

Strategic Fair Value Reporting: Evidence from the Crisis

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Abstract

Understanding bank financial reporting behavior is fundamental to discerning the effects of fair value accounting during the crisis. To that end, we build a model of banks' discretionary fair value reporting decisions that involves a tradeoff between the benefit of recognizing high value assets and the cost of higher future volatility. Using bank panel data from 2008-2012, we confirm two predictions of our model—that on average there is a positive correlation between the likelihood of reporting at fair value and a bank's stability, represented by its risk-weighted capital ratio, and that this strategic use of fair value is only present in periods of macroeconomic distress. Our results illustrate and quantify the degree to which banks use discretion inherent in GAAP fair value accounting to mitigate declines in asset values in bad times, attenuating concerns over the contribution of fair value to the crisis.

I. INTRODUCTION

Recent studies examine fair value accounting discretion, opportunism, and the role it may have played in the crisis (for discretion, Huizinga and Laeven (2012), opportunism, Barth, Gómez Biscarri, Kasznik, and López-Espinosa (2014), and the role in the crisis, Adrian and Shin (2008), Adrian and Shin (2010), and Amel-Zadeh, Barth, and Landsman (2014)). Underlying these investigations are assumptions that are not well understood about the behavior of banks, and how they will respond to fair value standards. Banks potentially receive benefits from recognizing, trading, or holding fair value assets, but may likewise face costs in the form of increased balance sheet risk. Using a simple analytical model in which banks make strategic fair value recognition decisions, we find that the likelihood of fair value reporting is correlated with a bank's capital ratio and that this relationship is dependent on macroeconomic stability. We test and confirm these predictions using data on U.S. banks from 2008-2012. Specifically, we show that the effects of risk-weighted capital on strategic fair value recognition decisions are only found in periods of macroeconomic distress.

Banks have a variety of motives for recognizing or acquiring fair-valued assets, such as revealing good information, signalling overall quality,¹ and increasing liquidity,² but also face costs in terms of increased balance sheet risk. However, this tradeoff is only relevant in understanding behavior if banks have discretion in acquiring, selling, or recognizing fair value assets. SFAS 115 and SFAS 159 are important to the discretion banks have in the use of fair value accounting for *existing* assets. SFAS 115 broke down assets into three categories,

¹For other examples of signalling quality, see Hughes and Schwartz (1988) in the context of inventory accounting method choice, and Levine and Hughes (2005) for expensing management compensation and earnings-based covenants.

²For an asset to be easily salable, it must be recorded in available-for-sale or trading securities, and so be recognized at fair value. Basel III, yet to be fully implemented, would require less capital to be held against trading securities vs. those held to maturity. Trading securities are in principal more liquid and so could be more easily sold if necessary.

held-to-maturity, *available-for-sale*, and *trading*.³ While the spirit of SFAS 115 is that an asset remains in one category or another, the financial crisis saw banks moving assets from *available-for-sale* to *held-to-maturity*, opportunistically valuing at par rather than market value so as to avoid regulatory constraints (Huizinga and Laeven (2012)). In 2008, Citigroup, with at least the implicit consent of regulators, moved significant assets from *available-for-sale* to the *held-to-maturity* category, allowing a reversal of the effects of temporary impairments, while in principle still accounting for other-than-temporary impairments.⁴ Subsequent to a massive bond rally in 2011, and again with regulatory forbearance, Citigroup decided to move these assets back to fair value.⁵ SFAS 115 categorization has evidently been used to allow a certain degree of latitude in the extent of fair value recognition. SFAS 159 expanded the option to fair value to a wider class of assets. Whether through asset creation, regulatory forbearance in these provisions, or asset turnover, there are many avenues for banks to make choices about recognition of fair value, even outside of adoption of new standards.

We develop testable empirical hypotheses using an analytical approach. In our model, a bank decides whether or not to disclose the fair value of a single asset. Recognizing fair value for an asset subjects the bank's balance sheet to a cost, dependent on the stability of the bank as measured by its capital ratio. Recognizing an asset of high quality has a benefit, signalling overall quality or increasing liquidity. A bank recognizes fair value for an asset only if the asset is valued above some threshold, otherwise pooling with other banks in the economy—all of whom face

³The first, *held-to-maturity*, is accounted for at amortized cost, with possible other-than-temporary (OTT) impairments. Prior to FASB Staff Position SFAS 115-2 and SFAS 124-2 in April 2009, other-than-temporary impairments wrote down the cost basis of securities to fair value. Accounting for these assets now depends on firm intent and ability to hold the security to recovery of the amortized cost basis. *Available-for-sale* securities are always recorded at fair value on the balance sheet, but other-than-temporary impairments are recorded and affect net income in the same fashion as securities that are *held-to-maturity*. *Trading* securities are recorded on the balance sheet at fair values with unrealized gains and losses recorded in net income as they occur.

⁴Regulatory forbearance is by no means sufficient for such practices. Banks are subject to oversight by the SEC and are required to have their decisions approved by their independent auditor.

⁵See <http://reut.rs/1g9Fkis> for further discussion. Other recent examples of moving to *held-to-maturity* involve JPMorgan Chase and Wells Fargo choosing to do so with significant assets in anticipation of rising interest rates. See <http://bloom.bg/1pEw35k> and <http://bv.ms/1evqQbs>.

similar recognition decisions.⁶ The threshold for recognition is lower, yielding more fair value reporting, if the bank's capital ratio is higher. This means banks that are less susceptible to future shocks are more willing to take on the risk to their balance sheets of recognizing the fair value of an asset.

We next consider the effect of macroeconomic conditions on the decision to report fair value assets by extending the model so that the bank issues another asset in a second period and must make a second disclosure decision. The cost of disclosure in the second period is uncertain at the time of the first fair value decision. We find that banks follow a threshold strategy as before. When costs are higher, the effect of the capital ratio on disclosing fair value is more pronounced. However, when costs are lower, the effect on bank decisions is diminished. The story of falling costs over time best fits our sample period, with the economy recovering from the financial crisis of 2008. Our model predicts a positive correlation between the likelihood of reporting and a bank's capital ratio, and further, that this correlation should decline with increasing macroeconomic stability.⁷

We test our model's predictions using quarterly data on banks' fair value choices during the crisis, 2008-2012. We define the fraction fair value as the fraction of assets on a bank's balance sheet that are reported at fair value, and regress this on the Tier-1 capital ratio, which is essentially shareholder's equity divided by risk-weighted assets—a measure of bank stability. In a test of our first hypothesis, we find that banks with higher Tier-1 capital ratio recognize more fair value. These effects remain when including controls related to bank performance, leverage (to focus our attention on the risk-weighting included in definition of Tier-1 capital),

⁶In the absence of costs, there is an incentive to recognize lower and lower quality assets, a phenomenon commonly known as unraveling. That is, the bank with the highest quality asset not recognized wants to recognize, so that its asset will be valued higher than the average of all worse assets. However, in the setting of fair value, at some point this marginal asset goes unrecognized because doing so is too costly for the bank.

⁷Our work also follows an important analytical literature on costly disclosure, beginning with Verrecchia (1983), Dye (1985), and Dye (1986) for disclosure of nonproprietary and proprietary information, and work on optimal mandatory disclosure, as in Dye (1990). Verrecchia (1990) finds that increases in private information lead managers to disclose more. A recent literature explores fair value disclosure and liquidity risk borne within the financial sector, and the repercussions of contagion, insurance shocks, reduced information value of prices, and competition, in Cifuentes, Ferrucci, and Shin (2005), Allen and Carletti (2008), and Plantin, Sapra, and Shin (2008), and ?, respectively.

liquidity, size, and acquisition activities, employing fixed effects to control for unobservable bank characteristics, and the effects still confirm the first testable implication of our model—that more stable banks are more willing to bear the cost of reporting the fair value of assets.

Improving macroeconomic conditions over our sample should lead to a decreasing effect of Tier-1 capital on fair value, but what may be surprising is that the effect of risk-weighted capital on fraction fair value disappears at the end of the crisis period. We test this using a capital ratio-quarterly interaction term. We find that the effect of having a high capital ratio on the choice of fair value is much higher than in the original specification for banks at the beginning of the sample and that this effect decreases statistically significantly over time, eventually reaching zero, in keeping with our second hypothesis. While we do expect that the effects of risk-weighted capital on fair value reporting should be mitigated outside of periods of macroeconomic crisis, the fact that banks are still affected by capital (through the debt ratio), but not the risk-weighting, is noteworthy. Our results are maintained after adding the same set of control variables, bank fixed effects, and time interactions for all the controls. The use of time-varying controls makes it unlikely that changes in regulation are driving our results, or that there is an underlying macroeconomic feature that is driving both fair value and Tier-1 capital. We also restrict our analysis to data following SFAS 159 elections in 2008, which means our results are robust to standard adoption. Our results are broadly consistent in a balanced panel, looking at only discretionary asset types, using a measure of market stability instead of a time trend, and using several other empirical models.

Our results illustrate and quantify the degree to which banks use discretion inherent in GAAP fair value accounting to mitigate declines in asset values in bad times. This channel explains 37% of the variation in the use of fair value across banks and over time in our sample. Policymakers and academics alike are interested in optimal accounting standards and understanding the role of fair value accounting in the financial crisis. We evaluate fair value reporting using a cost-benefit framework, uncovering the responsiveness of banks to economic conditions. The choice to fair value is particularly sensitive to risk-based regulatory requirements

for troubled banks in times of financial crisis. This shows that discretion in fair value adoption can be beneficial to the extent policymakers may be worried about fair value exacerbating capital problems. Our findings attenuate concerns over fair value reporting contributing to the crisis because discretion gives banks a way to lessen the fair value induced procyclicality of their balance sheets. Standard setters should therefore select and time the implementation of new fair value reporting requirements considering how macroeconomic conditions could facilitate, or impede, their intended goals. Whether it is due to responsiveness to regulators, or due to banking behavior during periods of macroeconomic distress, it is important for regulators to understand that the effects of risk-weightings are largely ignored by banks outside of the crisis.

