.01

Table 2.7: log Spread on log Fair Value Assets for Financial Institutions

	log Bid-Ask Spread				
	(1)	(2)	(3)	(4)	(5)
size	-0.050^{*}		0.010		-0.008
	(0.027)		(0.017)		(0.017)
lev	0.003		0.001		0.001
	(0.003)		(0.002)		(0.002)
rating_num		0.080^{***}	0.084^{***}		0.085^{***}
		(0.010)	(0.011)		(0.009)
month_to_maturity		0.004^{***}	0.004^{***}		0.003^{***}
		(0.0002)	(0.0002)		(0.0002)
volume		-0.001^{***}	-0.001^{***}		-0.001^{***}
		(0.0001)	(0.0001)		(0.0001)
L_FVa_to_TA				0.076^{***}	0.060^{***}
				(0.025)	(0.016)
Observations	85,547	85,547	85,547	85,547	85,547
Adjusted R^2	0.164	0.294	0.295	0.167	0.299

Note: Bond-months observations are pooled for sample of financial institutions . Coefficients are estimated by OLS including month fixed effects. Standard errors reported in parantheses are two-way clustered across firms and across months . *p<0.1; **p<0.05; ***p<0.01

Table 2.8: Spread on Fair Value Assets levels 1,2,3 for Financial Institutions

	Bid-Ask Spread				
	(1)	(2)	(3)	(4)	(5)
FVa1_to_TA	0.133	0.193			0.106
	(0.214)	(0.137)			(0.135)
FVa2_to_TA	0.059		0.138**		0.107**
	(0.104)		(0.057)		(0.052)
FVa3_to_TA	0.851**			0.914***	0.854***
	(0.413)			(0.300)	(0.281)
size		−1.079	−1.763*	−1.157	−2.127**
		(1.085)	(0.976)	(1.012)	(1.007)
lev		0.221**	0.214**	0.276***	0.286***
		(0.111)	(0.097)	(0.104)	(0.097)
rating_num		4.684***	4.717***	4.449***	4.520***
		(0.701)	(0.643)	(0.677)	(0.595)
month_to_maturity		0.198***	0.194***	0.201***	0.195***
		(0.015)	(0.014)	(0.015)	(0.014)
volume		−0.078***	−0.077***	−0.079***	−0.077***
		(0.007)	(0.006)	(0.007)	(0.006)
Observations	85,547	85,547	85,547	85,547	85,547
Adjusted R^2	0.298	0.422	0.423	0.426	0.428

Note: Bond-months observations are pooled for sample of financial institutions . Coefficients are estimated by OLS including month fixed effects. Standard errors reported in parantheses are two-way clustered across firms and across months . *p<0.1; **p<0.05; ***p<0.01

Table 2.9: Spread on Fair Value Assets with Firm Fixed effects

	Bid-Ask Spread				
	Within	Within	Within	Between	Between
	(1)	(2)	(3)	(4)	(5)
FVa_to_TA	−0.273*	−0.273*		0.152	
	(0.146)	(0.154)		(0.096)	
FVa1_to_TA			−0.161		−0.148
			(0.252)		(0.323)
FVa2_to_TA			−0.131		0.237*
			(0.095)		(0.134)
FVa3_to_TA			−0.175		0.400
			(0.431)		(0.279)
size	18.057***	18.057***	18.581***	−2.193	−2.259
	(4.177)	(4.284)	(4.108)	(2.745)	(2.785)
lev	0.402	0.402	0.387	0.463*	0.469*
	(0.249)	(0.252)	(0.259)	(0.236)	(0.261)
rating_num	3.742***	3.742***	3.631***	4.206***	4.187***
	(0.942)	(0.931)	(0.975)	(1.446)	(1.491)
month_to_maturity	0.187***	0.187***	0.186***	0.063	0.067
	(0.012)	(0.014)	(0.013)	(0.065)	(0.068)
volume	−0.069***	−0.069***	−0.069***	−0.076	−0.083
	(0.007)	(0.007)	(0.007)	(0.070)	(0.070)
Constant				8.052	7.467
				(28.360)	(28.421)
Firm FE	*Yes*	*Yes*	*Yes*		
Month FE	*Yes*	*Yes*	*Yes*		
Firm Cluster	*Yes*	*Yes*	*Yes*		
Month Cluster	*No*	*Yes*	*No*		
Observations	85,547	85,547	85,547	236	236
Adjusted R^2	0.479	0.479	0.479	0.092	0.095

