Information Risk and Fair Value:
An Examination of Equity Betas and Bid-Ask Spreads

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Abstract: Finance theory suggests that information risk—that is, the uncertainty regarding valuation parameters for an underlying asset—is reflected in firms' equity betas and the information asymmetry component of bid-ask spreads. We empirically examine these predictions for a sample of large U.S. banks, exploiting recent mandatory disclosures of financial instruments designated as fair value level 1, 2, and 3, which indicate progressively more illiquid and opaque financial instruments. Consistent with predictions, results reveal that portfolios of level 3 financial assets have higher implied betas and lead to larger bid-ask spreads relative to those designated as level 1 or level 2 assets. Both results are consistent with a higher cost of capital for banks holding more opaque financial assets, as reflected by the level 3 fair value designation.

Key Terms: *banks*, *risk, fair value*, *financial instruments*

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Abstract: Finance theory suggests that information risk—that is, the uncertainty regarding valuation parameters for an underlying asset—is reflected in firms' equity betas and the information asymmetry component of bid-ask spreads. We empirically examine these predictions for a sample of large U.S. banks, exploiting recent mandatory disclosures of financial instruments designated as fair value level 1, 2, and 3, which indicate progressively more illiquid and opaque financial instruments. Consistent with predictions, results reveal that portfolios of level 3 financial assets have higher implied betas and lead to larger bid-ask spreads relative to those designated as level 1 or level 2 assets. Both results are consistent with a higher cost of capital for banks holding more opaque financial assets, as reflected by the level 3 fair value designation.

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1. Introduction

This paper examines whether varying levels of information risk are reflected in firms' equity betas and bid-ask spreads. Specifically, we exploit a particular measure of information risk relevant to financial institutions: the requirement that certain financial instruments be measured at fair value and designated as level 1, 2 or 3, as mandated by recent reporting requirements. These designations are intended to capture increasing levels of opacity and illiquidity in the underlying instruments. We assess whether these measures are reflected in firm systematic risk and the information asymmetry component of the bid-ask spread.

The setting for the study focuses on the reporting of financial instruments at fair value for a sample of large U.S. banks over the period 1Q 2007 through 2Q 2008 for the following reasons. First, measurement of these instruments represents likely first-order effects on market participants' perceptions of risk surrounding the valuation of these firms. In addition, large banks are more likely to exhibit the following characteristics: diversified portfolios with substantial components across the three fair value categories; higher levels of disclosure regarding the related fair value estimates owing to deeper oversight by regulators and/or scrutiny by investors; and considerable market interest in their shares. These characteristics provide greater cross-sectional variation in our proxy for information risk (differences across fair value designations), as well as more precise measurement of the dependent variables (equity beta and bid-ask spreads) and experimental variables (fair value designations) that are the focus of the study. Our choice of 1Q 2007 through 2Q 2008 coincides with the earliest availability of information regarding level 1, 2, and 3 fair value disclosures. Finally, our examination of the interplay between information risk and the reporting of financial instruments at fair value is motivated by high-level policy debate regarding the role of fair values in the current economic crisis.[1]

We implement our empirical investigation of the association between fair value measures and information risk by building upon finance theory in two ways. First, we examine how firm level equity betas relate to banks' asset structures. Specifically, if the firm equity beta is simply the implied betas across its asset structure, this allows insights into market perceptions of information risk relating to different types of financial instruments held by these firms. Higher estimation risk, captured by the fair value designations, thus leads to predictions that implied betas will be increasing across financial instruments designated as fair value level 1, 2, and 3. Second, we examine how bid-ask spreads, specifically the information asymmetry component, reflect banks' asset structures. If estimation risk leads to greater information asymmetry, this leads to a prediction that firm bid-ask spreads will be increasing across the level 1, 2, and 3 designations.

Empirical results are consistent with both predictions. First, we document that implied betas are significantly more positive for financial assets designated as fair value level 3 relative to those designated as level 1 or 2. If equity betas capture firms' information risk, these results are consistent with firms' cost of capital increasing in their exposure to level 3 financial assets. Additional analyses decomposing beta reveal that the correlation between a firm's stock return and that of the market is increasing in the firm's exposure to level 3 financial assets. This provides additional evidence consistent with the information risk interpretation. Second, we document that bid-ask spreads are significantly more positive for level 3 financial assets relative to those designated either as level 1 or 2. Similar to the results for implied betas, this is

[1] For example, the requirement to report many financial instruments at fair value played a significant role in the substantial write-downs of financial assets reported recently by financial institutions, with over $485 billion in aggregate write-downs reported during January 2007 to August 2008.

consistent with greater information asymmetry, and thus an increasing cost of capital, for firms with greater exposure to level 3 financial assets. Results for both analyses are consistent across a number of alternative specifications.

Our paper contributes to three literatures. First, we contribute to the literature examining whether bank asset structure leads to greater opaqueness, thereby justifying regulatory intervention (Morgan 2002; Flannery, Kwan, and Nimalendran 2004). Our results suggest that asset structure does explain differences in information asymmetry among investors, and therefore the opacity of a firm. Second, we directly test the proposition of Lambert, Leuz and Verrecchia (2007) that information quality is reflected in firm beta, thereby contributing to the literature on estimation risk (Barry and Brown 1984, 1985; Clarkson and Thompson 1990). Finally, we contribute to the literature about the role of reporting for financial institutions (e.g., Barth 1994) by showing that level 3 assets have higher systematic risk and lead to higher information asymmetry, a finding that we attribute to the opaque nature of the underlying assets. These findings further suggest that current disclosure requirements regarding fair values of financial instruments are insufficient to overcome the perceived higher information risk for more illiquid financial instruments.

Section 2 provides background on financial reporting relating to financial institutions and fair value accounting, as well as the current paper's link to prior research. Section 3 presents our hypothesis development and research design. Section 4 presents the sample selection and descriptive statistics. Section 5 presents the primary empirical results. Section 6 presents sensitivity analyses, and Section 7 concludes.

2. Background

2.1. Banking and Fair Value Reporting

Under U.S. accounting standards, the reporting for financial instruments primarily depends on management intent to hold or trade the instruments in question. Financial instruments may receive one of three designations. First, "held to maturity" reflect financial instruments, which management has both the intent and ability to retain for the instruments' legal life. These instruments are typically non-derivative financial assets with fixed or determinable payments and fixed maturity, including loans held for investment, deposits, and debt. Second, "available for sale" reflect financial instruments, which management is willing to sell generally within the next fiscal year. Third, "trading securities" reflect financial instruments, which management generally will sell upon demand. The latter include assets and liabilities that are acquired principally for the purpose of selling or repurchasing in the near term, as well as derivatives that are not designated as hedging instruments.

While the reporting requirements for financial instruments under these classifications are detailed and complex, several provisions are most relevant.[2] Financial instruments designated as "held to maturity" generally are required to be reported on the firm's balance sheet at amortized cost, subject to impairment tests requiring that the instrument be written down to fair value if there has been a permanent decline in value. Financial instruments designated as "available for sale" are required to be reported on the balance sheet at fair value. Any unrealized gains and losses on these instruments are reported in accumulated other comprehensive income, a component of owners' equity; however, these gains and losses are not included in net income.

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[2] Most of the provisions are detailed under the following three reporting standards: Statement of Financial Accounting Standards (SFAS) 115, *Accounting for Certain Investments in Debt and Equity Securities*; SFAS 133, *Accounting for Derivative Instruments and Hedging Activities*; and SFAS 159, *The Fair Value Option for Financial Assets and Financial Liabilities*.

Finally, financial instruments designated as "trading securities" are required to be reported on the balance at fair value, with unrealized gains and losses included in net income each period.

In 2007, U.S. accounting standard setters adopted SFAS 157, *Fair Value Measurement,* to provide guidance on the measurement of fair values.[3] Thus, any financial instruments requiring measurement at fair value would apply the provisions of this standard. The standard defines fair value as "the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date." The standard further creates a hierarchy of inputs into fair value measurements, assessed across three levels (level 1, 2, and 3), indicating decreasing reliability. Level 1 inputs are unadjusted quoted market prices in active markets for identical items. With a few narrow exceptions, the standard requires that financial instruments be measured using level 1 inputs when available. Level 2 inputs are other directly or indirectly observable market data: quoted market prices in active markets for similar items, or in inactive markets for identical items. These inputs yield mark-to-model measurements that are disciplined by market information, such as yield curves, exchange rates, and empirical correlations. While the inputs to these models are reliable, the values depend critically on the validity of the models used. Finally, level 3 inputs are unobservable, firm-supplied estimates, such as forecasts of home price depreciation and the resulting credit loss severity on mortgage-related positions. These inputs generate mark-to-model valuations that are largely undisciplined by market information. Not surprisingly, SFAS 157 requires considerably expanded disclosures for level 3 fair value measurements.