Our work is related to research on various fair value provisions. Nelson (1996) finds that SFAS 107 fair value disclosures have incremental value relevance only in the case of investment securities.⁸ Beatty, Chamberlain, and Magliolo (1996) evaluate the adoption of SFAS 115 and find that bank holding companies had negative abnormal returns around adoption, especially those banks that were fully hedged. Cornett, Rezaee, and Tehranian (1996) more broadly study provisions for fair value, finding that more fair value hurts banks, particularly banks with low primary capital ratios—intuition similar to that in our model of disclosure. This is consistent with Khurana and Kim (2003), who find that fair value is more informative where objective market-determined values are available. Related to the framework set up by SFAS 157, Ahmed, Kilic, and Lobo (2006) examines the changes to markets as a result of SFAS 133, showing that recognition of fair value incrementally increases transparency for financial derivatives over simple disclosure. Davis-Friday, Folami, Liu, and Mittelstaedt (1999) find similar evidence for anticipated pension liabilities under SFAS 106. Amel-Zadeh et al. (2014) study whether fair value accounting contributes to procyclical leverage, finding that controlling for risk-weighted

⁸Consistent with this, Barth (1994) finds that fair value numbers for investment securities have value relevance but also add measurement error. Eccher, Ramesh, and Thiagarajan (1996) argue that the reason this result obtains for securities is due to the better availability of accurate financial information. Indeed, Khurana and Kim (2003) present evidence that fair value is more informative where objective market determined values are available. Barth, Beaver, and Landsman (1996) study footnote disclosures by recalculating earnings using fair value and study these recalculated earnings via market reactions. Hodder, Hopkins, and Wahlen (2006) use a later panel of banks and find that recalculated earnings are more volatile than book earnings, but that this incremental volatility is significantly related to equity market risk.

assets makes the effect of fair value on leverage insignificant. We examine this relationship from a different angle, directly quantifying the effect of risk-weighted assets on fair value reporting. Huizinga and Laeven (2012) document opportunistic use of SFAS 115 provisions in the pre- and early crisis period, 2001-08. We quantify these and other strategic choices over the entire crisis and show that responsiveness to risk-weighted capital measures disappear outside years of macroeconomic distress.

More recently, the incentives surrounding adoption of fair value accounting under SFAS 159 have been studied. Guthrie, Irving, and Sokolowsky (2011), following up on Henry (2009), investigate adoption of the SFAS 159 option in 2007 and 2008—they identify 72 early adopters of which only one third are in the financial sector—and look at the effect on earnings. Perhaps counterintuitively, the effect is not obviously positive. Wu, Thibodeau, and Couch (2013) find that financially vulnerable firms are more likely to adopt the fair value option for liabilities following SFAS 159 and that they accordingly experience ex post negative abnormal returns, so that the adoption seems to have reflected unpriced information. Additionally, there has been much debate in the literature surrounding the possible connection between fair value accounting and the recent financial crisis, surveyed by Kothari and Lester (2012) and Laux and Leuz (2010).

We study the costs underlying banks' fair value recognition decisions during the financial crisis (2008-2012), finding that the effect of capital ratios, a measure of stability, is strong at the beginning of the crisis, decreasing to zero as macroeconomic stability increases. Section II develops our hypotheses with an analytical model. Section III describes our dataset from the Compustat Bank universe of U.S. financial institutions. Section IV discusses our empirical strategy and results. Section V concludes.

II. THEORY AND HYPOTHESIS DEVELOPMENT

We build a parsimonious model of banks' recognition decisions as a choice about costly informational disclosure.⁹ Our model examines a bank that trades off the benefit of signalling

⁹For references on the informational content of recognized over disclose values, see Davis-Friday et al. (1999) and Ahmed et al. (2006).

high value and the cost of increased balance sheet risk. From this model we develop two testable hypotheses. First, that banks with higher capital ratios will recognize more assets at fair value. Second, that this relationship decreases as macroeconomic conditions improve. The purpose of our model is simply to make explicit the structure and assumptions underlying the hypotheses to be tested in Section IV.

Fair Value Reporting—Static Tradeoff

Each bank considers one asset denoted by α with value $\alpha \sim U[0, 1]$ and is endowed with a capital ratio, $K \in [\underline{k}, \bar{k}]$, $0 < \underline{k} \leq \bar{k} < 1$.¹⁰ For simplicity, we assume that the distribution of asset values does not depend on the capital ratio.¹¹ The manager must decide whether to reveal the value α through fair value reporting, or not. If the manager does report α , then its value becomes known, and if not, then the market must infer the value of the asset given knowledge of the set of assets disclosed and the underlying distribution of asset values.¹² Managers are paid proportionally to the market value of the bank's assets.¹³ If fair value is reported, then the bank pays a cost, $c(K)$, where $c(\cdot) \in [0, C]$, is twice continuously differentiable, and $\frac{dc(K)}{dK} < 0$, meaning that a higher capital ratio lowers costs of fair value disclosure. We abstract from agency considerations so that managers pay this cost directly. The cost $c(K)$ can be interpreted as a reduced form measure of the increased risk placed on the balance sheet of the bank.¹⁴ The cost could arise from increased

¹⁰In principle, the asset has a historical cost. A natural assumption in the post-crisis period is that the asset's underlying value has fallen below the historical cost. Regardless, the results in this section do not depend on whether the historical cost was higher or lower than this value.

¹¹If, as seems most likely, more stable banks have higher asset values, our theoretical results would be strengthened, since, under a cutoff strategy, the better asset values drawn for more stable banks would directly lead to more disclosure.

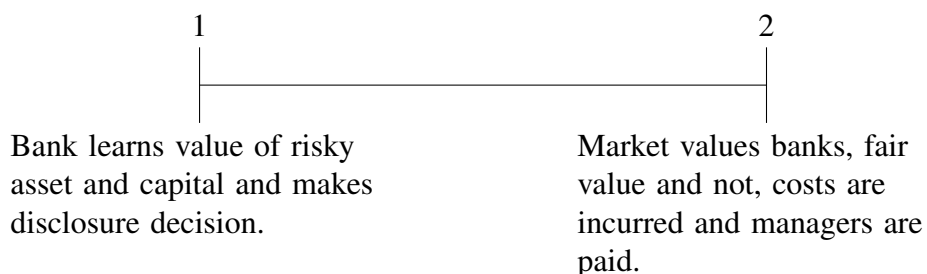
¹²We assume that this decision does not directly impact the capital ratio since we consider an asset that makes up a small portion of the balance sheet. Indeed, Badertscher, Burks, and Easton (2011) find that fair value losses had only small effects on regulatory capital.

¹³This compensation structure could be generated in a more generally contracting framework with agency issues, or else corresponds to an owner-manager for which agency conflicts are not present.

¹⁴A simplification inherent in this parametrization is that the cost does not depend on the bank-specific value of α . We do this to focus on the key implication of disclosing more fair value assets – opening up the balance sheet to more future shocks. This seems particularly relevant in the context of high systematic risk during the financial crisis. The magnitude of this effect is not obviously related to the current fair value of the asset. In addition, if lower quality assets imply higher future costs, our results would actually be strengthened, as this makes banks with high value assets more likely to disclose relative to those with low value assets.

probabilities of becoming liquidity constrained, violating covenants, or becoming insolvent altogether. We focus here on the costs associated with the balance sheet measured according to GAAP. A bank with a higher capital ratio is mechanically less susceptible to liquidity crises. If the manager does not fair value, then no cost is borne by the bank, but then the bank pools with all non-disclosing banks. The timeline of the single period model is described in Timeline 1.

Timeline 1: Single period fair value disclosure



Lemma 1. *Managers will disclose according to a cut-off strategy, $A(K) \in [0, 1]$.*

Proposition 2. *Let a bank have capital ratio K , then the manager discloses iff*

$$\alpha \geq 2c(K) \tag{1}$$

Proofs for Lemma 1 and Proposition 2 can be found in Appendix A. From Lemma 1, we have that banks disclose asset by asset, picking assets that are healthier to disclose. Proposition 2 shows that disclosure depends on the specific costs borne by the bank, $c(K)$. As capital ratios improve, $c(K)$ decreases, and the threshold for disclosing a particular asset decreases. This means that banks with higher capital ratios will be *more likely* to choose fair value.

While there are many factors in determining bank stability, the reason we would expect the bank with the higher capital ratio to be more stable is that it has a larger equity cushion relative to the riskiness of the assets on its balance sheet. We call the fraction of total assets reported at fair value the fair value reporting ratio. Using the capital ratio as a proxy for bank stability, we come to our first hypothesis.

Hypothesis 1. *There is a positive correlation between a bank's fair value reporting ratio and its capital ratio.*

Our hypothesis states that banks that have a higher capital ratio should be less responsive to the costs of fair value reporting, and so report more of their assets at fair value. A bank with a high capital ratio is going to be more stable, and subject to a lower risk of insolvency. As a matter of course, a stable bank will be less likely to miss a covenant, or go under water if the markets sour on a particular asset class it holds on its books. Therefore, such a bank would be more likely to report the better performing assets on its balance sheet at fair value. The tradeoff is clear because of the institutional design. In the spirit of SFAS 115 and SFAS 159, fair value disclosure entails a firm keep the fair value of an asset represented on its balance sheet until it sells that asset, which would come at a loss if they sell when the asset does poorly. Of course, an asset can potentially be switched back to historical cost—as Citigroup, JPMorgan Chase, and Wells Fargo have done—but this does not eliminate the previous exposure to volatility.

Fair Value Reporting—Dynamic Tradeoff

In 2008 and in the years thereafter, the financial system was in upheaval. Uncertainty over markets was high, and so was information asymmetry. Fair value disclosure costs were particularly high because of the increased likelihood of liquidity crises, regulatory interventions or binding capital constraints. Conversely, the benefits of disclosing were likely very high because of the associated information asymmetry. We now evaluate this in a two period extension of the model in the previous subsection. Just as in the single period model, each bank acquires or holds one asset with value $\alpha_1 \sim U[0, 1]$ and is endowed with capital ratio, $K \in [\underline{k}, \bar{k}]$, $0 < \underline{k} \leq \bar{k} < 1$. After learning this information, the manager can choose to disclose the fair value α_1 . However, in the second period, the bank acquires a second asset with value $\alpha_2 \sim U[0, 1]$ and retains the same capital ratio.¹⁵ We assume that the values of the assets in the two periods are uncorrelated,

¹⁵If the choice to acquire the asset is endogenous, this will reinforce the mechanism we describe above, assuming that better banks have greater means and desire to acquire said assets. Allowing the capital ratio itself to change will cause a similar dynamic effect to the change in disclosure costs described below.

