

Does Fair Value Accounting Contribute to Systemic Risk in the Banking Industry?

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Abstract: Critics have blamed fair value accounting for amplifying the subprime crisis and for causing a financial meltdown. It has been alleged that fair value accounting has created a vicious circle of falling prices, thereby increasing the overall risk in the financial system. In this paper, I investigate whether fair value accounting is associated with an increase in the risk of failure of the banking system as a whole. I find that the extent of fair value reporting is associated with an increase in contagion among banks. The increase in bank contagion is most severe during periods of market illiquidity. Further, my cross-sectional analyses suggest that increased bank contagion associated with fair value accounting is more likely to spread to banks that are poorly capitalized or have a relatively higher proportion of fair value assets and liabilities.

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1. INTRODUCTION

The Financial Accounting Standards Board (FASB) states that its long-term measurement objective of accounting for financial instruments is to use fair value to measure and report financial instruments (see Statement of Financial Accounting Standard (SFAS) No. 159). However, several parties have blamed fair value accounting for amplifying and extending the subprime crisis and the credit crunch that followed, which is considered by many the worst economic crisis in the United States since the Great Depression (Ryan 2008a).

The critics of fair value accounting, who include politicians, policymakers, auditors, and industry professionals, argue that fair value accounting has created a vicious circle of falling prices and led to a financial meltdown (Hughes and Tett 2008; Johnson 2008; and Rummell 2008). Speaking at a SEC panel on mark-to-market accounting and the market turmoil following the subprime crisis, William Isaac, Federal Deposit Insurance Corporation (FDIC) chairman from 1978 to 1985, blamed mark-to-market accounting for causing the financial meltdown that followed the subprime crisis (Katz, 2008).¹ Also, two recent analytical papers, Cifuentes, Ferrucci, and Shin (2005) and Plantin, Shin, and Sapra (2008), show that mark-to-market accounting has the potential of exacerbating contagion (i.e., the spread of market shocks – especially, on the downside – a process observed through co-movements in stock prices) among banks, thereby increasing the systemic risk in the banking industry. Systemic risk is the risk or probability of breakdowns in an entire system, as opposed to breakdowns in individual parts or components (Kaufman and Scott 2000).

¹ In this paper, I use the terms mark-to-market accounting and fair value accounting interchangeably.

In this paper, I test whether fair value accounting is associated with an increase in systemic risk in the network of banks. I also investigate whether the association between fair value accounting and an increase in systemic risk is greater during periods of market illiquidity. I further examine whether banks that are poorly capitalized or have relatively more fair value assets and liabilities are more likely to be affected by the increase in systemic risk associated with fair value accounting.

Fair value accounting uses market prices and other market inputs to value assets and liabilities. Under a fair value-oriented accounting regime, concerns about compliance with externally imposed solvency ratios (e.g., minimum regulatory capital requirements for banks) can force a firm to sell its assets following an event that reduces the market value of its assets.² If the market's ability to absorb excess supply shocks is less than perfect, which is likely to be the case for markets during periods of financial distress, such forced disposals will result in a short-run decrease in market prices. Under a fair value-oriented accounting regime when assets are marked down to the new lower price, a firm may be forced to sell even more assets to avoid violating regulatory solvency constraints.³ Additional disposals of assets can further depress prices, creating a feedback loop of falling prices and increasing the threat of systemic failure of the financial system (Cifuentes et al. 2005).

² In this paper, a 'fair value-oriented accounting regime' refers to a financial reporting regime in which FASB requires financial institutions to account for their assets and liabilities using fair value. The extent to which the accounting regime is fair value-oriented varies over time. The variation is jointly due to changes in FASB rules regarding accounting for assets and liabilities using fair value, and changes in financial institutions' holdings of assets and liabilities that need to be accounted for using fair value. A more fair value-oriented accounting regime would be one in which a greater proportion of assets and liabilities are reported using fair value.

³ Banks are required to maintain a minimum ratio of total capital to risk-weighted total assets. When a bank finds itself potentially violating the regulatory capital requirements, it can sell risky assets for less risky assets (e.g., cash is considered riskless and is therefore given a zero weight in estimating risk-weighted total assets) to reduce its risk-weighted total assets and thereby reduce the amount of minimum capital that it needs to maintain as a proportion of its risk-weighted asset base.

A large proportion of banks' assets do not trade in deep and competitive markets. Following an event that depresses the price of an asset (perhaps more than justified by the underlying fundamentals), sales of assets not traded in deep and competitive markets can exert negative price pressure. Therefore, asset sales by other firms exert a negative externality on firms that have decided to not sell their assets, the negative externality being a further fall in asset prices and larger reported unrealized losses by firms that have decided not to sell their assets. Short-sighted firms (i.e., firms with managers whose tenure is shorter than the life of its assets) have an incentive to reduce the reported loss by preempting sales by others and attempting to sell their asset before other firms. However, such preemptive action further amplifies the price fall and can lead to additional asset sales. These strategic concerns under a fair value-oriented accounting regime can lead to "procyclical" trades (i.e., selling assets when prices are falling and buying assets when prices are rising) that amplify the price fall in declining markets and thus have the potential of increasing systemic risk in the financial system (Plantin et al. 2008).⁴ Accordingly, I first investigate whether fair value accounting is associated with an increase in systemic risk in the banking industry.

Plantin et al. (2008) argues that under a fair value accounting regime, the incentive to preempt sales by other firms is greater during periods of market illiquidity because sales have a greater impact on short-run price when markets are illiquid. Thus, strategic concerns which can lead to procyclical trades and an increase in overall risk in the financial system are heightened during periods of market illiquidity. Therefore, I next examine whether the association between a more fair value-oriented accounting regime

⁴ Similarly, it can be argued that in good states of the world fair value accounting could be associated with market bubbles. However, I do not investigate the relationship between a fair value accounting regime and market bubbles as it is beyond the scope of this paper.

and increase in systemic risk in the bank industry is greater during periods of market illiquidity.

Finally, I investigate whether in the cross-section banks with certain characteristics are more likely to be affected by the increase in systemic risk associated with a more fair value-oriented accounting regime. More specifically, I examine whether the increase in systemic risk associated with a more fair value-oriented accounting regime is more likely to affect banks with : (i) a larger proportion of assets and liabilities reported at fair value (i.e., the extent to which a bank is fair value oriented) and, (ii) lower levels of regulatory capital.

First, a bank that reports a relatively larger proportion of its assets and liabilities using fair value is likely to face more pressure to sell its assets in a declining market to preempt sales by others or to avoid violating externally imposed capital adequacy ratios because a fall in asset prices will have a larger effect on the carrying value of its assets and liabilities. So, I predict that a more fair value-oriented bank is more likely to be affected by the increase in systemic risk associated with fair value accounting.

Second, a bank that is poorly-capitalized and has less ability to absorb losses from a fall in the value of assets without resulting in violation of capital adequacy ratios is more likely to dispose its assets in a fire-sale. Therefore, I predict that the increase in systemic risk associated with fair value accounting is more likely to affect banks that are poorly capitalized.

At the heart of the concept of systemic risk in banking is the notion of contagion among banks. De Bandt and Hartmann (2000) review the systemic risk literature and note that bank contagion risk may be viewed as the classical case of systemic risk. It further states that testing for bank contagion amounts to testing whether “bad news” or the

failure of a specific bank (or group of banks) adversely affects the health of other banks. Therefore, to examine whether fair value accounting is associated with an increase in systemic risk, I empirically investigate the association between fair value accounting and bank contagion.