The recent global financial crisis has raised criticisms of the above fair value reporting required for banks' financial instruments, with suggestions that reported fair values have played

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[3] The standard was effective for fiscal years beginning after November 15, 2007; though early adoption was allowable for the first calendar quarter of 2007.

a significant role in both the creation and continuation of the crisis. Much of the criticism focuses on implementation of these fair value standards in the context of highly illiquid financial instruments, particularly those designated as level 3 fair value.[4]

2.2. Prior Literature

This paper builds upon two primary streams of literature. First, we build upon the literature examining firm risk, particularly as measured by equity beta. Previous and concurrent studies model equity beta as a function of firm characteristics (Ferson and Harvey 1998; Berk, Green, and Naik 1999; Lambert, Leuz and Verrechia 2007; Khan 2008). Berk, Green, and Naik (1999) develops an equilibrium model showing a firm's systematic risk varies with optimal investment decisions that change the riskiness of invested capital and the proportion of capital relative to growth options. Beta is shown to vary with firm size and market-to-book, the two state variables used to proxy for this systematic risk. Similar results are obtained by other studies that find a link between systematic risk and firm characteristics (Gomes, Kogan and Zhang 2003; Carlson, Fisher and Giammarino 2004; Cooper 2006).

A large literature also relates equity beta to parameter estimation risk (Barry and Brown 1984, 1985; Clarkson and Thompson 1990; Coles, Loewenstein, and Suay 1995). These studies show that systematic risk decreases in the quality of information. Lambert, Leuz, and Verrechia (2007) shows that information risk, modeled as a noisy signal of future expected cash flows, is negatively related to equity beta and therefore cost of capital. The paper shows that a firm's

[4] As an illustration of the challenges of applying fair value methodologies to level 2 and, especially, level 3 mortgage securities, wide differences in markdowns of similar securities have been reported at different firms. For example, at the end of December 2007, Merrill Lynch publicly announced a 68% markdown of its "US ABS CDO-related net exposure." At the same time, Citigroup reported a 33% markdown of its total net exposures to senior CDOs. While it is possible that Citigroup's CDO holdings were from more highly-rated tranches than Merrill Lynch's, it is almost impossible for outside analysts to evaluate the qualitative differences between the holdings of the two firms (Healy, Palepu and Serafeim 2008).

assessed covariances with other firms' cash flows decrease as information quality increases, and that this effect is non-diversifiable. Khan (2008) models equity beta as a function of accruals, and Francis et al. (2005) provides evidence consistent with betas from CAPM exhibiting monotonic increases across portfolios of accruals that proxy for decreasing earnings quality and therefore higher information risk. We contribute to this literature by examining whether systematic risk, as reflected in the equity beta, is associated with information risk arising from the opacity of financial instruments, as captured by the level 1, 2, and 3 fair value designations.

Second, we build upon prior research examining sources of information asymmetry in the context of bid-ask spreads. Prior theoretical research suggests that market makers set bid-ask spreads based on three components: order processing costs, inventory holding costs, and information asymmetry costs (Stoll 1978a). The latter component is the primary interest of our study, where theory suggests that information asymmetries can lead to higher transaction costs for investors (e.g., Copeland and Galai 1983, Glosten and Milgrom 1985).

This paper builds primarily upon prior research providing theoretical and empirical support for several determinants of adverse-selection costs. Analytical papers (e.g., Verrecchia 1982, Diamond 1985, and Diamond and Verrecchia 1991) argue that commitments to higher quality public disclosure may reduce a firm's information asymmetry in financial markets, under the assumption that public disclosure of accounting information is a substitute for private information. Empirical studies provide support for this theory in a number of contexts: the mandatory release of accounting information (Greenstein and Sami 1994); firms' disclosure policies (Welker 1995); the voluntary disclosure of management earnings forecasts (Coller and Yohn 1997); and analyst following (Brennan and Subrahmanyam 1995). We contribute to this literature by examining whether information asymmetry, as reflected in the bid-ask spread, is associated with information risk arising from opacity of financial instruments, as captured by the level 1, 2, and 3 fair value designations.[5]

3. Hypothesis Development and Research Design

In this section, we discuss the hypothesis development and research for our two measures of risk: beta and bid-ask spreads.[6]

3.1. Beta Model

Consider a firm, which is financed by both debt and equity in the absence of taxes. By the balance sheet identity:

$$A = E + D \qquad (1)$$

where A is the firm's total assets, E its equity, and D total debt. Decomposing assets according to the fair value measurement bases yields the following relation:

$$A1 + A2 + A3 + OtherAssets = E + D \qquad (1a)$$

where $A1$ ($A2$) [$A3$] is assets measured at level 1 (level 2) [level 3] fair value, and $OtherAssets$ is remaining assets not measured at fair value.

Based on the relations in equation (1a), and scaling through by the firm's total assets (A), the weighted average beta for the firm is calculated as:

$$\beta_{A1}\, A1/A + \beta_{A2}\, A2/A + \beta_{A3}\, A3/A + \beta_{OA}\, OtherAssets/A = \beta_E\, E/A + \beta_D\, D/A \qquad (2)$$

Finally, solving for the equity beta leads to:

$$\beta_E\, E/A = \beta_{A1}\, FVA1 + \beta_{A2}\, FVA2 + \beta_{A3}\, FVA3 + \beta_{OA}\, OA - \beta_D\, Leverage \qquad (2a)$$

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5 Concurrent research examines alternative valuation effects (e.g., value relevance) of fair value disclosures (e.g., Goh, Ng, and Yong (2009); and Song, Thomas, and Yu (2009)).

6 Other measures exist to examine information risk, including probability of informed trade (PIN), trading volume, dispersion in analysts' forecasts, credit ratings and spreads. As discussed above, we focus on beta and bid-ask spreads as both offer well-developed finance theory linking the measure to information risk.

where *FVA1* (*FVA2*) [*FVA3*] are the firm's level 1 (level 2) [level 3] assets scaled by the firm's total assets, *OA* is the firm's assets not measured at fair value scaled by the firm's total assets, and *Leverage* is the firm's debt divided by total assets.[7]

We then use equation (2a), the derivation of firm-specific beta with respect to the decomposition of the firm's assets, as the basis for the following empirical regression (see Appendix A for variable definitions):

$$Beta\_adj_{it} = \alpha_1 FVA1_{it} + \alpha_2 FVA2_{it} + \alpha_3 FVA3_{it} + \alpha_4 OA_{it} + \alpha_5 Leverage_{it} + \phi_{it} \qquad (3)$$

In this regression, the dependent variable is *Beta_adj*, firm *i*'s quarter *t* equity beta (*Beta*) weighted by the equity ratio (equity divided by total assets). To obtain *Beta*, we estimate a single-factor CAPM:[8]

$$RET_{id} = \delta_0 + \delta_1 VW\_RET_{id} + \xi_{id} \qquad (4)$$

where RET_{id} is bank *i*'s common equity return, and VW_RET_{id} is the value-weighted stock market return, both measured for day *d*. We estimate this model using all available trading days for fiscal quarter *t*. Thus, δ_1 is our estimate of bank *i*'s equity beta (*Beta*) for each quarter *t*. We employ the single-factor CAPM owing to its theoretical underpinnings (e.g., Sharpe 1964; Black 1972).

Following the derivation of beta in equation (2a), the independent variables in equation (3) include the bank's assets, decomposed into those reported at level 1 fair value (*FVA1*), level 2 fair value (*FVA2*), level 3 fair value (*FVA3*), and all other (*OA*). As indicated above, all variables are scaled by the firm's total assets. Note that our fair value measures are intended to

[7] Liabilities can be similarly decomposed into those designated as level 1, 2, and 3 fair values (and all other liabilities). Our primary analyses focus on the asset decomposition to capture banks' operational (versus financing) components. However, we also assess the decomposition of liabilities in Section 5.

[8] We do not correct for non-synchronous trading (e.g., Dimson 1979) as our sample selection focuses on large market capitalization banks unlikely to have infrequent trading. Results applying this correction, which incorporates lagged returns into the CAPM model, are unchanged from those reported.

capture market values, but use reported book values as proxies. Thus, to maintain a consistent measurement base throughout the specification, we also measure equity, debt, and other assets using book values.[9] If the firm's equity beta is simply the composite of betas for the individual firm's portfolio of assets, then the predicted signs for $\alpha_1 - \alpha_4$ in equation (3) are positive. Finally, we include the scaled level of debt financing (*Leverage*). As demonstrated in equation (2a), the predicted sign for α_5 is negative, and $-\alpha_5$ is the beta of firm debt. The empirical estimates of α_1—α_5 are the implied betas that investors face based on the distribution parameters of the market value of equity and the fair value of the assets that management discloses.[10]

Our primary hypothesis is that investors face information risk that is increasing across portfolios of assets designated as level 1, 2, and 3. This follows from the reporting designations, wherein level 1 assets are measured using transactions from liquid markets for the same assets, level 2 assets are measured with reference to comparable inputs for similar (but not identical) assets, and level 3 assets employ unobservable internal valuation inputs.

If this risk is diversifiable (that is, fully idiosyncratic to the individual firm), then the allocation of assets across different fair value levels should have no relation to equity beta. Banz (1981) and Reinganum and Smith (1983) indicate that information risk should be diversifiable in an economy. In general, if parameter uncertainty about expected future cash flows is *uncorrelated* across a sample of low information assets, portfolio formation can increase precision and eliminate any effects on systematic risk.

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[9] In section 6.3, we alternatively replace book value of equity in equation (3) with market value of equity. Results are unchanged by this substitution.