$cov(\alpha_1, \alpha_2) = 0$.¹⁶ As in the first period, the manager makes the choice of whether or not to disclose the fair value α_2 in the second period.

Managers are paid proportionally to the market value of assets in each period, less any disclosure costs incurred, as in the one period model. In the first period, if fair value is reported for the first asset, α_1 , then the bank pays a cost, $c(K)$, where $c(\cdot) \in [0, C]$, is twice continuously differentiable, $\frac{\partial c(K)}{\partial K} < 0$, meaning that a higher capital ratio lowers disclosure costs, and $\frac{d^2 c(K)}{dK^2} > 0$, meaning costs are convex. In the second period, if fair value is reported for the second asset, α_2 , then the bank pays $c(K + \varepsilon)$, where ε is an additive capital shock that is uncorrelated with asset values in either period. Specifically, with probability p , $\varepsilon = \gamma$ and with probability $(1 - p)$, $\varepsilon = -\gamma$, with $\gamma \in [0, \min(\underline{k}, 1 - \bar{k})]$.¹⁷ Essentially, at the time of the second period decision about the second period asset, disclosure costs are different from those faced in the first period, which allows the reporting environment to vary stochastically over time. They can be higher or lower than the expected cost when the first period disclosure decision was made. The sum of these costs still reflects the increased risk borne on the balance sheet of the bank from the fair value decision. In each period, a bank with a higher capital ratio is less susceptible to such liquidity crises. If the manager does not fair value, then no cost is borne by the bank, but then the bank pools with all non-disclosing banks. If in the first period, the bank chooses to fair value α_1 , then the benefit and cost is incurred in each period. In the second period, if fair value is chosen for α_2 , then the cost is borne. The timeline of the two period model is described in Timeline 2.

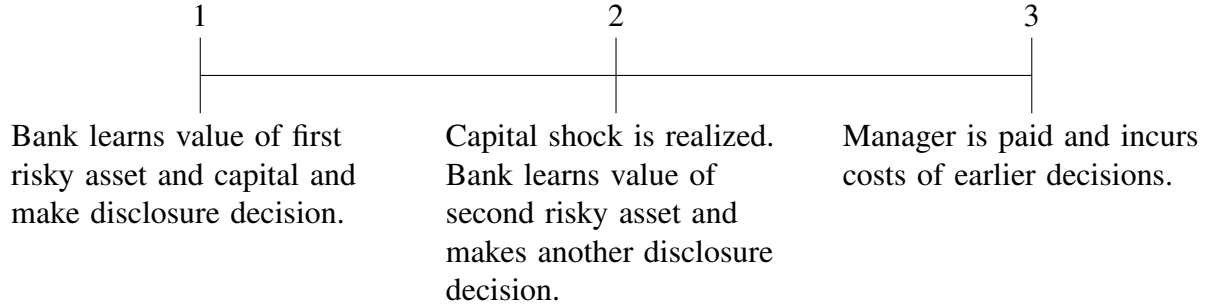
Cost of disclosure in the first period is $c(K)$, and in the second is $c(K + \varepsilon)$. From Proposition 2, the first period cutoff is $A_{\alpha_1,1}(K) = 2c(K)$. The intuition of this is clear, given the lack of correlation between α_1 and α_2 , and the fact that costs are the same for each period. However,

Proposition 3. *Given upper limit on costs, $C < \frac{1}{2}$ —that is, costs are not prohibitively*

¹⁶This assumption could be relaxed, which would add a potentially interesting signalling incentive to the disclosure decisions; we leave this to future work in order to focus on our particular tradeoff.

¹⁷The purpose of the second shock is to allow simple cost dynamics over time.

Timeline 2: Two period fair value disclosure with uncertain costs



*high*¹⁸—then the second period cutoff is

$$A_{\alpha_2, high}(K) = 2c(K - \gamma) \tag{2}$$

and, $A_{\alpha_2, low}(K) = 2c(K + \gamma) \tag{3}$

Proof for Proposition 3 can be found in Appendix A. We now extend the model to allow for second period disclosure of the first period asset, α_1 , in the case when disclosure had not been elected in the first period. This could occur due to restructuring of an asset or loan agreement under SFAS 159, or shifting assets between *held-to-maturity* and *available-for-sale*. Cost of disclosure in the first period is $c(K)$, and in the second is $c(K + \varepsilon)$. As such, no bank will disclose when cost of disclosure in the second period is higher. If the costs are lower, we know from Proposition 2 that the second period cutoff for α_1 is $2c(K + \gamma) \equiv A_{\alpha_1, 2}(K)$. From convexity of $c(\cdot)$, we know that banks are less sensitive to capital ratios when making fair value decisions in period 2 when costs are low, but are more sensitive when costs are high. We now examine the change this optionality will allow in the first period.

Proposition 4. *Given upper limit on costs, $C < \frac{1}{2}$ —that is, costs are not prohibitively high—then the first period cutoff for asset α_1 is*

$$A_{\alpha_1, 1}(K) = \frac{2}{2-p} [c(K) + (1-p)c(K - \gamma)] > 2c(K + \gamma) \tag{4}$$

¹⁸This technical condition can be weakened, depending on the functional form of $c(\cdot)$, and the distribution of the capital ratio K .

Proof for Proposition 4 can be found in Appendix A. We see from Proposition 3 that there is successive disclosure in each period. We also see this for asset α_1 if the bank is allowed to disclose fair value in either period. In addition, the convexity of $c(\cdot)$ means banks are less sensitive to capital ratios when making fair value decisions in period 2 when costs are low, but are more sensitive when costs are high. This can be seen in Figure 1. The downward sloping line is the disclosure cutoff. For any asset value (α) above that line, banks choose to report fair value. However, at what level banks make that decision depends on their capital ratio, K . In the range of \underline{k} to \bar{k} , the slope of the disclosure cutoff is steep—meaning banks are very sensitive to capital ratios when making fair value reporting decisions. When there is a positive capital shock, or low costs obtain, within the range $\underline{k} + \gamma$ to $\bar{k} + \gamma$, the slope of the disclosure cutoff is not as steep—banks depend less on their capital ratios in making fair value decisions than they did in the first period. This is even more stark if banks have the optionality available to them in α_1 . In this case there is successive disclosure in both assets, and the difference between $A_{\alpha_1,1}(K)$ and $A_{\alpha_2}(K)$ is even larger.

[Figure 1 about here.]

As firms disclose more assets at fair value, fewer assets will remain on balance sheets at historical cost. Stable banks should be more willing to trade off the risks of facing insolvency with the benefits of acquiring assets at fair value, over time. The reason we believe that this relationship should decrease over time is two-fold. First, the uncertainty over the market's outlook decreases following the crisis. Second, the benefit of disclosing fair value decreases over time. With the costs decreasing and the benefits decreasing, there should be less of a correlation between the stability of a bank and its fair value assets because the value of being a particularly stable bank decrease relative to the market, meaning firms will acquire assets and disclose fair value assets more idiosyncratically. This brings us to our second hypothesis.

Hypothesis 2. *The correlation between a bank's fair value reporting ratio and its capital ratio is decreasing with macroeconomic stability.*

Our hypothesis states that the incentive for a bank with a high capital ratio to disclose or acquire fair value assets will decrease over time with increasing financial sector stability. A bank with a high capital ratio will be more stable, but as the economy improves, and the benefits to disclosure decrease, stability will matter less in the choice of banks to disclose or acquire fair value assets. While fair value disclosure will lead some distressed banks to unload fair valued assets on more stable banks, this effect should also decrease over time, meaning that fair value disclosure should essentially equilibrate more in times of low stress.

III. DATA

We assemble a population of U.S. banks using quarterly data covering 2008-2012 from Compustat Bank. The two key empirical variables necessary for testing the hypotheses of Section II are the proportion of assets on the balance sheet that are reported at fair value and our measure of bank stability, the Tier-1 capital ratio.¹⁹ We use the total fair valued assets netting adjustments across levels for our calculation because this best represents the true risk exposure embodied in the bank's decision. The Tier-1 capital ratio is a construct of Basel I, and was designed to be a core measure of a bank's stability. It is essentially the ratio of equity of a bank to the risk-weighted assets (RWA) of that bank. While uncollateralized debt is given a 100% weighting, U.S. treasuries are given a weighting of 0%, with several asset classes weighted in between. A bank with a high Tier-1 capital ratio would be considered more stable than a bank with a lower Tier-1 capital ratio. For fiscal year 2007, we have only 22 observations for the fair value of assets—consistent with limited reporting of fair value.²⁰ Given the implementation of SFAS 157 (and secondarily 159) after November 15, 2007, we look at data from 2008-2012, in which more than 500 banks report some assets at fair value in each quarter.

Table 1 displays summary statistics for banks for our sample period. The fraction of

¹⁹The Tier-1 capital ratio comes directly from Compustat (*CAPRI*) and is calculated as equity capital plus minority interests, less portion of perpetual preferred stock and goodwill, as a percentage of adjusted risk-weighted assets. Basel I requires a ratio of 4% or higher.

²⁰There were some early adopters of SFAS 159 in 2007, which required their simultaneous adoption of SFAS 157, and they look similar on observable characteristics to adopters in 2008.

assets reported at fair value is recorded for all 10,770 bank-quarter observations, and has an average of 0.179, with considerable variation across banks. The current practice of fair value accounting under GAAP uses a hierarchy of inputs for valuation (SFAS 157/ASC 820-10-35-40 through 54A). Level 1 inputs are quoted prices from active markets for identical assets or liabilities. Level 2 inputs are other observable quoted prices, such as prices of similar assets or liabilities. Level 3 inputs are unobservable, as in the bank's own internal data. The breakdown among these categories shows that Level 2 assets, or those valued using Level 2 inputs, make up the vast majority of fair value assets.²¹ Level 1 makes up 0.009, Level 2, 0.169, while Level 3 make up a small proportion at 0.005. Note that these values are unweighted, and larger banks typically have more fair valued assets, consistent with a greater amount of asset trading. In the sample, the average Tier-1 capital ratio is 0.121, or 12.1%. While the regulatory minimum of Basel I in principle remains at 4%, there are several bank observations violating this threshold. Return on assets is measured as income before extraordinary items, divided by total assets. It is notably zero on average, which is not surprising given the prevalence of losses over this period. The size of the banks in the sample varies substantially, with average total assets of \$18B. Leverage is measured by the ratio of long-term debt divided by total assets, and has an average of 8.5%.