Using a sample that essentially includes all bank holding companies; I estimate logit regressions to test whether a more fair value-oriented accounting regime is associated with increase in contagion among banks. Following the approach in Eichengreen, Rose, and Wyplosz (1996), Bae, Karolyi, and Stulz (2003), and Boyson, Stahel, and Stulz (2008) to estimate contagion, I use logit regressions to estimate whether the probability that more banks experience extreme negative stock returns when money center banks are performing poorly is higher under a more fair value-oriented accounting regime.⁵ To proxy for the extent to which the accounting regime is fair value-oriented at a certain point in time, I estimate the ratio of the sum of assets and liabilities (held-to-maturity securities, available-for-sale securities, trading assets, mortgage servicing rights, other financial assets, derivative contracts, trading liabilities, other financial liabilities and servicing liabilities) recognized or disclosed using fair value by all the banks in my sample to the sum of total assets for these banks. The higher this ratio, the more fair value-oriented is the accounting regime.

The results on my first research question indicate that a more fair value-oriented accounting regime is associated with an increase in bank contagion above and beyond the contagion that exists due to trade and financial linkages in the banking industry, i.e., the probability that more banks experience extreme negative returns when the money center

⁵ The largest banks holding key positions in the interbank network are referred to as money center banks. Money center banks are generally considered “too-big-to-fail” by the central banks as they are crucial for the stability of the banking system.

banks are performing poorly is higher under a more fair value-oriented accounting regime. To investigate my second research question on whether a more fair value-oriented accounting regime is associated with a greater increase in bank contagion during periods of illiquidity, I classify the sample months into periods of liquidity and illiquidity using the modified liquidity measure of Amihud (2002) (see section 4.2 for more details about the proxy for monthly market-wide illiquidity). I find that fair value accounting is associated with an increase in bank contagion only during periods of market illiquidity.

The cross-sectional analyses suggest that a bank's capital level and the proportion of a bank's assets and liabilities reported using fair value affect the spread of increased bank contagion. The results of the cross-sectional tests indicate that the increased bank contagion associated with fair value accounting is more likely to spread to banks that have lower capital adequacy ratios or are more fair value-oriented.

I carefully construct my tests to investigate whether a more fair value-oriented accounting regime is associated with an increase in contagion in the banking industry; beyond the contagion that exists due to trade or financial linkages between banks. However, because of the nature of my first two research questions, these tests are time-series tests. Thus, a potential concern could be that the documented results on the first two research questions are due to the omission of a variable that is correlated with the extent to which the accounting regime is fair value oriented over time. While it is interesting to investigate which banks in the cross-section are more likely to be affected by the increased contagion under a more fair value-oriented accounting regime, another motivation for the cross-sectional analysis is to triangulate the findings from my time-series tests. Since it is unlikely that the results in the cross-sectional analysis are due to an omitted variable that is correlated with the extent of fair value used in financial reporting

over time, I am able to address the concern that results of my time-series tests are due to an omitted correlated variable by providing additional evidence on the relationship between bank contagion and fair value accounting in the cross-section. Further, as a robustness check I run a placebo test replacing the equally-weighted index of money center banks with an equally-weighted index of small- and medium-sized banks to ensure that my finds are not a consequence of a mechanical effect in the data or an omitted correlated variable.

I believe this is the first paper to provide empirical evidence of the impact of fair value accounting on systemic risk in the banking industry. In summary, I find that fair value accounting is associated with an increase in bank contagion. My cross-sectional analyses suggest that the spread of bank contagion associated with fair value accounting depends on bank characteristics. The results of this study can have important policy implications. The Emergency Economic Stabilization Act of 2008 gave the SEC the power to suspend mark-to-market accounting because several parties have blamed fair value accounting for exacerbating the credit crunch that has followed the Subprime crisis. The evidence presented in this paper can help the SEC and the standard setters analyze the impact of fair value accounting on systemic risk in banks and thereby help them in determining the costs and benefits of a fair value-based accounting regime for banks.

Section 2 briefly discusses the benefits and costs of fair value accounting. I develop my hypotheses in Section 3. Section 4 describes my research design and variable measurement. The data source and sample period are discussed in Section 5. Section 6 presents the results of the empirical tests. Section 7 investigates whether the spread of bank contagion is a function of bank-specific characteristics. In section 8 I perform robustness tests. Finally, I conclude in Section 9.

2. COSTS AND BENEFITS OF FAIR VALUE ACCOUNTING FOR FINANCIAL INSTRUMENTS

SFAS No. 157, *Fair value measurements*, 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.” A report prepared by the Office of the Chief Accountant of the SEC for the Congressional committee (SEC 2005) states two primary benefits of using fair value estimates of financial instruments in financial reporting. First, using fair value would mitigate accounting-motivated transactions designed to manage earnings under the current “mixed attribute” – part historical cost, part fair value – accounting model, i.e., there will no longer be an opportunity to engage in “gains trading.” Gains trading refers to the practice of selling appreciated securities to recognize gains while securities with unrealized losses are held to avoid recognizing those losses (see SFAS No. 115). Second, financial statements prepared using fair value accounting would be less complex relative to the ones currently prepared under the mixed attribute model. For example, Landsman (2006) notes that with all financial instruments measured at fair value, the hedge accounting model employed by SFAS No. 133 would be eliminated. Investors would no longer need to study the choices made by management to determine what basis of accounting is used for particular instruments as well as the firm would no longer need to maintain records of the hedging relationships.

The SEC report (SEC 2005) notes that there are costs associated with the move towards a fair value-based accounting regime. The key issue is whether fair value can be measured reliably for financial instruments which are not traded in competitive and liquid markets, e.g., specialized receivables or non-standardized loans. The reliability cost of fair value estimates is compounded by the problem that in the absence of active markets

for a particular financial instrument, management must estimate its fair value, which can be subject to discretion or manipulation (Landsman 2006). In the wake of the Subprime crisis, critics have argued that another cost associated with a fair value-oriented accounting regime is that it can create contagion, a vicious circle of falling prices, and increase the risk of failure of the financial system as a whole.

3. RELATED LITERATURE AND HYPOTHESES DEVELOPMENT

3.1. Fair value accounting and systemic risk

In an analytical framework, Cifuentes, Ferrucci, and Shin (2005) examine the consequences of marking-to-market of financial institutions' balance sheets when there are externally imposed regulatory solvency requirements. They argue that a shock that depresses the market value of assets carried on the balance sheets of financial institutions can lead to forced disposal of assets to avoid violation of solvency ratios. If the ability of the market to absorb such sales is less than perfect, which can be the case in a macro-economic crisis, forced disposals can lead to a further short-run fall in market prices. Under a mark-to-market accounting regime when assets are marked down to the new lower prices, a firm can be forced to dispose of more assets to avoid violating externally imposed prudential solvency constraints. Additional disposal of assets can further depress prices and can create a vicious circle of falling prices and additional asset disposals. The authors conclude that the combination of mark-to-market accounting and externally imposed solvency constraints can lead to a downward spiral in asset prices and become an important source of systemic risk in the financial system.