[10] We could alternatively estimate equation (3) including an intercept and excluding other assets. Under this specification, the coefficients for assets measured at fair value capture the incremental beta relative to other assets. This estimation yields identical results to those presented. We focus on the presented specification to allow direct estimation of implied betas.

However, prior research alternatively suggests that information risk is not diversifiable (Clarkson and Thompson 1990; Easley and O'Hara 2004). In our setting, the uncertainty surrounding the future cash flows of banking assets (such as loans, investment securities and derivatives) can be highly correlated across banks for at least two reasons. First, banks face counterparty risk since many of their assets are contracts with other banks. Thus, to the extent that bank B is likely to default, the expected future cash flows for bank A become a function of the probability of bankruptcy of its counterparty. This probability is, in turn, a function of the expected future cash flows from the assets of bank B, which creates a correlation across banks on the uncertainty of future asset payoffs. Second, many banks are heavily exposed to similar types of contracts (e.g., exposure to mortgage-backed securities), further increasing the correlation in uncertainty across the banking sector.

Therefore, in an economy where information risk of bank assets is not diversifiable, we expect a positive relation between the uncertainty surrounding the payoff distribution of a portfolio and equity beta. In other words, we hypothesize that the implied beta of a portfolio of assets is increasing in the information risk surrounding those assets. If required fair value designations appropriately capture this risk, then we expect that the implied beta is increasing across asset portfolios designated as level 1, level 2, and level 3. This is consistent with the theoretical development of Lambert, Leuz, and Verrecchia (2007), which demonstrates that a firm's beta from the CAPM is a function of its information quality. Specifically, higher quality information about a firm's future cash flows lowers cost of capital through a reduction in the assessed covariances with other firms' future cash flows, as well as through an effect upon real decisions influencing the expected value and covariances of firm cash flows. Critically, the paper shows that these effects are not diversifiable in a large economy, thereby making beta a function of information risk. Thus, our first hypothesis (stated in alternative form) is:

H1: The association between a bank's equity beta and its financial assets is increasing in the uncertainty about the parameters of the payoff distribution of those assets, as measured by the level 1, 2, or 3 designations.

The above prediction assumes that the level 1, 2, and 3 portfolios have securities that have equal co-movement (on average) with the market. We remain agnostic on whether this assumption is valid. However, it may be that harder-to-value assets have expected payoffs exhibiting lower correlation with the market return.[11] If assets receiving level 3 designations exhibit lower co-movement with the market index than those receiving level 1 or 2 designations, this could lead to lower expected betas for level 3 relative to level 1 or 2 assets, biasing against findings consistent with hypothesis 1.

3.2. Bid-Ask Spread Model

To examine the effects of fair value measurement on financial institutions' information asymmetry, we use the following bid-ask spread model, based on finance theory (e.g., Stoll 1978a, 1978b; Copeland and Galai 1983; Glosten and Milgrom 1985; Huang and Stoll 1997) (see Appendix A for all variable definitions):

$$LogSpread_{it} = \gamma_0 + \gamma_1 LogPrice_{it} + \gamma_2 LogTurn_{it} + \gamma_3 LogRisk_{it} + \gamma_4 LogFoll_{it}$$
$$\gamma_5 FV1_{it} + \gamma_6 FV2_{it} + \gamma_7 FV3_{it} + \varepsilon_{it} \quad (5)$$

We adopt the log-linear form for the dependent and control variables to accommodate the multiplicative relations suggested by prior theoretical work (Stoll 1978a). The dependent variable is *LogSpread*, the log of firm *i*'s quarter *t* average bid-ask spread, measured daily as the

[11] For example, concurrent research provides descriptive evidence that level 1 assets include disproportionately more investment securities (which tend to be more liquid), while level 3 assets include more loans (which tend to be less liquid) (Song, Thomas and Yi 2008).

ask price less the bid price divided by the average of the ask and bid prices. To coincide with the release of the fair value financial information that is the focus of our analysis, we measure *LogSpread* as the average over the 13 trading days $t–2$ to $t+10$, where $t = 0$ is the day of firm *i*'s quarter *t* earnings announcement.[12]

Among the control variables, we include *LogPrice*, the log of firm *i*'s average daily ending per share stock price. This controls for market makers' order processing costs, which decrease in proportion to a share's price (Benston and Hagerman 1974; Stoll 1978b); thus, the predicted sign for γ_1 is negative. We then include *LogTurn*, the log of firm *i*'s average shares traded divided by the number of shares outstanding, to control for liquidity of the firm's shares; the predicted sign for γ_2 is negative, as shares with higher liquidity reduce the market maker's risk of holding inventory (Demsetz 1968).[13] *LogRISK*, the log of firm *i*'s standard deviation of daily stock returns, controls for the riskiness of the firm's shares; the predicted sign for γ_3 is positive, as market maker's will increase spreads for more risky shares (Barnea and Logue 1975). Consistent with the measurement of our dependent variable, we measure *LogPrice*, *LogTurn*, and *LogRisk* over days $t–2$ to $t+10$, where $t = 0$ is the quarter *t* earnings announcement for firm *i*. Finally, we include *LogFoll*, the log of firm *i*'s analyst following measured over quarter *t*, to control for the information environment of the firm (Brennan and Subrahmanyam 1995). The predicted sign on γ_4 is negative, as market makers will set lower spreads for firms with richer information environments—reflected in higher analyst following.[14]

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[12] During our sample period, all necessary financial data for our analyses is released on banks' quarterly earnings announcements, including the primary financial statements (balance sheet, income statement, and statement of cash flows) as well as footnote disclosures relating to fair value levels. Alternative windows to measure the dependent variable (e.g., over a three-day window around earnings announcement) lead to similar results.

[13] Alternative measures of liquidity, such as average daily trading volume in shares or dollars traded, exhibit high correlations with our chosen proxy of share turnover, and do not change the results.

[14] Results are qualitatively unchanged when we alternatively use firm market capitalization in place of analyst following to proxy for information environment.

Our experimental variables focus on fair values relating to financial instruments, building on the disclosures mandated under SFAS 157. Specifically, we decompose the financial instruments reported as level 1 (*FV1*), level 2 (*FV2*), or level 3 (*FV3*) financial instruments. This enables us to assess whether the reported liquidity of financial instruments, as reflected in the disclosed level of fair value measurement, affects market-makers' perceived information risk. Similar to our analysis of implied betas, our primary bid-ask spread specification focuses on fair value designations for financial assets to capture the operating side of banks' balance sheets; additional analyses incorporate fair values of liabilities. If lower liquidity of the financial instruments reflects higher levels of information asymmetry regarding the underlying values of those instruments, then we predict that the bid-ask spread will be increasing in the opacity of the bank's financial assets; that is, $\gamma_5 < \gamma_6 < \gamma_7$. Thus, our hypothesis (again in alternative form) is:

H2: The information asymmetry component of the bid-ask spread is increasing in the illiquidity of the bank's financial assets, as measured by the level 1, 2, or 3 designations.

Similar to the discussion regarding beta, we acknowledge an alternative expectation: that level 1 assets are associated with higher information asymmetry relative to level 2 or level 3 assets. Myers and Rajan (1998) presents a setting, in which liquidity enables greater levels of trading and thus leads to more difficult monitoring. This is labeled the "paradox of liquidity." In the current setting, greater exposure to level 1 assets could allow traders to change positions more rapidly, causing uncertainty among investors (and thus information asymmetry) regarding expected portfolio holdings. This uncertainty can arise due to both the timing lag between when trades occur and when positions are reported (presumably at the end of the reporting period), as well as the lack of detail on trading activity during the reporting period. This would lead to a prediction that information asymmetry is decreasing in the illiquidity of bank's financial instruments, which should bias against findings consistent with hypothesis 2. We do not explicitly incorporate this alternative hypothesis, as we expect that the increase in information asymmetry due to perceived information risk for more opaque financial instruments should outweigh any (countervailing) increase in information asymmetry owing to rapid changes in portfolio holdings for more liquid financial instruments.

4. Sample Selection and Descriptive Statistics

Table 1 Panel A presents the sample selection process. We begin by identifying all firms defined as financial institutions (SIC between 6020–6726). We focus on financial institutions, as fair value standards and the associated disclosures relate most directly to financial instruments, which constitute the primary operating structure of these firms. Among all financial institutions, we focus on commercial banks (SIC 6020), savings institutions federally chartered (6035), and security brokers and dealers (6211), as these firms are most likely to have substantial exposure to financial instruments measured across the fair value levels we examine. We then impose a size criterion: we retain only those firms having total assets exceeding $10 billion as of December 31, 2006.[15] We impose this restriction for the following reasons. First, larger banks are more likely to have diversified portfolios, increasing the likelihood of substantial fair value components across all three fair value categories we examine (Nissim and Penman 2007). Second, larger banks measure more of their assets at fair value (SEC 2008). Third, they are also likely to provide more detailed disclosures for related fair values estimates, owing to deeper oversight by regulators and/or scrutiny by investors. Finally, larger banks are more likely to have considerable market interest in their shares, which is critical for estimation of both dependent variables in our primary analyses (that is, equity beta as well as bid-ask spread). This leads to our final sample of 56 firms. Panel B reveals that this sample is comprised of 44 commercial

[15] Later, we discuss the robustness of our results to inclusion of smaller firms (see section 6.1).

banks, 5 savings institutions, and 7 security brokers. For these firms, we hand-collect from respective 10-Q/10-K filings the fair value designations across the level 1, 2, and 3 categories.