[Table 1 about here.]

Table 2 shows the correlation table for these variables. The fraction of assets reported at fair value is positively correlated with Tier-1 capital ratio, in line with our first hypothesis. Return on assets is also positively correlated with Tier-1 capital ratio, meaning that, not surprisingly, more stable banks have higher returns.

[Table 2 about here.]

We illustrate in Figure 2 the quarterly trends for fraction of assets reported at fair value and the Tier-1 capital ratio from the beginning of 2008 through the end of 2012. The fair value

²¹This is the case because the largest asset category on a bank's balance sheet is usually "loans and leases," (Huizinga and Laeven (2012)).

fraction starts at about 16% in 2008 and increases relatively steadily to 20% at the end of 2012. Similarly, the Tier-1 capital ratio grows from 11.6% to 13.8% over the same period. These trends may arise through many different channels beyond the mechanism described in Section II, including changes in asset prices for fair valued assets and banks' slow accrual for credit losses on non-fair valued loans over the course of the crisis.

[Figure 2 about here.]

Figure 3 illustrates that the variation in fraction of assets reported at fair value from 2008 through 2012 is predominantly driven by changes in Level 2 assets. While Level 1 assets and Level 3 assets stay stagnant or decrease as a portion of the total assets of banks, Level 2 increases over time.

[Figure 3 about here.]

Our empirical strategy for testing Hypothesis 2 relies upon the evolving macroeconomic features of the economy following the immediate crisis of 2008. We consider three different measures of macroeconomic stability. The first measure is the Federal Reserve Board of Governors survey of senior loan officer lending standards. This survey asks whether officers have tightened lending standards. The second measure we consider is based on VIX, the S&P 500 option implied volatility, from the Chicago Board Options Exchange. Finally we consider an index of house prices, given the centrality of the housing market to the health of the financial sector and the greater economy during the financial crisis. In all cases, we interpret the measure as necessary so that an increase in the measure corresponds to an increase in stability. Figure 4 illustrates these three measures at a quarterly frequency 2008-2012. For comparability, the measures are normalized to have a mean of zero, a standard deviation of one, and are smoothed using the Hodrick-Prescott filter to deal with seasonality.

[Figure 4 about here.]

All of these measures are broadly increasing from 2008 to 2012 and are related to the stability of the financial sector. The choice over measures of macroeconomic stability, especially in a time of crisis, there are many possible measures. Rather than picking a particular measure, or some composite measure, we instead focus on the general trend in macroeconomic stability over the sample period. Because the market is clearly becoming more stable, we are agnostic about this choice and focus on a linear time trend rather than deliberating over the efficacy of one measure over another.²²

IV. EMPIRICAL STRATEGY AND RESULTS

In this section, we describe our empirical methods and the specifications we use to investigate the testable implications of our theoretical model. The object we describe is the fraction fair value (*FracFair*), and we define this as the fraction of assets on a bank's balance sheet that are reported at fair value. This number is reported for the Compustat Bank universe of banks, and it includes fair valued assets across all three valuation methodologies. Our basic regression model is as follows:

$$FracFair_{it} = \alpha + \beta T1C_{it} + \lambda X_{it} + \delta_i + \varphi Quarter_t + \varepsilon_{it} \quad (5)$$

where $T1C_{it}$ is bank i 's Tier-1 capital ratio in quarter t and X_{it} is a set of time-varying bank control variables.

Testing the Static Tradeoff

Table 3 presents the results of our tests of the first hypothesis; in each specification, standard errors are clustered at the bank level. To start, the first column simply uses the bivariate relationship between our variables of interest, yielding a coefficient of 0.741 (standard error of 0.117), which is significant at the 1% level. This means that banks with a higher Tier-1 capital

²²As a robustness check, we replace the linear time trend with a composite of the raw measures.

ratio do indeed report a larger fraction of their assets at fair value. In particular, a one percentage point increase in the Tier-1 capital ratio is associated with a 0.741 percentage point increase in the fraction of assets reported at fair value.

In column (2), we add a quarterly trend to the empirical model.²³ This allows us to control for myriad changing aggregate factors, such as government policy and changes in risk preferences. Not surprisingly, given the increase in fair value over time seen in Table 2, the trend itself enters the regression positively and significantly. The coefficient of interest is slightly smaller at 0.662 (standard error of 0.125) but is still strongly significant. This specification addresses the particular concern that assets that were previously reported at fair value are simply increasing in value over time, so that no active reporting decision is being made by banks subsequent to 2008. Since capital ratios were likewise increasing over time, this mechanical effect could, in principle, be driving our results. However, the similar coefficient obtained after controlling for this variation implies that this is not the case.

[Table 3 about here.]

Our next step is to control for other explanatory variables that can help explain how the fair value reporting decision varies across banks and through time. Column (3) illustrates the coefficient on the capital ratio after including a broad set of controls – it increases slightly to 0.715 (standard error of 0.128) and remains strongly significant. This is somewhat unexpected given that the controls we include are themselves correlated with the capital ratio, and might also be related to differences in fair value-related balance sheet risk, the key cost of fair value in our theoretical model.

We next look at the coefficients on the control variables themselves. The logarithm of total assets was included as a measure of bank size, and enters the regression positively and significantly, which is not surprising since larger banks might also be expected to exhibit less sensitivity to adverse shocks, at least as far as insolvency is concerned. Similarly, return on assets

²³ Similar results obtain when controlling for time effects using separate year-quarter dummies, rather than a linear trend.

and Tobin's q both enter positively and significantly, which is consistent with both higher current performance and market expectations of future performance indicating better ability to weather future volatility or liquidity shocks.

Of particular interest is the effect of including the debt ratio as a regressor. First of all, this means that the coefficient on the Tier-1 capital ratio is now estimated conditional on the debt ratio. Hence the variation used to identify this coefficient comes from the riskiness of assets, as codified by the Basel regulations, rather than also including the effects of leverage, as in columns (1) and (2). For the debt ratio coefficient itself, there are several mechanisms potentially at play. The direct effect of higher leverage on susceptibility to future shocks would seem to suggest a negative coefficient. However, the debt ratio also embodies the market's perception of the creditworthiness of the bank in the sense that, all else equal, a high debt ratio implies that lenders have been happy to lend to the bank. These two effects point in opposite directions, and in fact, the positive coefficient seen in column (3) suggests that the second dominates.

A similar conceptual framework is helpful to understand how the cash ratio affects the fair value fraction. On one hand, more cash provides a buffer for future liquidity shocks; on the other, high levels of cash imply either an absence of future investment opportunities or the fact that lenders' perceptions of the bank are poor, so that banks must hold more cash on their balance sheets rather than seek external finance. The coefficient on the cash ratio is in fact negative, which is suggestive evidence for the second mechanism.

The last pair of controls are the ratio of net cash flow from investing activities to total assets and a dummy variable for merger activity. We include these for several reasons. First, the changes in assets picked up by these measures reflects greater opportunity to make fair value decisions.²⁴ Additionally, endogenously higher asset turnover for more stable banks is another channel through which bank stability can affect the measured fair value fraction. Since banks that have invested a great deal in long-term assets will have negative net cash flows from investing,

²⁴Controlling for the change in assets directly yields similar results. We relegate this measure to an alternative test because it can vary due to asset price changes even if there is no asset turnover. Likewise, the aggregate level of assets may disguise significant gross asset turnover, which should be picked up by the investing cash flow measure.

the negative coefficient is consistent with this story. Banks with more asset acquisitions do more fair value, but this effect seems to be essentially independent of the relationship between the capital ratio and fair value, at least conditional on the whole set of controls. The negative sign on the merger variable can be explained by the fact that acquired banks during this time period were more likely to have low quality assets, directly leading to lower prevalence of initial fair value reporting at the time of asset acquisition.

Column (4) of Table 3 adds bank fixed effects to strip out time invariant unobservable factors at the level of the individual bank, such as a bank's managerial or asset quality. This yields a much smaller coefficient of 0.179 (standard error of 0.083), which is significant at the 5% level. This difference is not surprising, given that the fixed effects transform this coefficient into a within bank estimator. Hence, rather than coming from *levels* of the fair value fraction, identification in this case comes from *changes* in this fraction and in the capital ratio over time for each bank. The reduction in the magnitude of the coefficient tells us that some unobserved fixed effect is correlated with both the fair value fraction and the capital ratio. This could arise through our hypothesized mechanism, or through other unobserved bank characteristics—to be conservative, in this specification, our goal is to test Hypothesis 1 without employing such variation. The big increase in the R^2 suggests that much of the variation in the fair value fraction is explained by the fixed effects. Fixed effects would capture differences in business models across banks that could be mechanically related to balance sheet composition and the extent of fair value reporting. Specifically, for most traditional banks, available-for-sale securities make up the bulk of fair valued assets, while larger, trading-oriented banks, naturally have many more fair valued assets, such as from trading securities and other financial instruments.

This specification also helps to address one of our main identification concerns—that there is a correlation between the (unobserved) quality of a bank's assets and its capital ratio, which would yield similar results to what we find. To the extent that any such relationship stays roughly constant over time, which is not unreasonable given the limited asset turnover in this time period, its effect will be removed by the fixed effects. Given the positive and significant

coefficient we obtain, it remains clear that healthier banks, as measured by their capital ratios, report more of their assets at fair value.