The findings of Cifuentes et al. (2005) can hold even in the absence of externally imposed solvency requirements if banks have internal risk-control mechanisms in place that cause them to sell assets whose prices have fallen. Using data from U.S. Flow of

Funds account, Adrian and Shin (2007) find that commercial banks in the U.S. seem to target a fixed leverage ratio. This implies that when assets of banks are marked to market, a shock that reduces the market price of assets can lead to sale of assets by a bank adjusting its leverage back to the target ratio.

Plantin, Sapra, and Shin (2008) use an analytical model to analyze the impact of a “pure” historical cost-based accounting regime versus a fair value-based accounting regime on the behavior of a bank manager who seeks to maximize accounting earnings.^{6,7} In order to maximize the expected earnings of the bank, the manager has to decide whether to securitize a given loan portfolio before the bank’s earnings is reported or to hold the portfolio in the bank’s balance sheet. If the manager decides to hold the loan portfolio, the reported value of the loan portfolio is measured in accordance with the prevailing accounting standard. The authors analyze the impact of a historical cost-based accounting regime versus a fair value-based accounting regime on the bank manager’s decision to hold the loan portfolio in the balance sheet. Plantin et al. (2008) show that there are tradeoffs in moving from a historical cost-based accounting regime to one that is based on fair values; however the tradeoffs are far from one-sided.

Under a historical cost-based accounting regime, a short-sighted bank manager (i.e., a manager whose tenure is shorter than the lives of the bank assets) seeking to maximize reported earnings finds it optimal to sell assets that have appreciated in value to book the gain on sale. The opposite happens when assets have declined in value. A short-sighted bank manager is likely to hold on to assets that have recently declined in value to

⁶ In their model, there is no option of recording impairments under a historical cost-based accounting regime. Thus, they refer to it as a “pure” historical cost based accounting regime.

⁷ The authors provide two reasons to support their assumption that managers of banks seek to maximize accounting earnings. First, accounting earnings are a basis for managerial compensation. Second, accounting numbers are used in the calculation of regulatory capital ratios.

avoid recognizing the loss on sales hoping that fortunes would reverse and the recognition of the loss on sale can be avoided. Thus, historical cost accounting is insensitive to recent price changes and can lead to countercyclical trades (i.e., selling assets when prices are rising and not selling assets when prices are falling) which reduce the volatility in prices.

Fair value accounting overcomes the insensitivity of historical cost-based accounting to recent price changes by marking assets to market prices. However, fair value accounting can induce additional price volatility that offsets the advantage of fair value accounting being more timely and sensitive to recent price changes. Plantin et al. (2008) argue that a large proportion of banks' assets do not trade in deep and frictionless competitive markets (e.g., asset backed securities are traded in over-the-counter markets). Such markets display time varying risk premia that depends on supply shocks and transaction prices often jump after large supply shocks. Following a bad outcome for the asset, i.e., when the market price of the asset is depressed more than is justified by fundamentals, selling of the temporarily depressed asset in markets that are not deep and competitive exerts negative price pressure.⁸ When others sell, there is a negative effect on all others, but especially on those who have chosen not to sell the asset. Anticipating this negative outcome, a short-sighted bank manager is tempted to preempt sales by others by selling the asset itself, but such preemptive action further amplifies the price fall. Plantin et al. (2008) conclude that strategic concerns under fair value accounting can lead to procyclical trades (i.e., selling assets when prices are falling and buying assets when

⁸ One may wonder why arbitrageurs' are not buying assets and bidding the price back up when prices are lower than justified by fundamentals? However, unlike textbook arbitrageurs who instantly trade when prices deviate from fundamental values, real world arbitrageurs must overcome various frictions to take advantage of depressed prices. Consistent with this notion, Mitchell, Pedersen, and Pulvino (2007) show that market frictions are of first importance and document what appear to be major and persistent price deviations from fundamental values.

prices are rising) that amplify the price fall and volatility in prices that has the potential of increasing the overall risk, or the systemic risk, in the financial system.

In the real world, banks are required to use a mix of historical cost and fair value to report their assets and liabilities, i.e., banks report under a mixed-attribute accounting model. Therefore, it can be questioned whether the findings of the Plantin et al.'s (2008) stylized model can be generalized to the real world where banks report under a mixed-attribute accounting model. Fair value accounting can lead to an increase in systemic risk in the financial system even under a mixed-attribute accounting model as long as procyclical trades happen. Using data from the U.S. Flow of Funds accounts, Adrian and Shin (2007) find that the leverage of financial institutions is strongly procyclical. They document evidence that financial institutions adjust their balance sheets actively in a manner such that leverage is high during booms and low during busts. Therefore, as the accounting regime becomes more fair value-oriented, i.e., a greater proportion of assets and liabilities are accounted for using fair value, strategic concerns that lead to procyclical trades are greater and procyclical trades can increase the overall risk in the banking system. Accordingly, I hypothesize:

H1: A more fair value-oriented accounting regime is associated with an increase in systemic risk in the banking system.

3.2. Impact of market illiquidity on the association between fair value accounting and systemic risk

One implication of Plantin et al.'s (2008) model is that as the markets become more illiquid, fair value accounting becomes more inefficient than historical cost-based accounting, i.e., strategic concerns under a mark-to-market regime that can lead to procyclical trades are enhanced when markets are illiquid. The reason being during

periods of market illiquidity, the sale of assets by other firms has a greater impact on short-run price than sales during periods of liquidity (Amihud, 2002). Under a fair value-oriented accounting regime, which requires assets to be marked to the market prices, the incentive to preempt the fall in asset prices due to sales by other firms is greater during periods of market illiquidity because the price impact of sales by other firms is greater in an illiquid market. Or in other words, strategic concerns which lead to procyclical trades and an increase in overall risk in the financial system under a fair value-oriented accounting regime are greater when markets are relatively illiquid. Therefore, relative to periods of greater market liquidity, fair value accounting is associated with a greater increase in systemic risk in the banking system during periods of market illiquidity.

Accordingly I hypothesize:

H2: A more fair value-oriented accounting regime is associated with a greater increase in systemic risk in the banking system during periods of market illiquidity.

3.3. A fair value-oriented accounting regime versus a historical cost-based regime with impairments

Plantin et al. (2008) assume a historical cost-based accounting regime with no option of recording impairment in the reported value of assets. In the real world, historical cost accounting is usually not applied in a “pure” fashion; assets accounted for at historical costs are subject to impairment write-downs. Thus, it can be argued that during times when assets have decreased in value, a historical cost-based accounting regime with impairments is similar to a fair value-oriented accounting regime because under both the regimes the firm will have to report their assets at the new lower value. So, even under a historical cost-based regime with impairments firms may be faced with

strategic concerns that can lead to procyclical trades and an increase in systemic risk in the banking system. However, this is unlikely to be the case.

Firms are only required to record other-than-temporary-impairments to financial instruments reported at historical cost and firms have considerable discretion in recording such other-than-temporary-impairments. SFAS No. 144, *Accounting for the impairment or disposal of long-lived assets*, establishes the accounting and reporting for impairments in the value of long-lived assets. Financial instruments, including investments in equity securities accounted for under the cost or equity method, are excluded from the scope of this standard.⁹ Impairment of credit loans is prescribed by SFAS No. 114, *Accounting by creditors for impairment of loans*. This standard was issued in May 1993 and requires that impaired loans be measured based on “the present value of expected cash flows discounted at the loan’s effective interest rate” or “at the loan’s observable market price or the fair value of the collateral if the loan is collateral dependent.” However, SFAS No. 114 does not specify how a creditor should determine that a loan has been impaired. A loan is not considered impaired if the creditor expects to collect all amounts, including interest accrued at the contractual interest rate in case of delay in repayment. Similarly, SFAS No. 115, *Accounting for certain investments in debt and equity securities*, prescribes that impairment write-downs may only be recorded if the impairments are “other than temporary.” Certain economic liabilities accounted for using historical cost (e.g., most loan commitments) are subject to judgmental accruals of probable and reasonably estimable losses under SFAS No. 5, *Accounting for Contingencies*.