Note: Bond-months observations are pooled for sample of financial institutions. Standard errors are reported in the paranthesis. *p<0.1; **p<0.05; ***p<0.01.

Table 2.10: Spread on Fair Value Assets for Non Financial Firms

	Spread				L_Spread	
	(1)	(2)	(3)	(4)	(5)	(6)
FVa_to_TA	0.111*	0.132**				
	(0.060)	(0.065)				
FVa1_to_TA			0.017	−0.052		
			(0.141)	(0.098)		
FVa2_to_TA			0.152*	0.256***		
			(0.079)	(0.074)		
FVa3_to_TA			2.106**	1.876		
			(0.976)	(1.191)		
L_FVa_to_TA					0.027**	−0.005
					(0.012)	(0.012)
size	0.956	−1.833	0.862	−1.782	0.048***	−0.069**
	(1.247)	(2.011)	(1.249)	(1.995)	(0.013)	(0.030)
lev	0.081*	0.167**	0.084*	0.173***	0.001	0.001
	(0.046)	(0.064)	(0.046)	(0.063)	(0.001)	(0.001)
rating_num	2.992***	3.293***	2.950***	3.293***	0.070***	0.052***
	(0.544)	(0.774)	(0.548)	(0.769)	(0.007)	(0.008)
month_to_maturity	0.152***	0.146***	0.152***	0.146***	0.003***	0.003***
	(0.006)	(0.005)	(0.006)	(0.005)	(0.0001)	(0.0001)
volume	−0.089***	−0.083***	−0.088***	−0.083***	−0.001***	−0.001***
	(0.006)	(0.004)	(0.007)	(0.004)	(0.0001)	(0.0001)
Firm FE	*No*	*Yes*	*No*	*Yes*	*No*	*Yes*
Month FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Observations	279,335	279,335	279,335	279,335	279,335	279,335
Adjusted R^2	0.282	0.364	0.283	0.364	0.190	0.260

Note: Bond-months observations are pooled for sample of non financial firms . Coefficients are estimated by OLS. Standard errors reported in parantheses are two-way clustered across firms and across months . *p<0.1; **p<0.05; ***p<0.01

6 Summary and Concolusion

This paper examines the effect of Fair value measurement levels according to SFAS 157 on information asymmetry among the U.S. corporate bonds market investors. We find that the bid-ask spread of bonds is positively associated with the ratio of total fair value to total asset, and its magnitude is higher for level 3 and level 2 assets. It implies that information asymmetry is more substantial for firms with more opaque financial assets. These results support the view that bondholders' non-linear payoff function makes them demand more conservative accounting practices. The result holds for both the financial and non-financial sectors and is robust to linear and log-linear specifications. Our work will be extended by studying various circumstances that moderates the primary effects, such as institutional investors type and ex-ante information environment quality. Furthermore, we will study the role of disclosure policy regarding holding companies and their subsidiaries by looking at the direct entity that issues the bond. We will examine how fair value disclosures would be useful to investors in the case of distressed firms.

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Chapter 3

Banks' Financial Transparency and Liquidity Creation

This study investigates the effect of financial reporting transparency on the liquidity creation function of banks. Recent theoretical models suggest that banks are secret keepers, and by keeping information about the firms secret, banks can provide money like safe liquidity to depositors. This model implies that transparency harms liquidity creation. The previous empirical literature has treated the asset and the liability sides of banks' balance sheets separately. This study aims at connecting the two sides and measuring the effect of assets transparency on liquidity transformation. Using CALL reports, I find that Delayed Expected Loss Recognition measure of opacity and CAT FAT measure of liquidity creation are negatively associated, most significant for small banks.