Panels C and D present data regarding the time series of our sample observations. We include all available quarters from fiscal first quarter 2007 through fiscal second quarter 2008. We include 2007, which was the earliest allowable fiscal year for adoption of SFAS 157, and thus the earliest time period to obtain the relevant fair value categorizations. Our sample period ends at second quarter 2008 due to data availability at the time of analysis. The final sample includes 148 firm quarters, with 36 early adoption quarters across 9 firms in 2007, and the remaining 112 firm quarters across all 56 firms in 2008. Finally, Panel D presents the distribution by institution type and fiscal quarter, revealing that early adoption occurred for 6 commercial banks and 3 security brokers.

Table 2 presents descriptive statistics for the variables used in the regressions. Of note, financial assets reported at fair value (*FVA*) are 26.28% of firms' total assets on average across our sample firm-quarters. Of these, level 1 financial assets represent 4.51% of total assets (*FVA1*), level 2 represent 19.71% (*FVA2*), and level 3 represent 2.05% (*FVA3*).[16] Consistent with our focus on the financial assets measured at fair value, liabilities reported at fair value have relatively lower economic significance, with level 1 liabilities representing 2.27% of total assets (*FVL1*), level 2 liabilities representing 6.24% (*FVL2*), and level 3 liabilities representing 0.36% (*FVL3*). Also, as expected for this industry, *Leverage* is high with a mean of 92.23%.

[16] Untabulated descriptive statistics reveal a shift towards more illiquid financial assets over our sample period. Among early adopters, level 1 financial assets decreases from 11% of total assets at 1Q 2007 to 6% at 2Q 2008; in contrast, level 2 (level 3) assets increases from 23.5% to 29.0% (2.4% to 3.7%).

5. Empirical Results

5.1. Analysis of Beta

Table 3 presents Pearson correlations for variables used in the analysis of beta and the decomposition of financial instruments into fair value components. Regarding the dependent variable, *Beta_adj* (equity beta multiplied by the equity to total assets ratio), we find a highly significant negative association with *Leverage* (–0.592). We also find negative univariate associations between *Beta_adj* and all of the fair value measures for both financial assets (e.g., *FVA*) and financial liabilities (e.g., *FVL*).[17] We note that these univariate correlations do not incorporate the effect of leverage; this is revealed in the positive association between unadjusted equity beta (*Beta*) with all fair value measures, where the strongest association is with level 3 assets (0.331). We now turn to the multivariate results.

Table 4 presents results from the multivariate regression analyses, wherein the dependent variable is *Beta_adj*. We first present results from several baseline regressions. Column (1) reveals significantly positive coefficients as predicted for other assets not at fair value (*OA* = 0.943, *t*-statistic = 3.99) as well as fair value assets (*FVA* = 0.910, *t*-statistic = 3.44). In addition, the coefficient for leverage is significantly negative as predicted (*Leverage* = –0.898, *t*-statistic = –3.42). Column (2) presents the same regression, with the incorporation of (untabulated) fixed effects for sector, fiscal quarter, and year; results are slightly stronger relative to those in Column (1). Finally, column (3) presents results decomposing both assets and liabilities into those measured at fair value (*FVA* and *FVL*) and those not measured at fair value (*OA* and *OL*). Consistent with predictions, *OA* and *FVA* are significantly positive, and *OL* and *FVL* are

[17] Note that the correlations of *FVA* and the other variables (e.g., with *Beta_adj* at –0.450) mirrors those of *OA* and the other variables (e.g., with *Beta_adj* at 0.450). This is by construction: *FVA* and *OA* are perfectly negatively correlated by definition, as any assets listed at fair value will be excluded from the other assets category.

significantly negative. Note that the latter variables of *OL* and *FVL* represent the decomposition of *Leverage*.

Column (4) then presents results decomposing financial assets reported at fair value into the level 1, 2, and 3 categories. This model retains inclusion of fixed effects for sector, quarter, and year. The coefficients for *OA*, *OL*, and *FVL* remain significantly positive, negative, and negative, as previously discussed. In addition, coefficients are significantly positive as predicted for level 1 assets (*FVA1* = 1.254, *t*-statistic = 4.36), level 2 assets (*FVA2* = 1.314, *t*-statistic = 4.85), and level 3 assets (*FVA3* = 1.470, *t*-statistic = 4.85). Of note, the coefficients exhibit a monotonic increase across levels 1, 2, and 3, consistent with expectations. The bottom half of the table presents *F*-tests of coefficients corresponding to hypothesis 1. The test of equivalence of the coefficients across levels 1, 2, and 3 is highly significant (*FVA1* = *FVA2* = *FVA3*, *p*-value = 0.008), suggesting the coefficients are not of equal value. Further tests reveal that assets listed at level 3 exhibit significantly higher beta relative to those at level 1 (*FVA1* = *FVA3*, *p*-value = 0.011) and those at level 2 (*FVA2* = *FVA3*, *p*-value = 0.076).

Finally, column (5) presents results decomposing both financial assets and liabilities into their respective fair value components. Consistent with the above tabulation, the coefficients for financial assets exhibit progressively more positive betas moving from level 1 to 2 to 3, with differences that are significant as reported above. For financial liabilities, we observe a generally similar pattern of increasingly negative coefficients for level 1 and 3 liabilities. The coefficient for level 3 liabilities (–2.393) is significantly more negative relative to either level 1 liabilities (*p*-value = 0.016) or level 2 liabilities (*p*-value = 0.016).

To summarize, the results in Table 4 provide evidence that implied betas are increasing in the information risk of bank’s financial assets, as reflected in the level 1, 2, and 3 designations.

That is, we find evidence that implied betas increase monotonically across the financial asset designations of level 1, 2, and 3. We also find some support that betas of financial liabilities exhibit similar patterns of increasingly negative implied betas, particularly those designated as level 3. If the level 1, 2, and 3 designations capture increasing difficulties in the valuation of these assets, our results are consistent with increasing opacity leading to higher implied betas, reflective of higher information risk.

5.2. Analysis of Bid-Ask Spreads

Table 5 presents Pearson correlations for the variables used in the analysis of bid-ask spreads. The correlation between spreads and level 1 and 2 fair values are negative (significant only for level 2); the correlation is positive but insignificant for level 3. Note that most fair value measures exhibit positive correlation with both *LogPrice* and *LogFollow*, consistent with larger banks recording a higher percentage of their assets at fair value on the balance sheet. We now turn to the multivariate analyses.

Panel A of Table 6 presents results from regressions including fixed effects for sector, quarter, and year. Column (1) presents the base regression. Among the control variables, consistent with expectations, we find that the coefficient is negative for *LogTurn* (–0.337, *t*-statistic = –2.77), negative for *LogPrice* (–0.198, *t*-statistic = –2.09); and positive for *LogRisk* (0.584, *t*-statistic = 5.08). The coefficient for *LogFollow* is negative as predicted, but insignificant (–0.140, *t*-statistic = –0.82).

Column (2) then includes the variable *FV*, the aggregate financial assets measured at fair value. The coefficient is positive, but insignificant (0.309, *t*-statistic = 0.89). Coefficients for the control variables remain unchanged. Column (3) decomposes financial assets into the level 1

(*FV1*), 2 (*FV2*), and 3 (*FV3*) designations. The adjusted-R^2 increases by 4.82% relative to column (1), suggesting inclusion of decomposed financial assets at fair value adds significantly to the explanatory power of the regression. Only the coefficient for *FV3* is significantly positive (6.367, *t*-statistic = 1.85); the coefficients for *FV1* and *FV2* again are insignificant. Relating to hypothesis 2, *F*-tests reveal that the coefficient for *FV3* is significantly more positive relative to that for *FV1* (*p*-value = 0.049) or *FV2* (*p*-value = 0.036). Differences between *FV1* and *FV2* are insignificant (*p*-value = 0.740).

We next examine whether the incorporation of financial liabilities at fair value affects observed relations with bid-ask spreads. We first examine combined (i.e., not netted) financial assets and liabilities, as the source of information risk can arise from either type of financial instrument. Column (4) provides a benchmark regression incorporating aggregate financial instruments measured at fair value (*FV*), now defined as the (absolute) sum of fair value assets and liabilities divided by the (absolute) sum of assets and liabilities. Results for the control variables are unchanged; and the coefficient for *FV* is positive but insignificant. Column (5) provides the decomposition of combined financial assets and liabilities into those designated at level 1 (*FV1*), level 2 (*FV2*), and level 3 (*FV3*) fair values. The deflator remains the absolute sum of assets plus total liabilities. Results are similar to column (3) using only financial assets: the coefficient for *FV3* is significantly positive (12.142, *t*-statistic = 2.02), while coefficients for *FV1* and *FV2* are insignificant. In addition, *F*-tests reveal the coefficient for *FV3* to be significantly more positive than that for *FV1* (*p*-value of 0.031) or *FV2* (*p*-value of 0.028) financial instruments. Untabulated results examining only financial liabilities measured at fair value provide directionally consistent, though insignificant results: the coefficient for level 3 fair value liabilities (11.279) appears more positive than that for level 1 (–0.038) or level 2 (0.491) liabilities, though the differences between level 3 and level 1 (*p*-value = 0.101) or level 2 (*p*-value = 0.120) are insignificant.