⁹ SFAS No. 121, *Accounting for the impairment of long-lived assets and for long-lived assets to be disposed of* (issued in March, 1995), originally established accounting and reporting for impairment of long-lived assets. SFAS No. 144, issued in August, 2001, has superseded SFAS No. 121. SFAS No. 121 did not apply to financial instruments either.

In summary, under historical cost, a lot is left to managerial judgment and the management's bargaining power with the auditor to avoid recording impairments. Consistent with this notion, Ramanna and Watts (2008) report that 71% of their sample firms delay goodwill impairment and managerial discretion in reporting impairments is used opportunistically to manage financial statements. The U.S. savings and loan (S&L) crisis is also a case in point. The crisis partly stemmed from the fact that the variable interest rate on the deposit liabilities rose above the fixed interest rates earned on the mortgage assets. Historical cost accounting masked the problem by allowing it only to show up gradually through negative annual net interest income as the financial institutions did not record impairment write-downs on the mortgage assets.

Firms arguably have less discretion on marking assets to a lower price under a fair value-oriented accounting regime even though the decrease in price might be temporary, unless it can be determined that the market for the assets is disorderly and the transaction is distressed. It was only on April 9, 2009, that FASB issued FASB Staff Position No. 157-4, *Determining fair value when the volume and level of activity for the asset or liability have significantly decreased and identifying transactions that are not orderly*, providing additional guidance for estimating fair value in accordance with SFAS No. 157 in disorderly markets because it observed that firms were using the last transaction price (or quoted price) as the sole or primary basis of fair value, even though significant adjustment to the transaction price might have been required as the price could be from a distressed transaction or disorderly markets. Thus, until very recently, management did not have much discretion to not mark their assets to a new lower price under a fair value-oriented accounting regime. Therefore, when prices of assets are temporarily depressed, firms are required to report the assets at the new depressed price only under a fair value-

oriented accounting regime and not under a historical-cost based regime. Hence, strategic concerns that can lead to procyclical trades and increase the overall risk of the banking sector are unlikely to arise under a historical cost-based accounting regime that includes the option of recording other than temporary impairments.

4. RESEARCH DESIGN AND VARIABLE MEASUREMENT

4.1. Test of the association between fair value accounting and bank contagion

Kaufman and Scott (2000) define systemic risk as “the risk or probability of breakdowns in an entire system, as opposed to breakdowns in individual parts or components.” At the heart of the concept of systemic risk is the notion of bank contagion. De Bandt and Hartmann (2000) refer to bank contagion as the classical case of systemic risk. Accordingly, to examine whether fair value accounting is associated with an increase in systemic risk, I empirically investigate the association between fair value accounting and bank contagion. Contagion refers to the spread of market shocks (mostly, on the downside), a process observed through co-movements in stock prices (Dornbusch et al. 2001, Karolyi 2003).

Following the approach in Eichengreen, Rose, and Wyplosz (1996), Bae, Karolyi, and Stulz (2003), and Boyson, Stahel, and Stulz (2008) to estimate contagion, I use logit regressions to test whether fair value accounting is associated with an increase in contagion among banks. More specifically, I investigate how the probability of an extreme negative return for a bank is related to the occurrence of an extreme negative return on an index of money center banks, and whether this relationship has changed as the financial reporting regime has become more fair value oriented. I estimate the following logit model:

$$EXTREMENEG_{i,t} = \beta_1 + \beta_2 D_BANKRET_t + \beta_3 FV_ALL_t + \beta_4 D_BANKRET_t * FV_ALL_t + \beta_5 MKTRET_t + \beta_6 TBILL_t + Fixed\text{-}Year\ Effects + Fixed\text{-}Firm\ Effects + error_{i,t} \quad (1)$$

The dependent variable, $EXTREMENEG_{i,t}$, is set to one if bank i 's return for month t is in the bottom 10% of the entire time-series of monthly returns of bank i , and zero otherwise. Following Boyson, Stahel, and Stulz (2008), I use a lower 10% cutoff of the entire time-series distribution of returns to identify firm-specific “extreme” negative returns.

$D_BANKRET$ is a proxy for financial difficulties in the banking system. The largest banks holding key positions in the interbank network are referred to as money center banks. Since the failure of a money center bank can have serious negative consequences for the rest of the financial system participants, many money center banks are considered too-big-to-fail by the central banks and are crucial for the stability of the banking system. Therefore, to proxy for financial difficulties in the banking system I estimate the returns on an equally-weighted index of money center banks in the U.S. $D_BANKRET$ is an indicator variable that equals one when the monthly return on the equally-weighted index of money center banks is in the bottom quartile of the entire time-series of returns for this index, and zero otherwise.¹⁰ Appendix 1 lists the seventeen money center banks included in the equally-weighted index. The coefficient on $D_BANKRET$, β_2 , is an estimate of the probability of how financial difficulties at the money center banks are related to the realization of an extreme negative return by other banks in the system. A positive and statistically significant β_2 indicates contagion within

¹⁰ I use a cutoff of returns in the lowest quartile to define $D_BANKRET$ (versus a cutoff of lowest decile to code $EXTREMENEG$) to allow for variation in the dependent variable, $EXTREMENEG$.

banks that exists due to the nature of the banking industry, i.e., because of the trade and financial linkages between banks.

FV_ALL measures the extent to which the accounting regime is fair value oriented. FV_ALL is the ratio of the sum of assets and liabilities (held-to-maturity securities, available-for-sale securities, trading assets, mortgage servicing rights, other financial assets, derivative contracts, trading liabilities, other financial liabilities and servicing liabilities) recognized or disclosed at fair value by the banks in my sample to the sum of total assets of these banks.¹¹

Generally, only the fair value amounts that are recognized in income and retained earnings in accordance with U.S. GAAP are included in the calculation of regulatory capital. For example, available-for-sale securities are reported at fair value on banks' balance sheet with the changes in fair value reported in other comprehensive income. The changes in fair values reported in other comprehensive income are generally excluded from regulatory capital ratios. I include disclosed fair value amounts along with recognized fair value amounts in the estimation of FV_ALL for two reasons. First, banks use fair value of assets and liabilities that are only disclosed, and not necessarily recognized, under financial reporting rules in internal risk management (e.g., banks may use disclosed fair value amounts in their value-at-risk models). And, Cifuentes et al. (2005) shows that fair values used in internal risk management models can interact with changes in market conditions to increase bank contagion. Second, disclosed fair value amounts may be used as inputs in managerial compensation contracts. Use of disclosed fair value amounts, even though they are only disclosed and not recognized under U.S.

¹¹ Nissim and Penman (2007) adopt a similar approach to examine the application of fair value accounting in the banking industry. They estimate the proportion of assets and liabilities that are recognized at or close to fair value on the balance sheet, have related unrealized gains and losses in income, or have fair values disclosed in footnotes to document the extent to which bank balance sheets are fair value oriented.