1 Introduction

The role of banks as liquidity and maturity transformers makes them an essential element of the economy. Ideally, banks should collect short-term liquid deposits and other liabilities and transform them into longer-term, illiquid loans and other assets. The same role of banks can put them at risk of runs. While panic runs can prevent healthy banks from functioning, fundamental runs are necessary to avoid excessive risk-taking. The effect of accounting reporting choices and, in particular, transparency by banks on their performance and financial system stability is empirically an open question in accounting literature. Beatty and Liao (2014),Bushman and Williams (2015), and Acharya and Ryan (2016) call for further studies to investigate this relationship and its characteristics.

This research aims at studying the effect of financial reporting transparency on the liquidity creation function of banks. Banks transfer illiquid loans into liquid checkable deposits. This function presumably is desirable for the economy and helps the circulation of money from savings to investments. Banks can play such an important role based on being trusted by depositors.

Theory literature on bank transparency shows that, while regulators and market participants' ability can be improved by credible public information to monitor and exercise discipline on banks' behavior, there are potentially significant costs associated with transparency. Dang et al. (2017) theoretically compare the banking sector and financial markets as two intermediary institutions. The main difference between them lies in that banks can hide information about their assets while financial markets through price mechanisms reveal the most information. By keeping information about the firms secret, banks can provide money-like safe liquidity to depositors. This model implies that transparency harms liquidity creation.

Gao and Jiang (2018) augment Diamond and Dybvig (1983) with reporting choice of banks to study the role of accounting discretion in transparency on panic runs. They find that banks with powerful fundamentals (high return on assets or low return on assets) would not benefit from opacity, while banks with intermediate fundamentals (positive return on assets in case there is no early liquidation) can prevent panic runs in a pooling equilibrium.

The empirical literature has treated asset and liability sides separately. Beatty and Liao (2011) studied the role of delayed expected loss recognition on banks' willingness to lend during recessions. In an argument in line with the capital crunch theory, they suggest that lower transparency should be followed by cutting the lending in downturns. Their study focuses on the effect of transparency on the assets side of liquidity creation. Chen et al. (2020) investigate the role of transparency on deposit flows. They suggest that uninsured deposits are more information sensitive than insured deposits by controlling for the asset side. Although their study focuses on the liability side, they also indicate that holding the liability side, bank willingness to provide liquidity in forms of loan commitments is negatively associated with transparency.

To provide regulators with guidelines about the role of transparency, it is necessary to consider the implications of transparency on both sides of the balance sheet. This study aims at connecting the two sides and measuring the effect of assets transparency on liquidity transformation.

2 Theoretical Background and Hypothesis Development

2.1 Liquidity creating

Theoretical research suggests that banks create liquidity on the balance sheet and off the balance sheet. Some theories, such as Bryant (1980) and Diamond and Dybvig (1983), focus on the demand side and see liquidity creation as creating liquidity by giving depositors the right to withdraw on demand. Donaldson et al. (2015) consider both asset and liability sides. They believe that the more illiquid assets are, the more liquidity is created as it increases the economy's investment. Other models such as Boot and Thakor (1993), Holmstrom and Tirole (1998), and Kashyap et al. (2002) also recognized that Banks create liquidity off the balance sheet through loan commitments and similar claims to liquid funds. Loan commitment gives the customer the right to draw down liquid funds up to the specific limit at any time, requiring the bank to hold something illiquid. Berger, Bouwman, et al. (2016) suggest that off-balance-sheet liquidity creation accounts for nearly half of all bank liquidity creation in the United States, primarily due to loan commitments.

2.2 Transparency advocates

Barth and Schipper (2008) define financial reporting transparency as providing information that reflects a firm's underlying economics and is readily understandable by capital providers. They claim that both theoretical and empirical research concludes that transparency is associated with lower capital cost and is a desirable financial report characteristic. The primary mechanism that the study proposes is that transparent financial reporting can decrease non-diversifiable risk from investors' information asymmetry. Moreover, it may increase the average precision of an investor's assessment of the firm's future cash flow.