Banks' adoption of accounting policies related to fair value also play a role in describing the fair value reporting tradeoff faced by banks. In particular, use of the fair value option for liabilities (FVOL) decreases the incremental volatility impact of reporting assets at fair value, if there is offsetting risk exposure—one of the avowed goals of standard setters in formulating SFAS 159. Because of well known measurement issues in capturing accounting choices from Compustat, in our main specifications we do not include a variable describing takeup of FVOL. Fortunately, given the limited variation in time surrounding adoption, any variation in fair value accounting induced by FVOL should be effectively soaked up by bank fixed effects.²⁵

For several reasons, we are not particularly concerned about reverse causality undermining our interpretation of these regressions. First of all, Guthrie et al. (2011) find a negligible impact of positive transition adjustments associated with the adoption of SFAS 159 on banks' leverage and capital ratios. Similarly, Badertscher et al. (2011) show that fair value losses had only small effects on bank capital. In addition, the test of hypothesis 2 in the following section addresses this issue directly—as long as the fair value choice predominantly involves writedowns in asset values, as appears to be the case during this time period, a decreasing correlation of the fair value fraction and the capital ratio cannot be explained by a mechanical reverse causality.

To put our results in context, it is useful to consider how much of the variation in fair value reporting can be explained by the discretionary reporting channel. We quantify this channel as the part of the fair value decision that is sensitive to risk-weighted regulatory requirements—the stability of the bank. To do so, we find the average change in Tier-1 capital ratios from 2008-2012, which is 2.5 percentage points (11% in 2008 to 13.5% in 2012), and

²⁵In unreported tests, we measure FVOL adoption using a dummy variable for the presence of any fair-valued liabilities, which is equal to unity for about 31% of bank quarters in the sample. Including this measure in our regressions does not change the effect of the capital ratio, nor does the measure itself attain statistical significance. This is to be expected, given that fair valued liabilities relative to total assets are only 0.2%, against 17.9% for fair valued assets.

the average change in fair value fraction, which is 5 percentage points (15.5% in 2008 to 20.5% in 2012).²⁶ We take the coefficient on Tier-1 capital from column (3) of Table 3, which is 0.715, and multiply by the change in Tier-1 capital to get a predicted change in fair value reporting of 1.9 percentage points. This means that discretion explains 37% of the observed change in fair value reporting over our sample period. This calculation provides a midrange estimate of the magnitude of the discretionary channel. Including fixed effects would yield lower estimates, while attributing the role of other time varying controls to discretion would yield higher estimates.

Testing the Dynamic Tradeoff

In testing our second hypothesis, we are interested in how the effect of the capital ratio on the fraction fair value changes over time. Hence, we augment equation (5) with an interaction term, allowing this effect to vary linearly with time, as follows:

$$FracFair_{it} = \alpha + \beta_1 T1C_{it} + \beta_2 Quarter_t \times T1C_{it} + \lambda X_{it} + \delta_i + \varphi Quarter_t + \varepsilon_{it} \quad (6)$$

Hypothesis 2 predicts $\beta_2 < 0$, so that the effect of the capital ratio is declining over time, as the financial crisis resolves and so disclosure costs fall. Essentially, the specification in the previous subsection picks up the average level of this effect; here, β_1 estimates the effect in the first quarter of 2008, at the start of our sample, and then β_2 illustrates how this changes over time. If the effect is indeed diminishing, the initial effect should also be higher than the average effects shown in Table 3.

Table 4 presents the initial effect in the first row, and the time interaction in the second row. The baseline results are in column (1). The initial effect is large, with almost a one percentage point increase in the fair value fraction for a one percentage point increase in the capital ratio in the first quarter of 2008. The second row shows that this effect changes by -0.025

²⁶The values shown are the year averages. If we instead use the lowest quarter to the highest quarter, we obtain similar changes.

percentage points (standard error 0.012) per quarter, which is just as predicted by Hypothesis 2. To put this magnitude in context, the estimates imply that ten percent of the effect of the capital ratio on fair value reporting goes away each year. The effect of the quarterly trend itself is positive and significant, as before. Essentially, Tier-1 capital ratios are increasing over time, leading to more use of fair value, but the incremental increase in fair value reporting for an increase in the capital ratio is diminishing over time.

[Table 4 about here.]

Next, in column (2), we add the same set of control variables as in Table 3. Just as before, the effect size increases, to -0.037 (standard error of 0.012), and is still statistically significant and goes in the direction predicted by Hypothesis 2. The effects of the control variables themselves are similar to the previous table, though now log total assets and Tobin's q are no longer statistically significant. Bank fixed effects are added to the model in column (3), and both the initial effect of the capital ratio and the change in effect over time are smaller though still statistically significant (at the 1% and 5% level, respectively). The fall in the initial effect is not surprising given the strong persistence in these two key variables.

In column (4), a time interaction is included for each of the seven control variables to allow the effects of the other covariates to vary over time as well. Without these interactions, any change in these effects might be picked up by the capital ratio-time interaction, leading to spurious conclusions.²⁷ We can see that the effect size actually increases to -0.029 (standard error of 0.011). In addition, fixed effects combined with time interactions for all controls make it unlikely that the effect of Tier-1 capital on fair value assets is driven by a different underlying process. For reasons of space, the table does not report the coefficients on these extra interaction terms; however, a comparison across columns (3) and (4) indirectly reveals how these effects change over the sample. The two striking differences from this comparison involve the effects of return on assets and Tobin's q , both of which are evidently decreasing over time—this explains

²⁷This strategy also deals directly with the effects of differentially time-varying factors across banks. For example, capital infusions from the federal government's TARP program obviously varied over time and by the size of the bank.

the fact that their respective average effects are close to zero, while the initial effect, as seen in column (4) is significantly positive. Clearly, the effect must be falling over time to generate such a pattern. These two observations fit the intuition explained in Section II. As the financial crisis eases, even less successful banks can afford the inherent costs of disclosure in order to be compensated for their, perhaps few, high quality assets.

An alternative explanation of this pattern of results could be that regulatory forbearance changes through the sample period. Such forbearance would likely have disproportionate effects on larger banks and nearer to the height of the financial crisis so that the interaction of time and size in Column (4) of Table 3 should pick up such an effect. We find that there is indeed a small effect of bank size on the fair value reporting ratio, and that this decreases over time, consistent with a regulatory forbearance story. However, controlling for this does not change our results.

We are interested in the change in fair value reporting discretion over time, something we examined in a static model in the previous subsection. As before, we quantify this channel as the part of the fair value decision that is sensitive to risk-weighted regulatory requirements—the stability of the bank. Using the average sensitivity, we found that the channel explains 37% of the observed change in fair value reporting. However, in this section we allow our estimates of sensitivities to change over time. We use 1.115 (2008Q1) as the starting sensitivity and 0.412 (2012Q4; subtracting the time interaction over quarters from the initial value) as the ending sensitivity of fair value reporting to Tier-1 capital, as shown in column (2) of Table 4. This means that had banks stayed as concerned about survival as they were at the peak of the crisis, discretion would have explained 58% of the observed increase in fair value reporting. Conversely, had banks been as confident over this period as they were at the end of 2012, discretion could only have explained 21% of the change in fair value. The difference between these two amounts highlights the way in which bank behavior changes in response to crisis conditions. These calculations focus on how banks' behavior changes *conditional* on the observed change in capital ratios. Of course, a fuller model would consider the connection between macroeconomic conditions and the health of individual banks.

Robustness

In this section, we investigate a number of alternative specifications in order to investigate the robustness of the results discussed above. The first row of Table 5 reproduces the baseline results from our tests of the two hypotheses generated by the theoretical model in Section II. The first column is the coefficient on the Tier-1 capital ratio from the final specification of Table 3, which includes the quarterly time trend, full set of control variables and bank fixed effects. We call this coefficient ‘Mean T1C’ in the table since it reflects the average effect of the Tier-1 capital ratio on the fair value fraction during our sample period. The remaining two columns are the coefficient on the capital ratio and the effect interacted with the time trend, and come from the main specification testing the second hypothesis in Table 4, including the time trend, controls and bank fixed effects. We call these ‘Initial T1C’ and ‘Quarter * T1C’.

[Table 5 about here.]

One issue we address in this table is the extent to which initial adoption of SFAS 159 could be driving some of our results, particularly since the specifics of this rule made it easier for banks to adjust their fair value decision in the first quarter of 2008 than in later periods.²⁸ In row (2), we drop the first quarter of 2008, when the vast majority of banks’ adopted SFAS 157 and SFAS 159. As an additional check, in row (3), we drop all of 2008 in case of slower initial take-up. This yields a somewhat smaller average effect of the capital ratio but the pattern of results matches that of the baseline very closely. These results address the related concern that changes in asset valuation methodologies imposed by SFAS 157 could be driving our results.²⁹

In row (4), we restrict our calculation of the fair value fraction to include only Level 2 and 3 assets in the numerator, both because of the significant degree of managerial discretion inherent in the calculation of their values, and because the remaining category, Level 1, was

²⁸Note that opportunistic adoption behavior and subsequent reversal following public opposition from the SEC and Center for Audit Quality, studied in Henry (2009), had run its course by the start of 2008, and so does not affect our analysis.

²⁹For example, it could have been the case that less stable banks were taking more liberties with their pre-157 valuations, and so responded to the standardization by reporting less assets at fair value.

already subject to mandatory disclosure under SFAS 133. The results are almost identical to the baseline, which is expected since, as seen in Figure 3, the vast majority of fair value assets are of the ‘mark-to-model’ type.

Since the fair value fraction is indeed a fraction, it is necessarily restricted to the unit interval. Given the empirical distribution of this ratio, the bound at zero appears to be a potentially relevant constraint. Hence, we implement a Tobit model, which accounts for this lower limit. The results, in row (5), are very similar to the baseline, indicating that the ordinary least squares approach used for the rest of our results is not an important simplification.³⁰

In row (6), we experiment with dropping banks with substantial asset growth or decline, quarter over quarter, in case these bank quarters are disproportionately affecting our results. Specifically, we drop bank quarters with growth in the top or bottom one percent of the distribution. This slightly weakens the average effect of the capital ratio on the fair value fraction but leaves the initial level and trend of this effect quite similar.

The next robustness check, in row (7), involves subtracting the effect of changes in value on fair valued assets from the calculation of the fair value fraction. After this correction, the ratio does not reflect current period changes in the value of fair value assets. The results are essentially unchanged—this is because the effect on earnings is a relatively small quantity, on the order of a tenth of one percent of fair value assets. Even cumulating these effects over all periods, so that all subsequent value changes are ignored, does not change the results.