GAAP, in compensation contracts can create incentives for managers to make procyclical trades that have the potential of increasing bank contagion (Plantin et al. 2008).

Under a pure historical cost-based accounting regime, FV_ALL is zero as no assets or liabilities are recognized or disclosed at fair value. As the use of fair value to report bank assets and liabilities increases, the proportion of assets and liabilities recognized and disclosed at fair value will increase and FV_ALL will be greater than zero. Thus, higher values of FV_ALL proxy for a more fair value-oriented accounting regime. Since, the dependent variable, EXTREMENEG, is measured on a monthly frequency but banks are required to file the FR Y-9C report on a quarterly basis, I use the most recently filed FR Y-9C data to calculate FV_ALL for each month.

To control for macro-economic factors, I include MKTRET and TBILL as control variables. MKTRET is the monthly CRSP equally-weighted market return and TBILL is the monthly 3-month Treasury bill rate. For instance, when the markets are doing well, the ratio of assets and liabilities marked-to-market to total assets (i.e., FV_ALL) is higher by the virtue of its construction. Therefore, I include MKTRET in the regression to control for the influence of changes in market conditions on the relationship between bank contagion and the extent to which the reporting regime is fair value-oriented.

De Bandt and Hartman (2000) finds that over time banks have become more involved in financial trading activities as opposed to traditional lending. To control for changes in bank contagion due to operational and structural changes in the banking sector over time I include fixed-year effects. I do not include fixed-quarter or fixed-month effects in my model because it is unlikely that financial innovations or structural changes are happening on a quarterly or monthly frequency. It is more plausible that innovations and structural changes take place over relatively longer intervals of time. Further, to

control for the effect of omitted bank-specific characteristics on the relationship between bank contagion and fair value reporting, I include fixed-bank effects in my model.

In interpreting my results, a positive and significant coefficient on D_BANKRET, β_2 , is evidence of contagion among banks that exists due to trade or financial linkages in the banking industry. A positive and statistically significant coefficient on the interaction of FV_ALL and D_BANKRET, β_4 , would be evidence of a positive association between a more fair value-oriented accounting regime and increase in bank contagion. H1 predicts a positive and significant β_4 . Thus, my approach is carefully constructed to test for increase in contagion above and beyond contagion that exists among banks due to trade or financial linkages as the reporting regime becomes more fair value oriented.

4.2. Test of the impact of market illiquidity on the association between bank contagion and fair value accounting

To examine whether a more fair value-oriented accounting regime is associated with a greater increase in bank contagion during periods of market illiquidity, I expand model (1) to include proxies for market illiquidity:

$$\begin{aligned} EXTREMENEG_{i,t} = & \beta_1 + \beta_2 D_BANKRET_t + \beta_3 FV_ALL_t + \\ & \beta_4 D_BANKRET_t * FV_ALL_t + \beta_5 D_ILLIQ_t + \beta_6 D_BANKRET_t * D_ILLIQ_t * FV_ALL_t + \\ & \beta_7 MKTRET_t + \beta_8 TBILL_t + Fixed-Year\ Effects + Fixed-Firm\ Effects + error_{i,t} \end{aligned} \quad (2)$$

D_ILLIQ is a proxy for periods of market illiquidity. It is an indicator variable that equals one when market illiquidity is in the top quartile, and zero otherwise. I use the liquidity measure of Amihud (2002) as modified by Boyson et al. (2008) to proxy for monthly market-wide illiquidity. Amihud's (2002) proxy for market illiquidity is the ratio of daily absolute return to dollar trading volume on that day. I calculate a daily ratio of absolute return to dollar volume for each common stock on CRSP with listing on NYSE

and positive share volume. After eliminating the top and bottom 1% observations to remove outliers, I calculate a monthly raw market-wide liquidity measure as the market cap-weighted average of all individual daily measures. To normalize the raw measure, I multiply it by the lagged ratio of CRSP market cap to CRSP market cap in the first month of the sample period. On June 24, 1997, NYSE changed the tick size from 1/8 to 1/16, and from 1/16 to \$0.01 on January 29, 2001. To remove the impact of these changes on the proxy for market illiquidity, I regress the normalized monthly measure of market illiquidity on two tick size change indicator variables. The residual from this regression is a monthly measure of market-wide illiquidity, *ILLIQ*. A higher value of *ILLIQ* implies greater market-wide illiquidity. Therefore, the indicator variable *D_ILLIQ* is coded such that it equals one when *ILLIQ* is in the top quartile, and zero otherwise.

It can be argued that *D_ILLIQ* only captures the illiquidity in the equity markets as it is estimated using NYSE data, whereas banks can hold assets that are traded in markets other than the equity markets. Chordia, Sarkar, and Subramanyam (2005) study the joint dynamics of liquidity, trading activity, returns, and volatility in stock and U.S. Treasury bond markets. They hypothesize that liquidity in the equity market and other asset markets co-varies for two reasons. First, there are strong linkages between the equity market and other asset markets, which can affect the liquidity in these markets simultaneously. Second, several asset allocation strategies shift wealth between the equity market and other markets, thus liquidity may exhibit co-movement across the equity market and other asset markets. Consistent with their hypothesis, Chordia et al. (2005) find that liquidity co-varies across the asset markets. Shocks to spreads in one market increase spreads in the other market. Therefore, even though *D_ILLIQ* is estimated using equity market data, I expect it to capture illiquidity in other asset markets as well with the

caveat that like any other proxy, D_ILLIQ is not a perfect proxy and contains some amount of measurement error.

A positive and significant coefficient on the interaction of D_BANKRET, D_ILLIQ, and FV_ALL, β_6 , would be evidence consistent with the hypothesis that a more fair value-oriented accounting regime is associated with a greater increase in bank contagion during periods of market illiquidity. H2 predicts a positive and significant β_6 .

5. DATA

To test my hypotheses, I use U.S. bank holding companies as my sample. The practice of fractional-reserve banking and high-leverage makes banks very sensitive to losses.¹² Banks are also highly interconnected through direct exposures in the interbank money market and the large-value payment and settlement system. These characteristics of the banking sector make systemic risk a cause of concern for banks because an initial shock that causes one bank to fail can subsequently lead to the failure of other banks. Considering the threat of systemic failure in the banking sector and the important role played by banks in the modern economy and the financial system, not surprisingly, banks are subject to extensive supervision and regulations to reduce the likelihood and cost of bank failures.

Prior to the 1980s, banks in the U.S. were not subject to specific numerical capital adequacy standards. A more judgment-based, subjective, bank-by-bank approach was adopted to assess capital adequacy. In the early 1980s the incidence of bank failures began to increase, partly due to a result of worsening economic conditions (e.g. soaring interest rates, high oil prices, and the worldwide recession in 1981) and partly due to

¹² Fractional-reserve banking refers to the practice of keeping only a fraction of deposits in reserve while maintaining the obligation to redeem all deposits upon demand.

increase in bank risk profiles. The bank failures and diminishing bank capital triggered a regulatory response for the first time in 1981 when explicit numerical regulatory capital requirements were introduced. However, over the next few years several changes were made to the capital adequacy rules and it was not until 1988 that the central bank governors of the Group of Ten (G-10) countries adopted the Basel Capital Accord.