Beatty and Liao (2011) study the incurred loss model's role on banks' willingness to lend during recessions. Capital crunch theory implies that regulatory capital concerns make banks to lend less during the recession. They find a positive effect on transparency on lending during recessions. Banks that delay less in periods prior to the recessions have more minor capital adequacy concerns in the next quarters and need to reduce their lending less. A significant stream of transparency literature in the banking system focuses on the case of revealing stress tests publicly by regulators. It is commonly argued in this literature that transparency enables investors to monitor financial institutions more effectively, which improves market discipline and allocation efficiency. Bouvard et al. (2015) propose a theory of optimal transparency required by regulators. Disclosing bank-specific information improves the financial system during crises, while in normal economic cycles, it has a destabilizing effect. During the financial crisis of 2008, demand for transparency increases, and regulatory bodies performed and disclosed stress tests on the largest financial institutions. However, many including Fed Chairman Ben Bernanke, warned that "when the stress assessment was getting started, some observers had warned that the assessment and, in particular, the public disclosure of the results might backfire" (Speech at the Federal Reserve Bank of Chicago, Illinois, on May 6, 2010.) They suggest a model for the regulator commitment problem and study the case where the regulator can hold bank-specific information undisclosed while disclosing credibly aggregate information.

Bushman and Williams (2015) define bank transparency as the availability of bank-specific information to those outside of the bank, including depositors, investors, borrowers, counterparties, regulators, policymakers, and competitors. A key source of bank transparency is publicly disclosed financial reports, which provide bank-specific information to investors and regulators seeking to understand a bank's fundamentals to guide investment decisions, discipline risk-taking, and enhance stability. They studied the effect of delayed expected loss recognition (DELR) on banks' vulnerability to risk. They consider three aspects of banks' risk profile: stock market liquidity risk, downside tail risk of individual banks, and codependence of downside tail risk among banks. They find that opacity increases the risk profile. Banks with higher DELR (less transparent) show higher risk levels at an individual and systematic level.

Ertan et al. (2017) is an empirical attempt to study the effect of transparency on banks' performance. Authors take advantage of the European Central bank's disclosure initiative that can be thought of as a change in transparency. By January 2013, banks that use their asset-backed securities as collateral for repo financing are supposed to report a standard format - performance and features of the securitized loans. They find that transparency can have a real effect on the changing behavior of the bank. Banks under the transparency regime are monitored stronger, and the market discipline effect prevails; they will tend to originate better quality securitized loans with lower default probability.

Financial reporting transparency imposes higher discipline to banks in boom times and reduces their capital adequacy concerns in bust cycles. I hypothesize that transparency has a positive effect on liquidity creation.

Hypothesis 1: *Financial Reporting Transparency increases Liquidity Creation by banks.*

2.3 Opacity supporters

Gorton (2015) argues that bank output is private money production by issuing short-term debt such as demand deposits, private banknotes, and sale and repurchase agreements. Bank money functions efficiently if it would be accepted at its face value, and any information that creates doubt about it should not be revealed. This process optimally requires closing informative financial markets where bank liability (debt and equity) is traded.

Banks should keep the value of backing for their debt secret. However, as a side effect, opacity can follow bank runs. As an information event, a financial crisis can make bank debtholders suspicious about the value and risk of assets' backing the debt such that they try to retrieve their cash massively. That is why banks are regulated, although examiners keep their assessments hidden from the public. To illustrate his point, he suffices to one example, historical transition in the united states banking system from private bank notes to demand deposits after the U.S. Civil War.