In row (8) we use a balanced panel, constructing our estimation sample using only banks that were reporting during all quarters from the first quarter of 2008 to the final quarter of 2012. This yields a sample of 6,500 bank-quarters from 325 banks over 20 quarters. The much smaller sample size mostly reflects a great deal of bank failure during this period. Of course, this induces serious survivorship bias, so that we do not use this sample for our baseline. The mean effect of the capital ratio on the fair value fraction is actually larger in this case. The change over time is slightly smaller in magnitude at $-.020$, which combined with the larger standard error expected

³⁰Using a Tobit procedure to additionally account for the upper limit at one yields identical results—this is not surprising given that few banks are anywhere near this limit.

in this smaller sample, is not statistically significant. The result changing in this direction is not unexpected since the banks most sensitive to adverse shocks, and so to decreases in the probability of such shocks as the financial crisis started to resolve, are the most likely to leave the sample before the end of 2012, either by failing or by being acquired. This would explain a similar initial effect, at the start of 2008, but a somewhat reduced sensitivity to changing reporting costs over time.

We have documented evidence consistent with macroeconomic stability reducing the effect of the Tier-1 capital ratio on disclosing fair value. Rather than debate the relative merits of one measure of stability over another, all of the preceding results used a time trend and time interaction with the capital ratio to measure the effects of decreasing volatility on the decision to disclose fair value. To test whether this is justified, we combine three measures of macroeconomic stability in our analysis in place of the time parameter, in row (9). The three measures we use are based on the Federal Reserve Board of Governors survey of senior loan officer lending standards, the S&P 500 option implied volatility and the Federal Housing Finance Agency's index of home sales, respectively. We normalize the three measures to have a mean of zero and a standard deviation of one. They are then averaged, fit to the range of the time parameter for comparability with our earlier results.³¹ The results in row (9) show that replacing time with this stability measure shifts the mean effect up and the initial effect down, but leaves the results qualitatively the same.

V. CONCLUSION

We develop a model of costly disclosure to describe the tradeoff faced by banks when deciding whether or not to report an asset at fair value. From the model, we derive two testable hypotheses involving the tension between the benefits and the costs of reporting fair value. The first is that banks that are more stable, with higher capital ratios, will report more assets at fair value, given their lower costs of incremental volatility. The second is that the role of the capital ratio

³¹Note that, unlike their depiction in Figure 4, we do not smooth the measures, though such smoothing leaves the results qualitatively unchanged.

in driving fair value reporting decisions should decline as macroeconomic stability increases. We find support for both implications of our model using quarterly U.S. banking data from the beginning of 2008 through the end of 2012. Of note, we show that the effects of risk-weighted capital are only found in the crisis period. These results are robust to liquidity, size, leverage, performance, and merger activity controls, as well as bank fixed effects to mitigate heterogeneity in bank business models and a variety of alternative econometric specifications.

Our results shed light on the way in which banks can mitigate declines in asset values in downturns using the channel of discretion in fair value reporting. Our paper therefore provides evidence against fair value playing a leading role in the financial crisis. Also, as standard setters propose new fair value reporting requirements, they should consider how macroeconomic conditions will facilitate, or impede (in bad times), implementation. We find that banks are constrained by risk-weighted regulatory capital in their use of fair value, but only during periods of macroeconomic distress. Future work could explore the ramifications of seeming unresponsiveness outside of crisis times, or whether there are asymmetric effects on increasing versus decreasing the use of fair value. Additionally, it would be of interest for researchers to document further the specific ways in which banks apply discretion in fair value accounting.

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A. Model Proofs

Lemma 1. *Managers will disclose according to a cut-off strategy, $A(K) \in [0, 1]$.*

Proof. Let there be two banks, denoted by α_L and α_H such that $\alpha_L < \alpha_H$, with the same capital ratio, K . By means of contradiction, assume α_L discloses, while α_H does not. Banks that do not disclose are all valued the same.

We know that the value of disclosure to a bank with asset α is $\alpha - c(K)$.

$$\alpha_L - c(K) \geq \text{Value of not disclosing } \alpha_L, \alpha_H \geq \alpha_H - c(K) \quad (7)$$

$$\implies \alpha_L \geq \alpha_H \quad (8)$$

Which is a contradiction. If a bank with asset α does not disclose, neither do any banks with lower valued assets. By compactness, there exists a lowest $A(K) \in [0, 1]$ such that disclosure is made, constituting a cut-off strategy in which all banks with capital ratio K and $\alpha \geq A(K)$ disclose. □

Proposition 2. *Let a bank have capital ratio K , then the manager discloses iff*

$$\alpha \geq 2c(K) \quad (9)$$

Proof. A manager will disclose if and only if the value of disclosing, less the disclosure cost, is worth pooling with the remaining non-disclosing banks. Because the distribution of assets is uniform, this means that given the cutoff for a bank, considering the capital ratio, the market infers that the value of assets going undisclosed is half this cutoff value. As such, a manager will disclose if and only if

$$\alpha - c(K) \geq \frac{1}{2}A(K) \quad (10)$$

where $A(k)$ is the cutoff for a firm with capital ratio k . Only the manager on the boundary

determines the cut-off condition, so substituting $A(K)$ in for α , we get the desired result:

$$A(K) = 2c(K) \quad (11)$$

□

Proposition 3. *Given upper limit on costs, $C < \frac{1}{2}$ —that is, costs are not prohibitively high³²—then the second period cutoff is*

$$A_{\alpha_2, high}(K) = 2c(K - \gamma) \quad (12)$$

$$\text{and, } A_{\alpha_2, low}(K) = 2c(K + \gamma) \quad (13)$$

Proof. The proof is clear from the proof to Proposition 2. As $c(0) < \frac{1}{2}$, $K \in [\underline{k}, \bar{k}]$, and $\gamma \in [0, \min(\underline{k}, 1 - \bar{k})]$, it is clear that both cutoffs are within bounds, and when costs are high, the disclosure decision is more restrictive, as opposed to when the costs are low, and the disclosure decision is less so. □

Proposition 4. *Given upper limit on costs, $C < \frac{1}{2}$ —that is, costs are not prohibitively high³³—then the first period cutoff for asset α_1 is*

$$A_{\alpha_1, 1}(K) = \frac{2}{2-p} [c(K) + (1-p)c(K - \gamma)] > 2c(K + \gamma) \quad (14)$$

Proof. A manager will disclose if and only if the value of disclosing, less the cost, is worth pooling with the remaining non-disclosing banks on α_1 . However, there is an additional shock. Because the distribution of assets is uniform, this means that given the cutoff for a bank, considering the capital ratio, the market infers that the value of assets going undisclosed is half

³²This technical condition can be weakened, depending on the functional form of $c(\cdot)$, and the distribution of the capital ratio K .

³³This technical condition can be weakened, depending on the functional form of $c(\cdot)$, and the distribution of the capital ratio K .

this cutoff value. As such, a manager will disclose if and only if

$$2\alpha - c(K) - pc(K + \gamma) - (1 - p)c(K - \gamma) \geq \frac{1}{2}A_{\alpha_1,1}(K) + (1 - p)\frac{1}{2}A_{\alpha_1,1}(K) + p(\alpha - c(K + \gamma)) \quad (15)$$

where $A_{\alpha_1,1}(K)$ is the cutoff for a firm with capital ratio K in period one. Only the manager on the boundary determines the cut-off condition, so substituting $A_{\alpha_1,1}(K)$ in for α ,

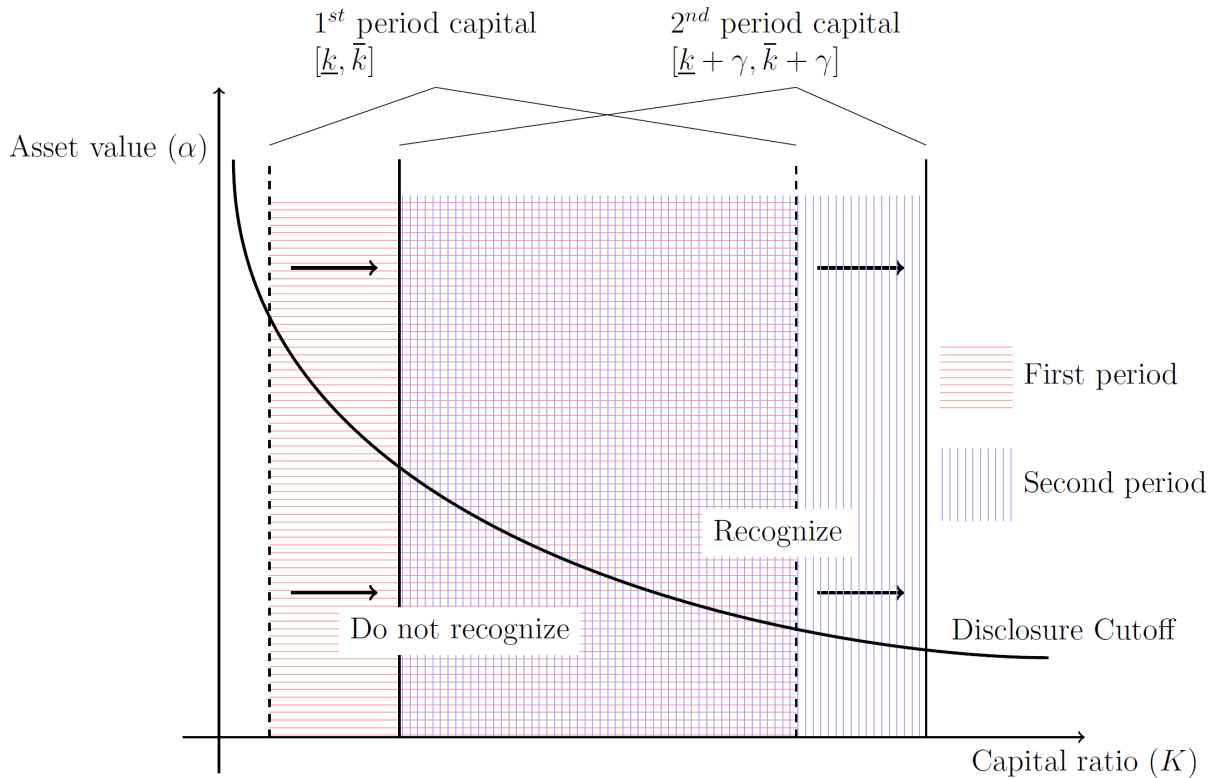
$$2A_{\alpha_1,1}(K) - c(K) - pc(K + \gamma) - (1 - p)c(K - \gamma) = A_{\alpha_1,1}(K) + \frac{1}{2}pA_{\alpha_1,1}(K) - pc(K + \gamma) \quad (16)$$

$$\implies (2 - p)A_{\alpha_1,1}(K) = 2(c(K) + (1 - p)c(K - \gamma)) \quad (17)$$

$$\implies A_{\alpha_1,1}(K) = \frac{2}{2 - p}[c(K) + (1 - p)c(K - \gamma)] \quad (18)$$