The 1988 Basel Capital Accord, as implemented in the U.S., “risk-weights” the assets and the off-balance sheet items based on their perceived credit risk. For example, most claims are weighted at 100 percent, claims on or guarantees provided by qualifying banks are weighted at 20 percent, and very low risk assets (e.g. claims guaranteed by the government) are weighted at 0 percent. Institutions subject to the Basel Accord are required to maintain certain minimum risk-based capital. As a result, banks are forced to hold more capital if they choose riskier assets.¹³

The increasing size and complexity of banks led to an eventual review of the original 1988 Basel Accords in June, 2006. The regulatory agencies adopted a new risk-based capital adequacy framework in December, 2007 and the new rules were effective beginning April 1, 2008.¹⁴ Since the purpose of this study is to examine the impact of fair value accounting on systemic risk in banks, I restrict my sample to the years 1988 to 2007 to avoid noise and biases in the data due to changes in capital adequacy rules.

The sample comprises all U.S. bank holding companies that file the FR Y-9C report and have financial data available for the period 1988 to 2007 on The Bank Holding Companies Database maintained by the Federal Reserve Bank of Chicago and stock price

¹³ Further details about the minimum capital requirements for banks and the regulatory action for violating these minimum capital requirements can be found at

http://stlouisfed.org/col/director/materials/alco_capitaladequacy.htm

¹⁴ Federal Register/ Vol. 72, No. 235/Friday, December 7, 2007/ Rules and Regulations available at <http://www.fdic.gov/regulations/laws/federal/2007/07base12dec7.pdf>

data on CRSP.¹⁵ In my sample there are 793 unique bank holding companies and a total of 98,162 bank-month observations.

Table 1 reports the summary statistics of the variables used in this study. The mean of FV_ALL, i.e., the extent to which the reporting regime is fair value oriented, is 0.37. In other words, as a proportion of total assets of the banks in the sample, 37 percent of assets and liabilities are either recognized or disclosed using fair value on average during the sample years 1988 to 2007. The mean of FV_BANK, i.e., the extent to which each individual bank is fair value oriented, is 0.16.

6. RESULTS

6.1. Trends in the Extent to which the Accounting Regime is Fair Value-Oriented over Time

Consistent with FASB's long-term objective of using fair value to account for financial instruments, the financial reporting rules for U.S. banks have become more fair value-oriented over time. In Appendix 2, I review fair value accounting standards that are most relevant to banks as they explicitly relate to disclosure or recognition of fair value of financial instruments.

The proxy for the extent to which the accounting regime is fair value-oriented, FV_ALL, is plotted over time in Figure 1. The time trend in Figure 1 is consistent with a significant increase in the use of fair value in financial reporting by banks in recent years. Prior to December 31, 1993, the sum of all assets and liabilities recognized or disclosed using fair value is less than five percent of the total assets of the banks in my sample. In May 1993, FASB issued SFAS No. 115, *Accounting for certain investments in debt and*

¹⁵ The Bank Holding Companies Database collects financial data included in the FR Y-9C reports filed by the bank holding companies. These reports contain information from the balance sheet, income statement, risk-based capital measures and additional supporting schedules. The data is available quarterly from 1986 onwards.

equity securities, which required the classification of debt and equity securities into three categories: held-to-maturity, trading, and available-for-sale securities. Also, required was the disclosure of fair value of securities classified as trading and available-for-sale. SFAS No. 115 was effective for all fiscal years ending after December 31, 1993. Subsequent to SFAS No. 115 becoming effective, FV_ALL sharply increased from 5 percent to 24 percent.

The next big increase in FV_ALL is around December 31, 1994. This increase can be attributed to SFAS No. 119, *Disclosures about derivative financial instruments and fair value of financial instruments*, becoming effective for fiscal years ending after December 31, 1994. SFAS No. 119 required disclosure of fair value estimates of derivative financial instruments. It also required disclosure of estimates of holding gains and losses for instruments that are held for trading purposes.

From December, 1994 to March, 2002 the total of assets and liabilities accounted for using fair value as a proportion of total assets of the sample banks hovered between 35 percent and 51 percent. In June, 1998 FASB issued SFAS No. 133, *Accounting for derivative instruments and hedging activities*, which superseded SFAS No. 119. SFAS No. 133 requires that a firm recognize all derivatives as assets or liabilities on the balance sheet at fair value. SFAS No. 133 was effective for all fiscal quarters of all fiscal years beginning after June 15, 2000.¹⁶ Since SFAS No. 119 already required disclosure of fair value of derivatives and SFAS No. 133 only mandated recognition of derivatives as assets or liabilities, FV_ALL does not change significantly around the date when SFAS No. 133 became effective. FV_ALL already included the fair value of derivatives

¹⁶ As issued, SFAS No. 133 was effective for all fiscal quarters of all fiscal years beginning after June 15, 1999. SFAS No. 137 deferred the effective date of SFAS No. 133 to June 15, 2000.

disclosed under SFAS No. 119, which subsequent to June 15, 2000 needed to be recognized as assets and liabilities. FV_ALL increased from 48 percent on March 31, 2002 to 66 percent on September 30, 2002 primarily due to the reporting of fair value of credit derivatives.

Figure 2 shows the monthly distribution of the number of banks experiencing returns in the lowest decile of their time-series of returns over the sample period (i.e., January, 1988 to December, 2007). The maximum number of banks experiencing returns in their lowest decile in any given month is 388 at the time of the Long Term Capital Management crisis (August, 1998).

6.2. Univariate analysis

The results from the univariate tests are reported in Table 2. I calculate the mean value of the EXTREMENEG variable conditional on the realization of the indicator variables, D_BANKRET, the interaction of D_BANKRET with D_FV_ALL and D_ILLIQ, and perform t-tests for differences in means. For the purpose of the univariate tests, I create an indicator variable D_FV_ALL which equals one when the value of FV_ALL is above or equal to its median value in the time series, and zero otherwise. A higher average for EXTREMENEG when the test variable is one implies an increase in contagion among banks.

The results in Table 2 indicate that the test variables, the interaction of D_BANKRET and D_FV_ALL, and the interaction of D_BANKRET, D_FV_ALL, and D_ILLIQ, are strongly associated with an increase in bank contagion. When D_BANKRET equals one, an average of 21% monthly-bank returns are in the bottom decile of the time-series of monthly-bank returns compared to only 6% when D_BANKRET is not equal to one. This is evidence consistent with existence of bank

contagion, i.e., more banks in the financial system experience extreme negative returns (i.e., returns in the bottom decile) when the money center banks face financial difficulties. The difference between the means of EXTREMENEG is statistically significant. When both D_BANKRET and D_FV_ALL equal one, 24% of the banks in the sample have monthly returns in the bottom decile of their time-series of returns whereas, only 9% of the sample banks have returns in the bottom decile of their time-series of returns when D_BANKRET or D_FV_ALL do not equal one. This evidence shows that more banks perform poorly in the same month when the returns of the equally-weighted index of money center banks are in the bottom quartile and the accounting regime is relatively more fair value oriented. This is evidence consistent with H1, suggesting that a more fair value-oriented accounting regime is associated with an increase in bank contagion.

To investigate the impact of market illiquidity on the positive association between a fair value-oriented accounting regime and bank contagion, I interact D_BANKRET, D_FV_ALL, and D_ILLIQ and estimate the means of the variable EXTREMENEG. The EXTREMENEG variable has a mean of 0.31 in the joint presence of money center banks performing poorly (D_BANKRET equals one), the accounting regime being more fair value oriented (the FV_ALL variable has a value greater or equal to its median), and markets being illiquid (D_ILLIQ equals one), and 0.09 otherwise. This evidence is consistent with H2 and indicates that during periods of illiquidity, the positive association between bank contagion and a fair value-oriented accounting regime is greater.