Panel B of Table 6 then presents comparable regressions incorporating (untabulated) firm fixed effects. This specification mitigates concerns that the fair value measures are correlated with unobserved firm heterogeneity that influences spreads, but is not captured by inclusion of the other variables within the regression. Results are similar to those presented in Panel A; though, not surprisingly, the explanatory power of the regression increases substantially. In column (3), we again find a significant positive coefficient for level 3 financial assets (*FV3* = 2.062, *t*-statistic = 3.79); this coefficient is significantly larger than that for level 2 assets (*p*-value = 0.017), and larger but insignificant relative to that for level 1 assets (*p*-value = 0.220). Column (5) presents similar results using combined (not-netted) financial assets and liabilities: the coefficient for level 3 assets is significantly larger than that for level 2 (*p*-value = 0.019), and larger but insignificant relative to that for level 1 (*p*-value = 0.210).

Overall, the results in Table 6 provide some support for hypothesis 2. Specifically, the results are consistent with bid-ask spreads increasing in firm's exposure to level 3 financial instruments relative to those designated as level 1 or 2. The results also suggest that the source of information asymmetry primarily arises in financial assets versus liabilities, consistent with our focus on the operating side of banks' balance sheets. If the uncertainty regarding the underlying values of the financial instruments (i.e., information risk) is captured by the level 1, 2, and 3 designations, this evidence is consistent with information asymmetry being higher for more difficult to value financial assets, particularly those designated as level 3.

6. Sensitivity Analyses

In this section, we conduct four sensitivity analyses. First, we assess the robustness of our results to the incorporation of smaller banks into the sample. Second, we decompose one of our primary dependent variables—beta—into its components to derive further insights. Third, we examine analysis of beta incorporating market value of equity as opposed to book value of equity. Finally, we examine the effects of early adoption of fair value provisions.

6.1. Incorporation of Smaller Banks into the Sample

Previously, we indicated our motivation for focusing on larger financial institutions. We now broaden the sample to include smaller financial institutions from Compustat having necessary data to construct our primary analyses. This includes fair values reported under the level 1, 2, and 3 designations; this data is available only for fiscal first and second quarters of 2008. We systematically incorporate these firms into our sample.

Table 7 presents the results. Panel A first presents results for the model examining firm's equity beta; as previously, the dependent variable is firm beta multiplied by the equity to assets ratio (*Beta_adj*). For parsimony, we include only regressions decomposing financial assets into level 1, 2, and 3 categories. Column (1) presents results including observations above the median (N = 529), defined using total assets reported at quarter end for all available observations.[18] Results are consistent with those reported in Table 4: fair value level 3 financial assets have significantly higher implied betas relative to those designated as level 1 (p-value = 0.006) or level 2 (p-value = 0.003). Column (2) increases the sample to include observations above the first quartile of total assets (N = 794); column (3) increases the sample to include all

[18] We do not tabulate results for firms with size above the first quartile, as this correlates very highly with our tabulated results using a primary sample of the largest banks.

available observations (N = 1,045). Results in both columns are consistent with the primary results of Table 4. Overall, the results in Panel A of Table 7 suggest that higher implied betas for less liquid financial assets occur across a wide range of financial institutions.

Panel B then presents results for bid-ask spreads. Again, for parsimony the specification focuses on the decomposition of financial assets; and columns (1), (2), and (3) retain the sample definitions presented in Panel A above. For column (1), which includes observations with total assets above the median, fair value level 3 financial assets result in significantly higher bid-ask spreads relative to either level 1 (p-value = 0.073) or level 2 (p-value = 0.045) financial assets. However, in columns (2) and (3), which include observations above the first quartile of total assets and all observations, respectively, we fail to find evidence of differences in bid-ask spreads across the fair value levels. In fact, the coefficients for the fair value estimates are negative. We note a measurement concern that arises for increasingly smaller banks in this analysis. Specifically, our chosen measurement window for bid-ask spreads centers on the earnings announcement. This measurement is justified for our primary sample of larger banks, as it coincides with the release of fair value information that is the focus of the study. However, examination of a random sample of smaller banks' earnings announcements reveals that such fair value information is often *not* released with the earnings announcement. Thus, we present analyses of bid-ask spreads using smaller banks for completeness; however, measurement error likely increases for smaller banks within this analysis. Overall, the results are consistent with information asymmetry increasing in the exposure to level 3 financial assets for larger banks only. However, results are inconclusive for smaller banks.

6.2. Decomposition of Beta

The results in section 5.1 indicate that fair value level 3 financial instruments are associated with higher firm betas, consistent with firm's information risk increasing in its exposure to level 3 financial instruments. We now decompose beta into its primitive elements to provide further insights. Specifically, we use the following decomposition:

$$Beta = \rho_{x,m} \frac{std_x}{std_m} \quad (6)$$

where *Beta* is the firm's equity beta; $\rho_{x,m}$ is the correlation of firm *j*'s stock return with that of the market; std_x is the standard deviation of the firm *j*'s stock return; and std_m is the standard deviation of the stock return for the market. We use $\rho_{x,m}$ and std_x / std_m as alternative dependent variables to better isolate the association between risk and the fair value level 1, 2, and 3 designations. Paralleling our derivation of *Beta_adj* in section 5.1, we use as our dependent variables *Corr* for $\rho_{x,m}$ (which is $\rho_{x,m}$ multiplied by equity divided by total assets) and *StDev* for std_x / std_m (which is std_x / std_m multiplied by equity divided by total assets).[19] Further, both are measured using daily stock returns over fiscal quarter *t*, using the value-weighted stock market return as the benchmark for market.

Several studies (Morck, Yeung, and Yu 2000; Jin and Myers 2006) suggest that stock returns of more opaque firms exhibit higher correlation with the market return (that is higher $\rho_{x,m}$). This expectation arises as insufficient firm-specific information leads market participants to infer valuation parameters based on non-firm specific (e.g., macro-economic) indicators. Accordingly, we predict that fair value level 3 instruments will have a higher association with $\rho_{x,m}$ relative to those designated as either level 1 or 2.

[19] The volatility measures use actual volatility from historical returns. We alternatively use implied volatility to measure std_x / std_m, employing 60, 90 and 180 day implied volatilities that coincide with the measurement window of beta. Results are unchanged using these alternative measures.

Predictions relating std_x / std_m and the three levels of fair value are less clear: banks with more opaque assets may have more volatile stock returns owing to information risk, or banks with more liquid assets may have more volatile stock returns owing to the previously discussed liquidity paradox (Myers and Raghuram 1998). Therefore, the relation between relative volatility (std_x / std_m) and fair value exposure is an empirical question, and we do not predict the signed effects.

Table 8 presents the results, with subsamples that correspond to our Table 7 analyses. Panel A presents results where the dependent variable is *Corr*. Across all three subsamples, we obtain directionally consistent results of a monotonic increase in coefficients across the level 1, 2, and 3 financial asset designations. However, these differences are statistically significant only for the subsample above the first quartile (N = 789) (*FVA1 = FVA 2 = FVA3* p-value = 0.050) and for all firms (N = 1,045) (p-value = 0.085). To the extent that the dependent variable (*Corr*) better isolates effects attributable to information risk, this is consistent with firms having greater exposure to level 3 financial assets facing relatively high information risk relative to those with level 1 or level 2 financial assets.

Panel B presents results where the dependent variable is *StDev*. The coefficient for level 3 financial assets is more positive relative to that for level 1 or level 2 financial assets for all three subsamples. However, there is no monotonic relation between volatility and fair valuation, as level 1 fair value has a more positive coefficient than level 2. This latter result may reflect investors changing their positions more for firms holding more liquid assets (Myers and Rajan 1998).

6.3. Analysis of Beta Using Market Value of Equity versus Book Value of Equity

As discussed previously, our empirical estimation of the association between equity beta and fair value decomposition of assets (equation 3) uses book value of equity to proxy for market value of equity. To provide an estimation more consistent with finance theory, we now examine the robustness of the beta model to estimation using market value of equity to both derive the other assets variable, as well as scale all variables. In this specification, other assets are computed as the difference between the sum of market value of equity plus book value of liabilities less the sum of the fair value assets. Further, all variables are deflated by the sum of the market value of equity plus book value of liabilities. Untabulated results reveal that betas on level 3 financial assets are significantly more positive relative to those for either level 1 or level 2 assets. Further, the magnitudes of the betas are similar to those tabulated in the primary analyses. Finally, results also hold across the subsamples examined in Table 7.