We therefore see that $A_{\alpha_1,1}(K) > A_{\alpha_1,2}(K)$, as needed, and given $c(K) \sim [0, C]$, $\gamma \in [0, \min(\underline{k}, 1 - \bar{k})]$, that $A_{\alpha_1,1}(K) \leq 1$, as required. \square

Figure 1: Fair Value Disclosure with Positive Capital Shock



This figure illustrates the two-period model we discuss in the subsection on Hypothesis 2. A bank in each of two periods faces the decision whether or not to recognize fair value for a new asset. The horizontal axis represents the Capital ratio of the bank, whereas the vertical axis represents the value of the asset. The downward-sloping line represents the cutoff for disclosure. Above the line, a bank will recognize an asset's fair value. Below the line, the bank will pool with all other banks with similar assets. In the first period, Capital ratio is lower, meaning that the affects of a higher capital ratio are greater (the curve is steeper). In the second period, a positive shock to capital means that banks face a flatter curve, and there is a lessened effect of the Capital ratio on the propensity to recognize the fair value of an asset.

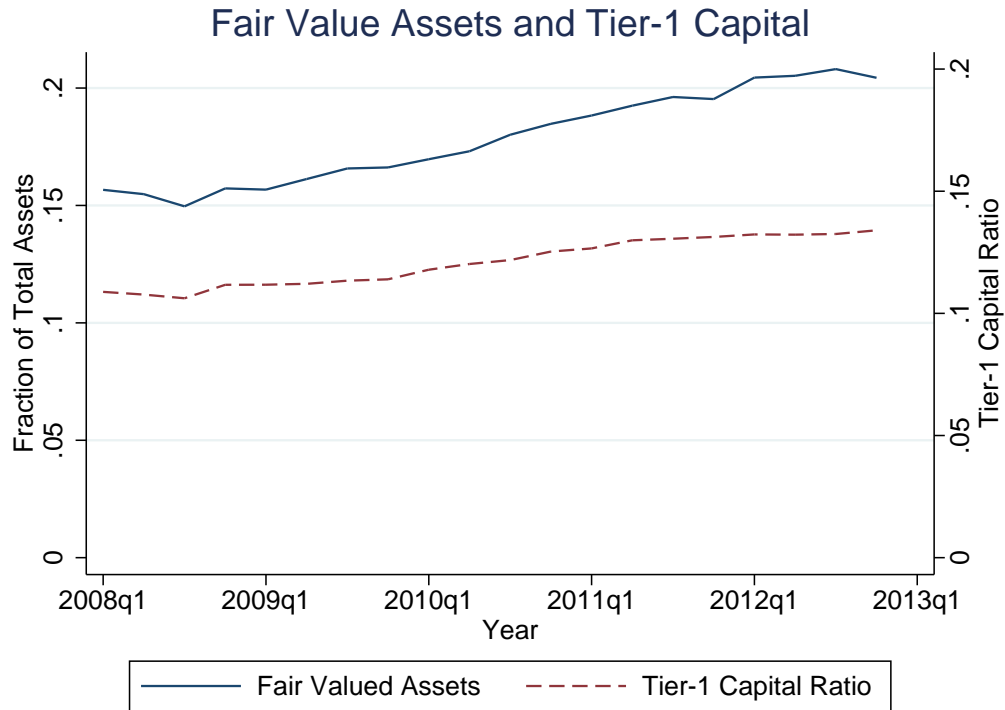


Figure 2: This figure illustrates the quarterly fraction of assets reported at fair value and Tier-1 capital ratio for banks from 2008-2012. We have 10,770 bank-quarter observations in our sample. Fraction of assets reported at fair value is the net assets reported at fair value divided by total assets on the balance sheet. Tier-1 capital ratio was implemented by Basel I as a measure of stability and is calculated as equity capital plus minority interests, less portion of perpetual preferred stock and goodwill, as a percentage of adjusted risk-weighted assets.

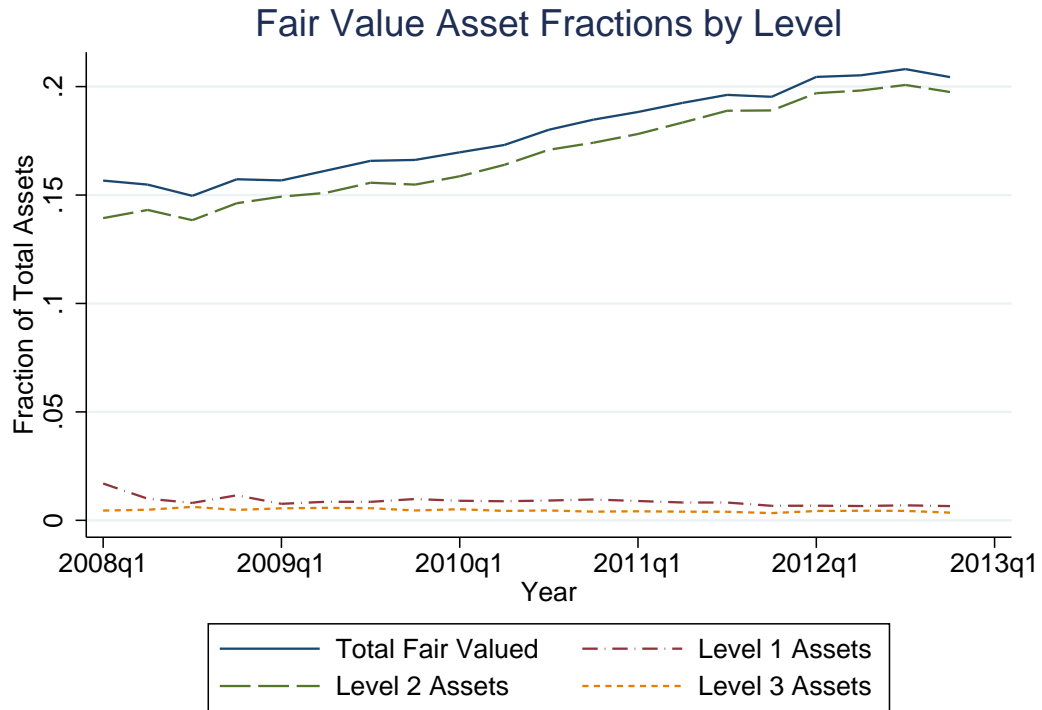


Figure 3: This figure illustrates the quarterly fraction of assets reported at fair value, and Levels 1, 2, and 3 assets for banks from 2008-2012. We have 10,770 bank-quarter observations in our sample. Fraction of assets reported at fair value is the net assets reported at fair value divided by total assets on the balance sheet. Level 1 assets are assets with quotable prices in active markets for identical assets. Level 2 assets use a valuation model with observable inputs. Level 3 assets use unobservable inputs for fair value measurement.

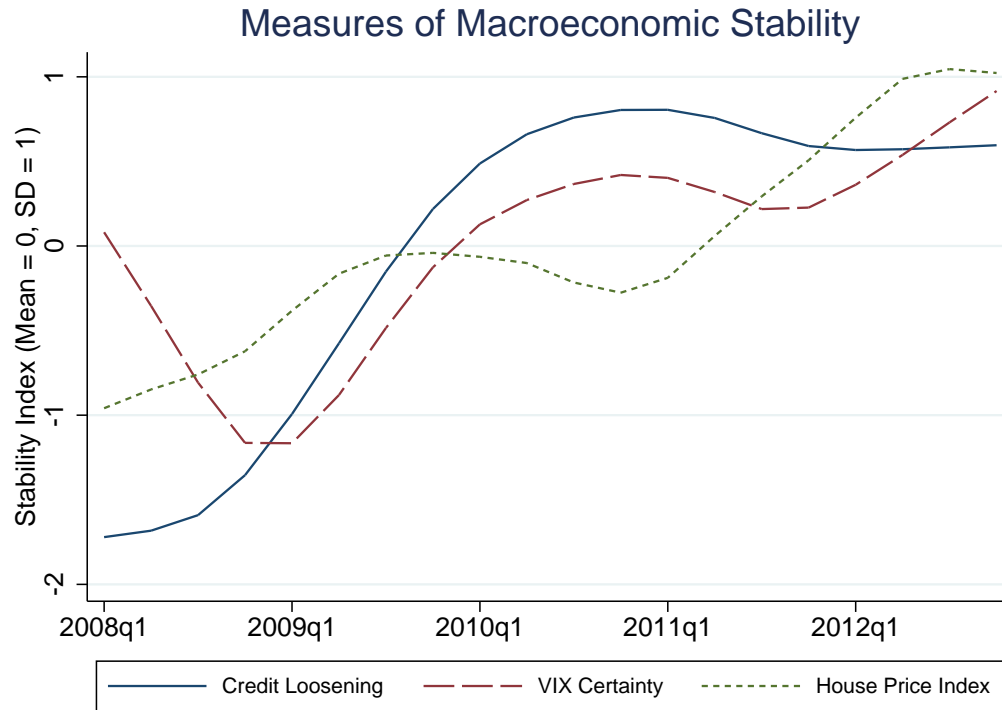


Figure 4: This figure illustrates quarterly data on three measures of macroeconomic stability from 2008-2012. Credit loosening is the negative of the net percentage of domestic senior loan officers tightening standards for commercial and industrial loans for medium and large borrowers. VIX certainty is the negative of the implied volatility of options trading on the Chicago Board Options Exchange. House Price Index comes from FHFA and is based on observed sales prices. All three measures are normalized to have mean zero and standard deviation one, and are smoothed using the Hodrick-Prescott filter to deal with seasonality.