Dang et al. (2017) propose a theoretical model to show that banks optimally are opaque, and by doing so, they play a complementary role to capital markets. The main difference between banks and capital markets is in the way that the two institutions process information. In capital markets, aggregated private and public information through price discovery reflect the information about projects fully. Competition among expert traders leads to efficient price discovery and symmetric information among all investors and risky liquid claims. The disadvantage of the price discovery is that securities delivered by capital markets do not have a stable value and cannot play money-like securities. Capital markets reveal too much information too early that results in a fully revealing equilibrium. Thus, capital markets provide risky liquidity. However, a bank's opacity makes it costlier for an expert investor to uncover information about the bank's balance sheet, lessening the expert's informational advantage. Additionally, opacity prevents public information from affecting the value of a bank's assets. Authors predict that banks invest more in less risky and less transparent projects to reduce the cost of producing private money due to complementarity between the production of money and the asset.

Gao and Jiang (2018) augment Diamond and Dybvig (1983) with reporting choice of banks to study the role of accounting discretion in transparency on panic runs. In their model, the bank is featured by an exogenous maturity mismatch between liability and assets sides. This mismatch makes banks vulnerable to coordination failure among depositors (panic-based runs) or insolvency (fundamental-based runs). Only bank managers can observe the fundamentals and can issue a biased report as they prefer fewer withdrawals. In this setting, depositors and creditors should infer both managers' bias and the belief of other stakeholders to coordinate. The global game methodology is used to obtain a unique equilibrium. Creditors withdraw if and only if they observe a signal which falls below a common threshold. From the point of view of the manager, the reporting strategy is a partial pooling. The strongest banks can survive without misreporting, while the weakest banks will suffer from the run as misreporting bias is not big enough. More notably, misreporting allows banks with intermediate fundamentals to pool together and avoid runs.

Chen et al. (2020) use transparency as a moderator for the effect of bank performance on deposit flows. They find that uninsured deposits are more sensitive to bank performance for more transparent banks. However, as expected, sensitivity insured deposits to bank performance is not affected by transparency. Deposits are the most significant portion of banks' liability side and represent around 60% of banks' funding sources. According to Hanson et al. (2015), around 50% of deposits are uninsured in the largest commercial banks, and wholesale funding is a significant funding source.

Chen et al. (2020) consider three aspects of transparency separately. They propose a measure of asset transparency based on the explanatory power of loan loss provisions and nonperforming loans of previous periods to predict future charge-offs. They use the educational background of depositors as investors' sophistication transparency. The third type of transparency considered in their work is where information is more extensively available for public banks compared to private banks. Although their study focuses primarily on the effect of various aspects of transparency on deposit growth rate sensitivity to past performance (previous period ROE), they also study the effect of transparency on loan commitments. They recognize that transparency can affect both sides of the balance sheet; however, they treat both sides separately and control for the other side. This work is the first study attempting to reconcile both sides to view how transparency affects banks' performance.

Transparent banks are more subject to runs, and their deposit flow is more sensitive. I hypothesize that transparency reduces their ability to create liquidity.

Hypothesis 2: *Financial Reporting Transparency decreases Liquidity Creation by banks.*

Table 3.1: Weights to construct CAT FAT

Category	Weight: Assets (e.g. Loans)	Weight: Liabilities (e.g. Deposits)
Liquid	-0.5	+0.5
Semiliquid	0	0
Illiquid	+0.5	-0.5

3 Research Design

3.1 Liquidity Creation

Berger and Bouwman (2009) propose several alternative liquidity creation measures. Although banks are more complex than what is pictured in theories, they prefer "CAT FAT" measure to other measures as it is closest in spirit to the theories. The theories discuss that banks create liquidity on-balance sheet by financing relatively illiquid assets with relatively liquid liabilities. They also create liquidity off-balance sheet through loan commitments and similar claims to liquid funds. "CAT FAT" is constructed in three steps.

First, we should classify all bank assets, liabilities, equity, and off-balance sheet activities as liquid, semiliquid, or illiquid.