6.4 Separate Analysis of Banks Electing Early Adoption of Fair Value Provisions

We next partition the sample into banks electing early adoption of SFAS 157 (and thus providing level 1, 2, and 3 fair values in fiscal 2007) as compared to banks not electing early adoption. Our motivation for this partition is that early adoption may reflect endogenous decisions by bank management regarding both the composition and disclosure of the underlying portfolio of financial instruments. As revealed in Table 2, only nine sample firms elect early adoption. Accordingly, we re-estimate our primary regressions separately on the sub-samples of observations relating to early adopters ($N = 54$, representing 9 early-adopter firms over six quarters spanning fiscal quarter 1 2007 through fiscal quarter 2 2008) and non-early adopters (N

= 94, representing 47 firms over two quarters in 2008). Results across both groups are similar to those presented previously: level 3 financial assets have significantly higher betas, and exhibit more positive bid-ask spreads, relative to those designated as either level 1 or level 2.[20]

7. Conclusion

This paper examines the effects of reported fair values for financial instruments upon firm level information risk. Recent financial reporting requirements mandate certain financial instruments be classified and disclosed at one of three fair value levels: level 1, reflecting liquid markets for identical instruments; level 2, reflecting market inputs for similar financial instruments; and level 3, reflecting internal valuation estimates. We predict that information risk—that is, investors' ability to understand the parameters regarding the underlying economic value of financial instruments—will increase across levels 1, 2, and 3. Finance theory suggests that higher information risk is reflected in higher betas, leading to a prediction that implied betas are increasing across financial instruments designated at level 1, 2, and 3 fair values. Finance theory also suggests that higher information risk will lead to higher levels of information asymmetry, leading to a prediction that bid-ask spreads are increasing across financial instruments designated as level 1, 2, and 3 fair values.

Empirical results are consistent with both predictions. Using quarterly data from 1Q 2007 through 2Q 2008 for a sample of large U.S. banks, we find that implied betas for level 3 financial assets are significantly more positive relative to those designated either as level 1 or level 2. We further find that the information asymmetry component of the bid-ask spread is

[20] Within the bid-ask spread analysis, the difference is positive but insignificant only when firm fixed effects are included for the early adopter banks.

increasing in firm's exposure to level 3 financial assets relative to level 1 or level 2. The results are robust across a number of specifications.

Overall, our results suggest that concerns surrounding the measurement and reporting of illiquid financial instruments appear warranted. Specifically, the evidence suggests that current disclosures surrounding these financial instruments are insufficient to mitigate investor perceptions of greater information risk for highly opaque financial assets. This suggests that further regulation may be warranted, included enhancements to the disclosures particularly for financial instruments reported at level 3 fair value. Our results also suggest that future movements to incorporate risk-weighted regulatory capital, particularly in which illiquid financial instruments receive higher risk weightings, appear justified.

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Appendix A – Variable Definitions

Category	Beta Model	Spread Model	Definition
Dependent Variables			
$Beta_{it}$	X		The coefficient from a regression of firm *i*'s daily stock returns for quarter *t* regressed on daily value-weighted market returns for quarter *t.*
$Beta\_adj_{it}$	X		Beta multiplied by the ratio of equity to total assets for firm *i* at quarter *t*.
$Spread_{it}$		X	The average bid-ask spread (calculated as the difference between ask and bid price deflated by the midpoint) for firm *i* over days *t-2* to *t+10*, where *t = 0* is the day of the quarter *t* earnings announcement.
Experimental Variables			
FVA_{it}	X		The amount of assets listed at fair value divided by total assets for firm *i* at the end of quarter *t*; obtained from hand-collection of financial footnotes.
$FVA1_{it}$ ($FVA2_{it}$) [$FVA3_{it}$]	X	X	The amount of assets listed as level 1 (level 2) [level 3] fair value divided by total assets for firm *i* at the end of quarter *t*; obtained from hand-collection of financial footnotes.
FVL_{it}	X		The amount of liabilities listed at fair value divided by total assets for firm *i* at the end of quarter *t*; obtained from hand-collection of financial footnotes.
$FVL1_{it}$ ($FVL2_{it}$) [$FVL3_{it}$]	X		The amount of liabilities listed as level 1 (level 2) [level 3] fair value divided by total assets for firm *i* at the end of quarter *t*; obtained from hand-collection of financial footnotes.
$FVAL_{it}$		X	The amount of assets and liabilities (not netted) listed at fair value divided by total assets and liabilities for firm *i* at the end of quarter *t*; obtained from hand-collection of financial footnotes.
$FVAL1_{it}$ ($FVAL2_{it}$ [$FVAL3_{it}$]		X	The amount of assets plus liabilities (i.e., not netted) listed as level 1 (level 2) [level 3] fair value divided by total assets plus total liabilities (again, not netted) for firm *i* at the end of quarter *t*; obtained from hand-collection of financial footnotes.
Control Variables			
OA_{it}	X		The amount of assets not listed at fair value divided by total assets for firm *i* at the end of quarter *t*; obtained from hand-collection of financial footnotes.
OL_{it}	X		The amount of liabilities not listed at fair value divided by total assets for firm *i* at the end of quarter *t*; obtained from hand-collection of financial footnotes.
$Leverage_{it}$	X		The ratio of total liabilities to total assets for firm *i* at the end of quarter *t*.
$Turn_{it}$		X	The average volume of shares traded divided by shares outstanding for firm *i* over days *t-2* to *t+10*, where *t = 0* is the day of the quarter *t* earnings announcement.
$Price_{it}$		X	The average stock price for firm *i* over days *t-2* to *t+10*, where *t = 0* is the day of the quarter *t* earnings announcement.
$Risk_{it}$		X	The standard deviation of daily returns for firm *i* over days *t-2* to *t+10*, where *t = 0* is the day of the quarter *t* earnings announcement.
$Follow_{it}$		X	The number of analysts following firm *i* during quarter *t*.

Table 1
Sample selection and frequency statistics

This table presents the sample selection in Panel A, frequency of firms by institution type in Panel B, frequency of observations by fiscal quarter in Panel C, and frequency of observations by institution type and fiscal quarter in Panel D.

Panel A: Sample selection

All financial institutions with SIC between 6020-6726	962
Less: institutions not classified as Commercial Banks (SIC 6020), Saving Institutions Federal Chartered (6035), or Security Brokers and Dealers (6211)	219
Remaining firms with SIC codes of 6020, 6035, or 6211	743
Retain: institutions with total assets as of 12/31/2006 > $10 billion	58
Less: Institutions providing no fair value information	2
Final number of firms	**56**

Panel B. Frequency of firms by institution type

Commercial Banks (SIC 6020)	44
Saving Institutions Federal Chartered (SIC 6035)	5
Security Broker and Dealers (SIC 6211)	7

Panel C. Frequency of observations by fiscal quarter

Fiscal Year	Fiscal Quarter	Observations
2007	1	9
2007	2	9
2007	3	9
2007	4	9
2008	1	56
2008	2	56
Total observations		**148**

Panel D. Frequency of observations by institution type and fiscal quarter

Institution Type	Fiscal Year	Fiscal Quarter	Observations
Commercial Banks	2007	1	6
Commercial Banks	2007	2	6
Commercial Banks	2007	3	6
Commercial Banks	2007	4	6
Commercial Banks	2008	1	44
Commercial Banks	2008	2	44
Saving Institutions Federal Chartered	2008	1	5
Saving Institutions Federal Chartered	2008	2	5
Security Broker and Dealers	2007	1	3
Security Broker and Dealers	2007	2	3
Security Broker and Dealers	2007	3	3
Security Broker and Dealers	2007	4	3
Security Broker and Dealers	2008	1	7
Security Broker and Dealers	2008	2	7
Total observations			**148**

Table 2
Descriptive statistics

This table provides descriptive statistics for the variables used in the regression analyses. All variables are defined in Appendix A. Across all variables, $N = 148$.

Variable	Mean	Std deviation	Max	Q3	Median	Q1	Min
Dependent Variables							
Beta	1.44	0.56	3.65	1.70	1.40	1.13	–0.06
Beta_adj	0.106	0.047	0.253	0.133	0.104	0.073	-0.005
Spread	0.27 %	0.30 %	2.29 %	0.28 %	0.18 %	0.13 %	0.05 %
Experimental Variables							
FVA	26.28 %	17.55 %	84.06 %	36.93 %	19.80 %	14.26 %	0.34 %
FVA1	4.51 %	8.09 %	63.62 %	7.33 %	0.72 %	0.13 %	0.00 %
FVA2	19.71 %	14.12 %	76.88 %	25.37 %	15.65 %	11.46 %	0.00 %
FVA3	2.05 %	2.85 %	23.67 %	3.24 %	0.84 %	0.17 %	0.00 %
FVL	8.87 %	14.40 %	51.84 %	8.56 %	1.18 %	0.23 %	0.00 %
FVL1	2.27 %	5.75 %	40.74 %	0.66 %	0.02 %	0.00 %	0.00 %
FVL2	6.24 %	11.12 %	48.26 %	5.22 %	0.58 %	0.10 %	0.00 %
FVL3	0.36 %	0.64 %	3.04 %	0.42 %	0.01 %	0.00 %	0.00 %
FVAL	18.17 %	15.52 %	60.29 %	21.43 %	11.24 %	7.92 %	2.50 %
FVAL1	3.48 %	6.67 %	52.53 %	4.08 %	0.48 %	0.07 %	0.00 %
FVAL2	13.45 %	11.86 %	52.30 %	17.12 %	9.59 %	6.23 %	0.00 %
FVAL3	1.25 %	1.61 %	12.26 %	2.00 %	0.66 %	0.10 %	0.00 %
Control Variables							
OA	73.72 %	17.55 %	99.66 %	85.74 %	80.20 %	63.07 %	15.94 %
OL	83.36 %	12.63 %	95.39 %	90.92 %	89.38 %	83.06 %	43.85 %
Leverage	92.23 %	2.67 %	98.66 %	93.97 %	91.82 %	90.47 %	85.80 %
Turn	2.29 %	2.25 %	13.39 %	3.11 %	1.55 %	0.89 %	0.02 %
Price	40.44	41.28	224.17	51.04	27.87	17.30	2.19
Risk	4.43 %	3.05 %	17.09 %	5.86 %	3.49 %	2.32 %	0.24 %
Follow	14.73	6.49	27.00	20.00	17.00	9.00	0.00

Table 3
Correlations for variables used in analysis of beta

This table presents Pearson correlations for variables used in the analysis of beta. All variables are defined in Appendix A. *N* = 148 for all correlations. *p*-values are for two-tailed tests of significance, and are indicated in parentheses.