6.3. Multivariate analysis

The results of the univariate tests can be biased due to cross-sectional correlation and other omitted correlated variables. Therefore, in this section I use multivariate logit regressions to investigate my hypotheses.

6.3.1. Fair value accounting and bank contagion

The results of estimating equation (1) are reported in Table 3. Model 1 does not include fixed-year or fixed-firm effects. Model 2 includes fixed-year effects only, and model 3 includes both fixed-year and fixed-firm effects. Since, the inferences drawn from the three models do not differ, for the purpose of brevity, I only discuss the results of the model that includes both fixed-year and fixed-firm effects.

In model 3, the coefficient on D_BANKRET, β_2 , is positive and statistically significant, indicating that a bank is more likely to experience extremely poor performance (i.e., returns in the bottom decile of its time-series of returns) when the money center banks are experiencing financial difficulties. This is evidence of contagion among banks. Consistent with H1, the coefficient on the interaction of D_BANKRET and FV_ALL, β_4 , is positive and statistically significant. This suggests that a more fair value-oriented accounting regime is associated with an increase in contagion in the banking system. Importantly, this evidence is obtained after controlling for contagion that exists in the banking industry exclusive of the financial reporting regime in place.¹⁷

The coefficient on MKTRET, β_5 , is negative and significant. This is consistent with banks being more likely to have extreme negative returns when the equity market is doing poorly. The coefficient on TBILL, β_6 , is positive and significant in model 1. However, after the inclusion of fixed-year and fixed-firm effects, the coefficient on TBILL turns negative.

¹⁷ Drawing conclusions based on the sign of the estimated coefficient on an interaction term in a logit regression may lead to erroneous inferences because under certain conditions the sign of the coefficient on the interaction term maybe different from the sign of the marginal effect of the interaction or the interaction effect may have different signs for different values of covariates. Therefore to ensure that I am not drawing incorrect inferences, I re-compute the logit model using the “inteff” command in Stata (see Norton, Ai, and Wang 2004). Untabulated results indicate that the coefficient on the interaction of D_BANKRET and FV_ALL, β_4 , is positive and statistically significant at the 10 percent level for all values of the covariates. Thus, inferences drawn based on the sign of β_4 are not incorrect.

6.3.2. Market illiquidity's impact on the association between fair value accounting and bank contagion

In this section, I assess whether a more fair value-oriented accounting regime is associated with a greater increase in contagion during periods of market illiquidity.

Results of estimating equation (2) are presented in Table 4. Results of model 3 indicate that after the inclusion of D_ILLIQ, the proxy for market illiquidity, there is still evidence of contagion among banks. The coefficient on D_BANKRET, β_2 , remains positive and significant. The coefficient on the interaction of D_BANKRET and FV_ALL, β_4 , is no longer statistically significant. This suggests that during periods of market liquidity, a more fair value-oriented accounting regime is not associated with an increase in bank contagion. Consistent with the prediction in H2, I find that the coefficient on the interaction of D_BANKRET, D_ILLIQ, and FV_ALL, β_6 , is positive and significant.¹⁸ Thus, during periods of market illiquidity fair value accounting is associated with a greater increase in contagion among banks relative to periods when markets are liquid.

In summary, using multivariate logit models that control for macro-economic risks and include fixed-year and fixed-firm effects, I find that fair value accounting is positively associated with an increase in bank contagion above and beyond contagion that exists due to trade and financial linkages in the banking industry. Further, the positive

¹⁸ I report unadjusted standard errors in the tables. Standard errors from a regression run on a panel dataset maybe biased in the presence of time-series dependence or cross-sectional dependence in residuals (see Petersen 2008). Since I include fixed-bank effects in my model, it is unlikely that residuals have time-series dependence in my setting. However, even though I include MKTRET and TBILL as independent variables and they should extract cross-sectional dependence from EXTREMENEG, the dependent variable, it may be the case that the standard errors are biased due to some leftover cross-sectional dependence in the residuals. To address the concern about cross-sectional dependence in the residuals, I re-estimate the standard errors by clustering them by quarter. Untabulated results indicate that the inferences drawn based on adjusted standard errors remain unchanged.

association between fair value accounting and bank contagion only occurs during periods of market illiquidity.

7. CROSS-SECTIONAL TESTS

In this section, I investigate whether the additional bank contagion associated with a more fair value-oriented accounting regime spreads as a function of bank-specific characteristics. More specifically, I examine whether the extent to which each bank holding company's balance sheet is fair value-oriented and the level of bank capital affects the spread of the additional contagion to individual banks.

7.1. Extent to which a bank's balance sheet is fair value-oriented and the spread of contagion

In the cross-section, there is variation in the extent to which each bank's balance sheet is fair value oriented because the amount of assets and liabilities held by each bank that are required to be accounted for using fair value varies. So, even though the accounting regime for banks has become more fair value oriented over time (see Figure 1), the pressure from strategic concerns (i.e., the incentive to preempt sale of assets by others) faced by banks that can lead to procyclical trades under fair value accounting would vary based on the proportion of assets and liabilities of each bank that are marked-to-market. In the extreme, a bank that does not hold any assets or liabilities that are accounted for using fair value (i.e., its entire balance sheet consists of assets and liabilities that are accounted for using historical cost) would be immune to the pressure to preempt a fall in prices from the selling of assets by other banks. This is because a fall in the prices of assets does not impact the carrying values of assets and liabilities on its balance sheet. On the other hand, a bank whose entire balance sheet is composed of assets and liabilities that are accounted for using fair value would be most sensitive to the

feedback effect of fair value accounting. I investigate whether the spread of bank contagion under a fair value oriented-accounting regime varies by the extent to which individual bank's balance sheet is fair value oriented. To do so, I estimate the following logit model:

$$\begin{aligned} EXTREMENEG_{i,t} = & \beta_1 + \beta_2 D_BANKRET_t + \beta_3 FV_ALL_t + \\ & \beta_4 D_BANKRET_t * FV_ALL_t + \beta_5 FV_BANK_{i,t} + \beta_6 D_BANKRET_t * FV_BANK_{i,t} * FV_ALL_t \\ & + \beta_7 MKTRET_t + \beta_8 TBILL_t + Fixed-Year Effects + Fixed-Firm Effects + error_{i,t} \quad (3) \end{aligned}$$

FV_BANK measures the extent to which a bank's balance sheet is fair value oriented. FV_BANK is the ratio of the sum of assets and liabilities (held-to-maturity securities, available-for-sale securities, trading assets, mortgage servicing rights, other financial assets, derivative contracts, trading liabilities, other financial liabilities and servicing liabilities) recognized or disclosed at fair value by the bank scaled by its total assets. A positive and statistically significant coefficient on the interaction of D_BANKRET, FV_BANK, and FV_ALL, β_6 , would be evidence consistent with the notion that under a more fair value-oriented accounting regime, financial difficulties at the money center banks are more likely to spread to banks that are themselves more fair value oriented. The other variables in equation 3 have been defined before.