Second, weights should be assigned to each activity, and they should be in line with the theory-maximum (i.e., dollar-for-dollar) liquidity is created when illiquid assets are transformed into liquid liabilities. Maximum liquidity is ruined when liquid assets are transformed into illiquid liabilities or equity. Illiquid assets, liquid liabilities, and illiquid off-balance sheet items are assigned positive weights. Liquid assets, illiquid liabilities, and liquid off-balance sheet items are assigned negative weights (e.g. Table 3.1)

Third, the dollar value of transactions is summed based on category and weights. Due to data availability issues, this measure uses the category of loans rather than their maturity (so it is called CAT) and includes off-balance sheet activities (so it is called FAT).

"CAT FAT" measure is preferred to Deep and Deep and Schaefer (2004) liquidity transformation gap or "LT gap" -calculated as (liquid liabilities - liquid assets)/ total assets - for three reasons. First, the "LT gap" measures the liquidity of loans based on maturity. Second, the "LT gap" does not take into account the contribution of off-balance-sheet activities to the liquidity creation function of banks. Third, the "LT gap" considers only two classifications of assets and liabilities - liquid or illiquid - while the preferred "CAT FAT" approach uses three - liquid, semiliquid, and illiquid.

To include CAT FAT in the regressions, it should be scaled by Gross Total Assets (total assets plus the allowance for loan and lease losses and the allocated transfer risk reserves).

3.2 Bank Reporting Transparency

The most prominent component of banks' books that allows for discretion is the loan loss provision of the loan book. Beatty and Liao (2011), Bushman and Williams (2015), and many others in the literature used delayed expected loan loss recognition *(DELR)* with various specifications to estimate banks' transparency. The loan book is the largest asset on a bank's balance sheet, and lending activities underlying loans are usually based on private information that is kept secret from bank outsiders. Beatty and Liao (2014) provide an extensive review of the measure in the literature. It is shown that DELR is a manifestation of opportunistic loan provisioning behavior that results in reduced bank transparency.

Bushman and Williams (2012) generate bank-quarter estimates of DELR for each bank-quarter, estimating the following equations over a prior 12-quarter rolling window-which requires the bank to have data for all 12 quarters:

$$\begin{aligned} LLP_t = \gamma_0 + \gamma_1 \Delta NPL_{t-1} + \gamma_2 \Delta NPL_{t-2} \\ + \gamma_3 Capital_{t-1} + \gamma_4 EBLLP_t + \gamma_5 Size_{t-1} + \nu_t \end{aligned} \tag{3.1}$$

$$
\begin{aligned}
LLP_t = \gamma_0 &+ \gamma_1 \Delta NPL_{t-1} + \gamma_2 \Delta NPL_{t-2} \\
&+ \gamma_3 \Delta NPL_t + \gamma_4 \Delta NPL_{t+1} + \gamma_5 Capital_{t-1} \\
&+ \gamma_6 EBLLP_t + \gamma_7 Size_{t-1} + \nu_t
\end{aligned}
\tag{3.2}
$$

In these equations, LLP is loan loss provisions scaled by lagged total loans, ΔNPL is the change in nonperforming loans scaled by lagged total loans, Capital is the tier 1 capital ratio, EBLLP is earnings before loan loss provision scaled by lagged total loans, Size is the natural log of total assets. Capital and EBLLP are controls. Beatty, Chamberlain, et al. (1995) imply using capital to control banks' incentives to manage capital through loan loss provisions, and Bushman and Williams (2012) imply using EBLLP to control for banks' incentives to smooth earnings.

The incremental R^2 is calculated by subtracting the adjusted R^2 of Equation 3.1 from Equation 3.2. It is shown that higher incremental R^2 is consistent with more timely recognition of expected losses. For each quarter, they rank banks based on their incremental R^2 and set the dummy variable DELR equal to 1 if the bank is below the median incremental R^2, and 0 otherwise. In sum, DELR is 1 for banks that most aggressively delay loss recognition.