Variable	Beta	Beta_adj	Leverage	FVA	FVA1	FVA2	FVA3	FVL	FVL1	FVL2	FVL3	OA
Beta_adj	0.444											
	(0.000)											
Leverage	0.404	–0.592										
	(0.000)	(0.000)										
FVA	0.147	–0.450	0.637									
	(0.074)	(0.001)	(0.000)									
FVA1	0.078	–0.423	0.551	0.516								
	(0.349)	(0.002)	(0.000)	(0.000)								
FVA2	0.072	–0.279	0.382	0.862	0.040							
	(0.387)	(0.000)	(0.000)	(0.000)	(0.628)							
FVA3	0.331	–0.185	0.461	0.420	0.140	0.240						
	(0.000)	(0.024)	(0.000)	(0.000)	(0.089)	(0.003)						
FVL	0.221	–0.459	0.717	0.806	0.588	0.594	0.349					
	(0.007)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)					
FVL1	0.302	–0.377	0.642	0.518	0.805	0.135	0.235	0.640				
	(0.000)	(0.003)	(0.000)	(0.000)	(0.000)	(0.102)	(0.004)	(0.000)				
FVL2	0.122	–0.379	0.568	0.743	0.330	0.671	0.310	0.923	0.297			
	(0.138)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)			
FVL3	0.135	–0.348	0.516	0.581	0.269	0.497	0.348	0.705	0.248	0.727		
	(0.103)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)		
OA	–0.147	0.450	–0.637	–1.000	–0.516	–0.862	–0.420	–0.806	–0.518	–0.743	–0.581	
	(0.074)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
OL	–0.167	0.398	–0.607	–0.785	–0.555	–0.597	–0.300	–0.989	–0.595	–0.933	–0.696	0.785
	(0.042)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Table 4
Analysis of beta

This table presents results from regressions examining the relation between scaled beta and the decomposition of banks' financial assets and liabilities into fair value components. Across all regressions, the dependent variable is *Beta_adj* and $N = 148$. All variables are defined in Appendix A. We present coefficient estimates with *t*-statistics indicated in parentheses, and *p*-values from *F*-tests of coefficients corresponding to hypothesis 1. Standard errors are robust to heteroscedasticity and clustered at the firm level. The regressions include: base regressions (columns 1–3), regressions decomposing only assets into fair value components (column 4), and regressions decomposing assets and liabilities into fair value components (column 5).

				Base Regressions				Decomposition of Assets		Decomposition of Assets and Liabilities	
Variable	Pred Sign	Coeff	(*t*-statistic)	Coeff	(*t*-statistic)	Coeff	(*t*-statistic)	Coeff	(*t*-statistic)	Coeff	(*t*-statistic)
		(1)		(2)		(3)		(4)		(5)	
OA	+	0.943	(3.99)	1.194	(4.93)	1.364	(5.21)	1.388	(5.24)	1.385	(5.28)
FVA	+	0.910	(3.44)	1.166	(4.53)	1.299	(4.85)				
FVA1	+							1.254	(4.36)	1.266	(4.42)
FVA2	+							1.314	(4.85)	1.300	(4.83)
FVA3	+							1.470	(4.85)	1.485	(4.88)
Leverage	–	–0.898	(–3.42)	–1.147	(–4.30)						
OL	–					–1.328	(–4.62)	–1.357	(–4.67)	–1.349	(–4.70)
FVL	–					–1.247	(–4.68)	–1.260	(–4.63)		
FVL1	–									–1.311	(–4.71)
FVL2	–									–1.195	(–4.44)
FVL3	–									–2.393	(–3.92)
Fixed effects for sector, year, and quarter		No		Yes		Yes		Yes		Yes	

Tests of hypothesis 1: *p*-values for *F*-tests comparing coefficients

	(4)	(5)
Assets decomposition:		
FVA1 = FVA2 = FVA3	0.008	0.055
FVA1 = FVA3	0.011	0.018
FVA2 = FVA3	0.076	0.052
FVA1 = FVA2	0.058	0.310
Liabilities decomposition:		
FVL1 = FVL2 = FVL3		0.047
FVL1 = FVL3		0.016
FVL2 = FVL3		0.016
FVL1 = FVL2		0.314

Table 5
Correlations for variables used in analysis of bid-ask spreads

This table presents Pearson correlations for variables used in the analysis of bid-ask spreads. All variables are defined in Appendix A. *p*-values for two-tailed tests of significance are indicated in parentheses. The variables Spread, Turn, Price, Risk, and Follow are log transformed (hence, the "Log" prefix).

Variable	LogSpread	LogTurn	LogPrice	LogRisk	LogFollow	FVA	FVA1	FVA2	FVA3	FVAL	FVAL1	FVAL2
LogTurn	0.058											
	(0.484)											
LogPrice	–0.436	–0.324										
	(0.000)	(0.000)										
LogRisk	0.459	0.726	–0.485									
	(0.000)	(0.000)	(0.000)									
LogFollow	–0.332	0.393	0.050	0.065								
	(0.000)	(0.000)	(0.547)	(0.433)								
FVA	–0.212	–0.064	0.527	–0.275	0.129							
	(0.010)	(0.438)	(0.000)	(0.001)	(0.120)							
FVA1	–0.097	–0.047	0.323	–0.180	–0.179	0.516						
	(0.239)	(0.573)	(0.000)	(0.028)	(0.030)	(0.000)						
FVA2	–0.233	–0.078	0.439	–0.239	0.213	0.862	0.040					
	(0.004)	(0.344)	(0.000)	(0.004)	(0.009)	(0.000)	(0.628)					
FVA3	0.125	0.125	0.154	0.001	0.242	0.420	0.140	0.240				
	(0.130)	(0.131)	(0.062)	(0.989)	(0.003)	(0.000)	(0.089)	(0.003)				
FVAL	–0.222	–0.013	0.547	–0.255	0.178	0.961	0.571	0.786	0.407			
	(0.007)	(0.878)	(0.000)	(0.002)	(0.030)	(0.000)	(0.000)	(0.000)	(0.000)			
FVAL1	–0.118	0.044	0.336	–0.134	–0.112	0.546	0.967	0.086	0.191	0.613		
	(0.153)	(0.598)	(0.000)	(0.104)	(0.174)	(0.000)	(0.000)	(0.301)	(0.020)	(0.000)		
FVAL2	–0.238	–0.058	0.499	–0.256	0.261	0.883	0.178	0.936	0.291	0.895	0.209	
	(0.004)	(0.483)	(0.000)	(0.001)	(0.001)	(0.000)	(0.030)	(0.000)	(0.004)	(0.000)	(0.011)	
FVAL3	0.102	0.125	0.211	–0.019	0.260	0.498	0.180	0.318	0.982	0.503	0.226	0.395
	(0.215)	(0.131)	(0.010)	(0.819)	(0.001)	(0.000)	(0.029)	(0.001)	(0.000)	(0.000)	(0.006)	(0.000)

Table 6
Analysis of bid-ask spreads

This table presents regression results examining the relation between bid-ask spreads and the decomposition of banks' financial assets and liabilities into fair value components. Across all regressions, the dependent variable is *logSpread* and $N = 148$. All variables are defined in Appendix A. Panel A (Panel B) presents analyses using fixed effects for sector, quarter, and year (firm, quarter, and year). We present coefficient estimates with *t*-statistics indicated in parentheses, and *p*-values from *F*-tests of coefficients corresponding to hypothesis 2. Standard errors are robust to heteroscedasticity and clustered at the firm level. The regressions include: base regression (column 1), regressions decomposing only assets into fair value components (columns 2–3), and regressions decomposing combined (i.e., not netted) assets and liabilities into fair value components (columns 4–5). FV, FV1, FV2, and FV3 correspond to the variables FVA, FVA1, FVA2, and FVA3 in columns (2-3), and to the variables FVAL, FVAL1, FVAL2, and FVAL3 in columns (4-5).