Table 1: Summary Statistics for Quarterly 2008-2012

This table shows summary statistics using quarterly data for banks from Compustat Bank in our sample from 2008-2012. We report the fraction of assets reported at fair value, the fraction (non-netted) of assets at Level 1, 2, and 3, the Tier-1 capital ratio, ROA, Assets, Debt Ratio, Cash Ratio, Investing Cash Flow Ratio, and Merger Activity. We have data for 10,770 bank-quarter observations. Fraction Fair Value is the fraction of assets reported at fair value. Level 1, 2, and 3 Fractions are the fractions of Level 1, 2, and 3 assets, respectively, where Level 1 are marketable securities, Level 2 have market equivalents, and Level 3 have no market equivalents. Tier-1 Capital is shareholder's equity divided by risk-weighted assets. Total Assets, Earnings Divided by Assets, and Tobin's q are also reported. Debt Ratio is debt divided by total assets, Cash Ratio is cash divided by total assets, and Investing Cash Flow Ratio is cash flows from investing activities divided by total assets. Any Merger is 1 if there was merger activity for that bank in that particular quarter, and 0 otherwise.

Variable	N	Mean	SD	P25	Median	P75
Fraction Fair Value	10770	0.179	0.11	0.101	0.165	0.239
Level 1 Fraction	10767	0.009	0.029	0	0	0.003
Level 2 Fraction	10770	0.169	0.119	0.089	0.155	0.229
Level 3 Fraction	10762	0.005	0.016	0	0	0.002
Tier-1 Capital	10770	0.121	0.038	0.097	0.118	0.141
Total Assets (Billions)	10770	17.876	143.758	0.6	1.2	3.157
Return on Assets	10770	0	0.005	0	0.001	0.002
Tobin's q	10770	0.981	0.048	0.948	0.979	1.009
Debt Ratio	10770	0.119	0.079	0.06	0.106	0.164
Cash Ratio	10770	0.061	0.05	0.026	0.047	0.08
Investing CF Ratio	10770	-0.005	0.029	-0.021	-0.003	0.012
Any Merger	10770	0.09	0.285	0	0	0

Table 2: Summary Correlations for Quarterly 2008-2012

This table illustrates summary correlations using quarterly data for banks from Compustat Bank in our sample from 2008-2012. We have data for 10,770 bank-quarter observations. We look at fraction fair value, or the fraction of assets a bank reports at fair value. We also look at Tier-1 capital ratio, as required by Basel I. ROA is included as a measure of bank performance. Log total assets is the measure of size for banks, and the debt ratio measures leverage.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Fraction Fair Value	1.00								
(2) Tier-1 Capital	0.26	1.00							
(3) Log Total Assets	0.13	-0.06	1.00						
(4) Return on Assets	0.16	0.29	0.05	1.00					
(5) Tobin's q	0.13	0.03	0.16	0.21	1.00				
(6) Debt Ratio	0.09	-0.23	0.26	-0.04	0.06	1.00			
(7) Cash Ratio	-0.08	0.13	-0.04	-0.12	-0.05	-0.31	1.00		
(8) Investing CF Ratio	-0.12	-0.08	0.00	-0.16	-0.14	-0.01	0.16	1.00	
(9) Any Merger	0.01	0.04	0.27	0.07	0.07	-0.02	0.04	0.06	1.00

Table 3: Bank Choice of Fair Value

This table illustrates results for a regression of fraction fair value assets on Tier-1 capital ratio for banks from 2008-2012 using quarterly data and 10,770 bank-quarter observations. In specification (1), we regress fraction fair value on Tier-1 capital ratio and find a significant positive correlation. In specification (2) we add a control for variation over time, and find a statistically significant increase for banks in our sample. We employ controls in specification (3) to explore alternative explanations for the prevalence, variation, and increases over time in fraction fair value. We control for log assets, ROA, debt ratio, cash ratio, investing cash flow ratio, and merger activity. In specification (4), we use fixed effects to account for unobservable time-invariant bank characteristics. Tier-1 capital ratio is equity of a bank divided by the risk-weighted assets of that bank, as determined by Basel I. Log assets and ROA follow standard definitions. Debt ratio is long term debt and short term debt divided by total assets. Cash ratio is total cash divided by total assets. Investing cash flow ratio is the net cash flow for investing divided by total assets. Any merger is a dummy variable with value one if the bank engaged in merger activity.

	(1)	(2)	(3)	(4)
Tier-1 Capital	0.741*** (0.117)	0.662*** (0.125)	0.715*** (0.127)	0.179** (0.083)
Quarterly Trend		0.002*** (0.000)	0.004*** (0.000)	0.004*** (0.000)
Log Total Assets			0.007*** (0.003)	0.015 (0.016)
Return on Assets			0.338 (0.323)	0.021 (0.163)
Tobin's q			0.228*** (0.072)	0.051 (0.040)
Debt Ratio			0.215*** (0.063)	0.115** (0.045)
Cash Ratio			-0.156** (0.073)	-0.235*** (0.033)
Investing CF Ratio			-0.318*** (0.065)	-0.191*** (0.025)
Any Merger			-0.019** (0.008)	-0.012*** (0.003)
Fixed Effects	No	No	No	Yes
Adj. R-Squared	0.066	0.078	0.153	0.838
N	10,770	10,770	10,770	10,770

Table 4: Bank Choice of Fair Value Over Time

This table presents results for a regression of fraction fair value assets on Tier-1 capital ratio while taking into account the diminishing effect of Tier-1 capital ratio over time, for banks from 2008-2012 using quarterly data and 10,770 bank-quarter observations. In specification (1), we regress fraction fair value on Tier-1 capital ratio, an interaction between quarter and Tier-1 capital ratio, and a quarterly trend. We find that while effects for Tier-1 capital ratio and quarterly trend remain positive and statistically significant, that the effect of Tier-1 capital ratio is statistically significantly decreasing over time. We employ controls in specification (2) to explore alternative explanations for the prevalence, variation, and increases over time in fraction fair value. We control for log assets, ROA, debt ratio, cash ratio, investing cash flow ratio, and possible mergers. In specification (3), we use fixed effects account for unobservable time-invariant bank characteristics. Specification (4) adds year interactions for all controls. Tier-1 capital ratio is equity of a bank divided by the risk-weighted assets of that bank, as determined by Basel I. Log assets and ROA follow standard definitions. Debt ratio is long term debt and short term debt divided by total assets. Cash ratio is total cash divided by total assets. Investing cash flow ratio is the net cash flow for investing divided by total assets. Any merger is a dummy variable with value 1 if the bank engaged in merger activity.

	(1)	(2)	(3)	(4)
Tier-1 Capital	0.923*** (0.180)	1.115*** (0.179)	0.457*** (0.122)	0.539*** (0.134)
Quarter * Tier-1 Capital	-0.025** (0.012)	-0.037*** (0.012)	-0.025** (0.010)	-0.029*** (0.011)
Quarterly Trend	0.005*** (0.002)	0.008*** (0.002)	0.007*** (0.001)	0.019*** (0.005)
Log Total Assets		0.008*** (0.003)	0.019 (0.015)	0.028* (0.015)
Return on Assets		0.186 (0.322)	-0.003 (0.156)	0.656** (0.318)
Tobin's q		0.229*** (0.072)	0.065 (0.040)	0.143*** (0.050)
Debt Ratio		0.219*** (0.064)	0.133*** (0.044)	0.188*** (0.050)
Cash Ratio		-0.162** (0.073)	-0.246*** (0.032)	-0.309*** (0.071)
Investing CF Ratio		-0.322*** (0.065)	-0.194*** (0.025)	-0.155*** (0.053)
Any Merger		-0.019** (0.008)	-0.012*** (0.003)	0.020*** (0.007)
Fixed Effects	No	No	Yes	Yes
Time Interactions	No	No	No	Yes
Adj. R-Squared	0.080	0.158	0.840	0.844
N	10,770	10,770	10,770	10,770

Table 5: Robustness

This table illustrates results for various specifications regressing fraction fair value assets on Tier-1 capital ratio. Mean TIC reports the average effect of Tier-1 capital ratio on fair value assets while controlling for a quarterly trend, log assets, ROA, debt ratio, cash ratio, net investing cash flow ratio, and a dummy for mergers with fixed effect. Initial TIC and Quarter * TIC report the coefficients for Tier-1 capital ratio in 2008Q1 and the quarter-Tier-1 capital interaction, respectively in a regression with the same controls. (1) **Baseline** specification is as presented in Table 3, column 4, and Table 4, column 3. (2) Drop 2008, Q1 drops data from initial election in quarter 1 of 2008. (3) Drop 2008 drops all data from 2008, the initial election year. (4) Only level 2 and 3 assets uses level 2 and 3 assets only, divided by total assets. (5) Tobit restricts the model to positive values (avoiding the OLS bounding problem). (6) Drop top & bottom 1% growth drops bank-quarter observations in the top and bottom 1% of growth levels, avoiding excessive mergers. (7) Fair value adjustment subtracts the effect of changes in value on fair valued assets from the calculation of the fair value fraction. (8) Balanced panel—banks must be in sample for all 20 quarters. (9) Stability measure uses an average of three measures of stability—credit loosening, VIX certainty, and house price index—in place of the time trend and time interaction.

	Mean TIC	Initial TIC	Quarter * TIC
(1) Baseline N=10,770	0.179** (0.083)	0.457*** (0.122)	-0.025** (0.010)
(2) Drop 2008Q1 N=10,297	0.173** (0.085)	0.477*** (0.130)	-0.026** (0.010)
(3) Drop 2008 N=8,761	0.153* (0.088)	0.493*** (0.157)	-0.026** (0.012)
(4) Only level 2 and 3 assets N=10,770	0.146* (0.085)	0.428*** (0.120)	-0.025** (0.010)
(5) Tobit N=10,770	0.177** (0.081)	0.456*** (0.117)	-0.025** (0.010)
(6) Drop top & bottom 1% growth N=10,576	0.141 (0.088)	0.422*** (0.122)	-0.025** (0.010)
(7) Fair value adjustment N=10,770	0.180** (0.083)	0.457*** (0.122)	-0.025** (0.010)
(8) Balanced panel N=6,500	0.271** (0.114)	0.497*** (0.164)	-0.020 (0.014)
(9) Stability measure N=10,770	0.281*** (0.083)	0.387*** (0.093)	-0.018** (0.009)