Although DELR is the prominent measure of transparency, Chen et al. (2020) use a slightly different specification. They use the actual loan charge-offs of each period as a proxy for expected loan losses in the preceding period. They assume that the following period write-offs can reflect managers' private information about what they expect to become uncollectible. They use adjusted R^2 of Equation 3.3 estimated for each bank-quarter over the prior 12 quarters on a rolling basis.

$$
\begin{aligned}
Chargeoffs_t = \alpha_0 &+ \beta_1 LLP_{t-1} + \beta_2 LLP_{t-2} \\
&+ \gamma_1 NPL_{t-1} + \gamma_2 NPL_{t-2} \\
&+ \delta Capital_{t-1} + \rho EBLLP_t + \varepsilon_t
\end{aligned}
\tag{3.3}
$$

Capital is equity divided by total assets, and the rest of the variables are scaled by total loans.

The adjusted R^2 measure is more intuitive than DELR. I first estimate adjusted R^2, and to test the robustness of the results will also use DELR.

3.3 Control variables

I use Gross Total Assets to control for size. GTA is total assets plus the allowance for loan and lease losses and the allocated transfer risk reserves. First, I divide my sample into three size levels. Large banks (GTA $>$ \$3 billion), Medium banks (GTA between \$1 and \$3 billion), and small banks (GTA less than \$1 billion). Second, in each subsample, I control for the Natural Logarithm of GTA.

Berger and Bouwman (2009) suggest that liquidity creation is associated with capital adequacy. I control for capital using the ratio of equity to gross total assets.

Bushman and Williams (2015) suggest that transparency is associated with the banks' risk profile, which also affects liquidity creation. I estimate the earning volatility by the standard deviation of the bank's quarterly return on assets measured over the previous 12 quarters (multiplied by 100).

Bank Holding Company provides internal financing to the bank and affects its liquidity creation. I use a dummy variable that turns one if the bank belongs to a BHC in any prior 12 quarters.

3.4 Estimation and Data

To examine the effect of transparency on liquidity creation, I estimate a pooled OLS regression using quarterly data. I include bank and quarter fixed effects to account for time-invariant bank unobservables and institutional and contextual features. I cluster standard errors by banks to correct for possible serial correlations.

$$Liquidity_{it} = \beta_0 + \beta_1 Trans_{it-1} + Controls + FE + \varepsilon_{it} \tag{3.4}$$

CAT FAT scaled by GTA measures liquidity. Transparency is measured by adjusted R^2. Controls include lagged Capital Ratio (Equity to GTA), Earnings Volatility (standard deviation of ROA), Size (natural logarithm of GTA), and a dummy for Bank Holding Company Status.

Primarily data comes from Call Reports for all US commercial banks. Due to data limitations and 12 rolling window requirements, my study spans 28 quarters from 2004 to 2011. Call reports are accessible through WRDS. Quarterly liquidity creation estimates are readily provided by Berger, Bouwman, et al. (2016).

4 Results

Table 3.2 reports the results for estimating the equation (4) for three size levels. I find that transparency has a significant negative effect on liquidity creation for small banks (-0.0045). Although negative, the effect for medium and large banks is not significant.

Table 3.2: Effect of Transparency on Liquidity Creation by bank size

	(1)	(2)	(3)
	Small	Medium	Large
Trans_R2_lag1	-0.0045***	-0.0033	-0.0017
	(0.001)	(0.003)	(0.015)
equity_ratio_lag1	-0.2465***	-0.0859	0.6178
	(0.046)	(0.120)	(0.861)
risk_roavol	-0.0426***	-0.0520***	-0.1593
	(0.004)	(0.010)	(0.099)
size_log_GTA	-0.0244***	-0.0658***	-0.2818***
	(0.007)	(0.017)	(0.105)
bhc_status	0.0235***	-0.0050	-0.8855
	(0.006)	(0.015)	(0.705)
Constant	0.5940***	1.3652***	5.9551***
	(0.082)	(0.233)	(1.978)
Observations	160,689	9,388	5,580
R-squared	0.043	0.181	0.158
Number of banks	7,269	626	313

Robust standard errors in parentheses.

*p<0.1; **p<0.05; ***p<0.01

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