	Base Regression	Decomposition of Assets		Decomposition of Assets and Liabilities	
Variable (Predicted sign)	Coeff (*t*-statistic) (1)	Coeff (*t*-statistic) (2)	Coeff (*t*-statistic) (3)	Coeff (*t*-statistic) (4)	Coeff (*t*-statistic) (5)
Panel A. Fixed effects for sector, quarter, and year					
Intercept	–4.334 (–6.28)	–4.313 (–6.19)	–4.283 (–6.51)	–4.279 (–6.10)	–4.219 (–6.25)
LogTurn (–)	–0.337 (–2.77)	–0.334 (–2.72)	–0.314 (–2.76)	–0.338 (–2.82)	–0.313 (–2.77)
LogPrice (–)	–0.198 (–2.09)	–0.214 (–2.20)	–0.210 (–2.35)	–0.230 (–2.38)	–0.225 (–2.52)
LogRisk (+)	0.584 (5.08)	0.587 (5.05)	0.534 (4.84)	0.585 (4.99)	0.537 (4.81)
LogFollow (–)	–0.140 (–0.82)	–0.148 (–0.85)	–0.209 (–1.24)	–0.154 (–0.83)	–0.231 (–1.33)
FV (+/–)		0.309 (0.89)		0.601 (1.34)	
FV1 (+/–)			0.236 (0.25)		0.212 (0.18)
FV2 (+/–)			–0.112 (–0.33)		0.037 (0.08)
FV3 (+/–)			6.367 (1.85)		12.142 (2.02)
Adjusted R^2	46.50%	46.41%	51.32%	46.96%	51.94%
Test of hypothesis 2: *p*-values for *F*-tests comparing coefficients					
FV1 = FV2 = FV3			0.092		0.081
FV1 = FV3			0.049		0.031
FV2 = FV3			0.036		0.028
FV1 = FV2			0.740		0.895
Panel B. Fixed effects for firm, quarter, and year					
Intercept	–4.977 (–3.59)	–4.970 (–3.58)	–4.818 (–3.32)	–4.987 (–3.52)	–4.827 (–3.29)
LogTurn (–)	–0.219 (–1.86)	–0.224 (–1.86)	–0.216 (–1.73)	–0.220 (–1.82)	–0.212 (–1.70)
LogPrice (–)	–0.515 (–3.93)	–0.526 (–4.06)	–0.512 (–3.97)	–0.528 (–4.03)	–0.509 (–3.93)
LogRisk (+)	0.498 (4.41)	0.502 (4.49)	0.495 (4.28)	0.500 (4.45)	0.493 (4.24)
LogFollow (–)	0.328 (0.77)	0.320 (0.77)	0.262 (0.61)	0.337 (0.79)	0.263 (0.61)
FV (+/–)		0.577 (0.81)		0.706 (0.66)	
FV1 (+/–)			1.126 (1.18)		1.940 (1.41)
FV2 (+/–)			0.189 (0.27)		0.224 (0.21)
FV3 (+/–)			2.062 (3.79)		3.646 (2.85)
Adjusted R^2	84.72%	84.74%	84.73%	84.68%	84.73%
Test of hypothesis 2: *p*-values for *F*-tests comparing coefficients					
FV1 = FV2 = FV3			0.006		0.005
FV1 = FV3			0.220		0.210
FV2 = FV3			0.017		0.019
FV1 = FV2			0.154		0.089

Table 7
Sensitivity analyses: increasing sample to include smaller banks

This table presents results from sensitivity analyses examining the robustness of our results to increasing the sample to include smaller-sized banks. All variables are defined in Appendix A. Panel A presents results corresponding to Table 4 for the analysis of firm beta: the dependent variable is *Beta_adj*. Panel B presents results corresponding to Table 6 for the analysis of firms' bid-ask spreads: the dependent variable is *LogSpread*. In both panels, we decompose financial assets reported at fair value into level 1 (FVA1), level 2 (FVA2), and level 3 (FVA3) designations. "Size" in the column headings refers to defining the sample with respect to total assets at the end of the quarter. Standard errors are robust to heteroscedasticity and clustered at the firm level.

Variable	Predicted Sign	Size > Median (*N* = 529)		Size > First Quartile (*N* = 794)		All Firms (*N* = 1,045)	
		Coeff	(*t*-statistic)	Coeff	(*t*-statistic)	Coeff	(*t*-statistic)
		(1)		(2)		(3)	
Panel A. Analysis of beta (dependent variable is *Beta_adj*)							
OA	+	1.422	(9.64)	1.555	(16.77)	1.129	(7.85)
FVA1	+	1.424	(9.98)	1.501	(13.43)	0.925	(4.54)
FVA2	+	1.336	(8.28)	1.457	(15.58)	1.039	(7.73)
FVA3	+	2.294	(5.29)	2.878	(6.33)	2.036	(2.74)
Leverage	–	–1.401	(–8.42)	–1.560	(–16.59)	–1.111	(–7.33)
Fixed effects for sector, year, and quarter		Yes		Yes		Yes	
Tests of hypothesis 1: *p*-values for *F*-tests comparing coefficients							
FVA1 = FVA2 = FVA3		0.003		0.006		0.081	
FVA1 = FVA3		0.006		0.001		0.050	
FVA2 = FVA3		0.003		0.001		0.074	
FVA1 = FVA2		0.113		0.503		0.182	
Panel B. Analysis of bid-ask spread (dependent variable is *LogSpread*)							
Intercept		–4.517	(–11.59)	–4.902	(–18.24)	–4.719	(–18.77)
LogTurn	(–)	–0.504	(–13.05)	–0.547	(–22.45)	–0.510	(–21.71)
LogPrice	(–)	–0.310	(–5.43)	–0.301	(–6.15)	–0.351	(–8.16)
LogRisk	(+)	0.469	(5.45)	0.479	(7.71)	0.405	(7.18)
LogFollow	(–)	–0.196	(–4.65)	–0.305	(–6.65)	–0.460	(–9.83)
FVA1	(+/–)	–0.321	(–0.95)	–0.555	(–1.87)	–0.556	(–1.54)
FVA2	(+/–)	–0.973	(–3.21)	–0.856	(–2.93)	–0.609	(–2.05)
FVA3	(+/–)	2.546	(1.28)	–0.903	(–0.66)	–2.439	(–2.61)
Adjusted R^2		65.39%		74.45%		77.60%	
Fixed effects for sector, year, and quarter		Yes		Yes		Yes	
Tests of hypothesis 2: *p*-values for *F*-tests comparing coefficients							
FVA1 = FVA2 = FVA3		0.066		0.330		0.149	
FVA1 = FVA3		0.073		0.799		0.050	
FVA2 = FVA3		0.045		0.975		0.070	
FVA1 = FVA2		0.119		0.399		0.895	

Table 8
Sensitivity analyses: decomposition of beta

This table presents results from decomposing the dependent variable of *Beta_adj* (scaled beta) into its two mathematical components as alternative dependent variables: *Corr* and *StDev*. "*Corr*" is the correlation of daily stock returns for firm *j* with those for the value-weighted stock market. "*StDev*" is the standard deviation of daily stock returns for firm *j* divided by the standard deviation of stock returns for the value-weighted stock market. Both correlation and standard deviation are weighted by equity divided by total assets to maintain consistency with our model development of beta. All other variables are defined in Appendix A. Standard errors are robust to heteroscedasticity and clustered at the firm level.

Variable	Predicted Sign	Size > Median (N = 527) Coeff (t-statistic) (1)		Size > First Quartile (N = 789) Coeff (t-statistic) (2)		All Firms (N = 1,045) Coeff (t-statistic) (3)	
Panel A. Analysis of *Corr*							
OA	+	0.619	(16.76)	0.600	(22.91)	0.440	(7.97)
FVA1	+	0.640	(19.47)	0.592	(19.21)	0.332	(3.29)
FVA2	+	0.647	(16.65)	0.617	(21.46)	0.438	(7.65)
FVA3	+	0.723	(5.09)	0.743	(10.10)	0.563	(2.79)
Leverage	–	–0.629	(–15.16)	–0.613	(–20.12)	–0.449	(–7.63)
Fixed effects for sector, year, and quarter		Yes		Yes		Yes	
Tests of hypothesis 1: p-values for F-tests comparing coefficients							
FVA1 = FVA2 = FVA3		0.370		0.050		0.085	
FVA1 = FVA3		0.248		0.037		0.150	
FVA2 = FVA3		0.260		0.066		0.270	
FVA1 = FVA2		0.365		0.102		0.032	
Panel B. Analysis of *StDev*							
OA	+	2.842	(20.71)	2.652	(23.17)	2.815	(13.95)
FVA1	+	2.839	(16.01)	2.602	(14.78)	2.791	(10.33)
FVA2	+	2.619	(17.94)	2.470	(18.98)	2.615	(12.94)
FVA3	+	4.474	(9.32)	4.135	(11.61)	3.234	(7.05)
Leverage	–	–2.806	(–18.50)	–2.632	(–20.79)	–2.783	(–12.64)
Fixed effects for sector, year, and quarter		Yes		Yes		Yes	
Tests of hypothesis 1: p-values for F-tests comparing coefficients							
FVA1 = FVA2 = FVA3		0.000		0.000		0.030	
FVA1 = FVA3		0.000		0.000		0.224	
FVA2 = FVA3		0.000		0.000		0.121	
FVA1 = FVA2		0.110		0.374		0.071	