The results of estimating equation (3) are reported in Table 5. In all three models, the coefficient on D_BANKRET, β_2 , is positive and significant. This is evidence of contagion among banks. The coefficient on the interaction of D_BANKRET and FV_ALL, β_4 , is no longer significantly different from zero. The coefficient on the interaction of D_BANKRET, FV_BANK, and FV_ALL, β_6 , is positive and statistically significant in all three models. This suggests that in a more fair value-oriented accounting

regime, the increased bank contagion is more likely to spread to banks that are more fair value oriented themselves.

7.2. Bank capital and the spread of contagion

Cifuentes et al. (2005) shows that the interaction of mark-to-market accounting with externally imposed solvency requirements has the potential of increasing contagion in the financial system. The authors argue that following a shock that depresses the market value of assets carried on the balance sheet, concerns about violation of regulatory capital adequacy ratios would lead to forced disposal of assets. However, a bank that is well-capitalized and has the ability to absorb losses from the decrease in the value of assets without resulting in a violation of capital adequacy ratios is less likely to dispose its assets in a fire-sale. Thus, the additional bank contagion introduced by fair value accounting is more likely to spread to banks that are poorly capitalized.

In December, 1991, the U.S. Congress passed the Federal Deposit Insurance Corporation Improvement Act (FDICIA) which emphasized the importance of the need of adequate capital buffers. One key provision of FDICIA, Prompt Corrective Action (PCA), involved early intervention in problem banks by regulators. PCA aims to resolve banking problems of inadequate capital early and at the minimum cost to the bank insurance fund.¹⁹ PCA uses three major ratios in the assessment of capital adequacy. These three ratios are:

1. Tier 1 Risk-Based Capital Ratio
2. Total Risk-Based Capital Ratio
3. Tier 1 Leverage Ratio

¹⁹ Further details about the minimum capital requirements for banks and the regulatory action for violating these minimum capital requirements can be found at http://stlouisfed.org/col/director/materials/alco_capitaladequacy.htm

Based on values of these ratios a bank is classified as well-capitalized, adequately capitalized, undercapitalized, significantly undercapitalized, or critically undercapitalized. A bank is subject to strict limitations in accordance with PCA as these ratios decline below certain levels. For example, some of the restrictions that an undercapitalized bank is subject to include restrictions on paying dividends or paying management fees to a controlling person, the bank must file and implement a capital restoration plan, etc.

To test if increase in bank contagion associated with a more fair value-oriented accounting regime is more likely to spread to banks that are poorly capitalized, I estimate the following logit model:

$$\begin{aligned} EXTREMENEG_{i,t} = & \beta_1 + \beta_2 D_BANKRET_t + \beta_3 FV_ALL_t + \beta_4 \\ & D_BANKRET_t * FV_ALL_t + \beta_5 CAP_{i,t} + \beta_6 D_BANKRET_t * CAP_{i,t} * FV_ALL_t + \beta_7 MKTRET_t \\ & + \beta_8 TBILL_t + Fixed-Year\ Effects + Fixed-Firm\ Effects + error_{i,t} \end{aligned} \quad (4)$$

CAP is an indicator variable that proxies for the level of bank capital. CAP equals one if a bank is classified as well-capitalized, two if a bank is classified as adequately capitalized, three if a bank is undercapitalized, and four if a bank is significantly or critically undercapitalized. Thus, the higher the value of CAP, the worse off is the bank in terms of adequate capital. Consistent with the prediction that additional contagion associated with a more fair value-oriented accounting regime is likely to spread to banks that lack adequate capital, I expect the coefficient on the interaction of D_BANKRET, CAP, and FV_ALL, β_6 , to be positive and statistically significant. The other variables in equation (4) have been defined before.

The Bank Holding Companies Database has data for the capital adequacy ratios beginning March 31, 2001. So, for the purpose of the analysis in this section, my sample

period is restricted to the years 2001 to 2007. Equation (4) is estimated using a total of 33,124 bank-month observations.

The results of estimating equation (4) are reported in Table 6. The coefficient on $D_BANKRET$, β_2 , is no longer statistically significant. The coefficient on the interaction of $D_BANKRET$ and FV_ALL , β_4 , is positive and statistically significant. Thus, there is evidence of a positive association between the increase in bank contagion and a more fair value-oriented accounting regime. As predicted, β_6 , the coefficient on the interaction of $D_BANKRET$, CAP , and FV_ALL is positive and statistically significant in each of the three models. This is evidence consistent with the notion that in a more fair value-oriented accounting regime, the increased bank contagion is more likely to spread to banks with lower capital buffers.

Given the restrictions placed on poorly capitalized banks, strong efforts are made by bank management to keep their banks well-capitalized for PCA purposes and to avoid the three undercapitalized categories. The Federal Reserve Bank of St. Louis notes that it is very unusual for a bank not to be well-capitalized and even more unusual for a bank to be in one of the three undercapitalized categories. To ensure that the results in Table 6 are not driven by a few banks that are classified as undercapitalized or worse, I re-estimate equation (4) by coding CAP equal to zero if a bank is well-capitalized and one otherwise. I find that the inferences drawn do not change if I re-define CAP as a dichotomous indicator variable. The untabulated results suggest that increase in bank contagion is higher for banks that are not well-capitalized under a more fair value-oriented accounting regime.

In summary, in this section, I investigate whether variation in cross-sectional bank characteristics helps to explain the spread of additional bank contagion associated with a

more fair value-oriented accounting regime. I find that the spread of additional contagion in the cross section is affected by the extent to which a bank's balance sheet is fair value-oriented and by the capital levels of banks. First, additional bank contagion associated with a more fair value-oriented accounting regime is more likely to spread to banks whose balance sheets are more fair value-oriented, i.e., a higher proportion of their balance sheet is accounted for using fair value. Second, poorly capitalized banks are more likely to be impacted by additional bank contagion associated with a more fair value-oriented accounting regime.

8. ROBUSTNESS TESTS

8.1. Excluding money center banks from the sample

The results presented in Table 3 and Table 4 are based on a sample that includes money center banks which also comprise the equally-weighted bank index. To address the concern that I am inducing a positive bias in my coefficients of interest (β_4 in Table 3 and β_6 in Table 4) by including the money center banks that comprise the equally-weighted bank index in the sample, I re-estimate my tests after excluding the money center banks from the sample. As a result the sample size reduces to 95,621 bank-month observations and untabulated results indicate that the inferences drawn do not change upon excluding the money center banks from the sample. I continue to find that the extent of fair value reporting is associated with an increase in contagion among banks. When I split my sample into periods of market liquidity and illiquidity, I find that the positive association between fair value accounting and bank contagion exists only during periods of market illiquidity.

8.2. Placebo test using an equally-weighted index of medium-sized banks

As a robustness check I also run a placebo test using an equally-weighted index comprising of seventeen random small- or medium-sized bank holding companies as a proxy for difficulties in the financial system instead of an index of money center banks to address the concern that my findings with respect to H1 and H2 are the result of a mechanical effect or an omitted correlated variable.

Money center banks are the largest banks in the economy and hold key positions in the interbank network. These banks are crucial for the stability of the banking system because the failure of money center banks can cause a systemic crisis. Thus, financial difficulties at money center banks are likely to adversely affect the other banks in the economy. On the other hand, since small- or medium-sized banks are not as crucial as money center banks for the stability of the financial system, the failure of small- or medium-sized banks will not adversely affect the health of the other banks in the financial system to the same extent as the failure of a money center bank. Therefore, to address the concern that my findings are mechanical or are driven by an omitted correlated variable, I re-examine the relationship between fair value accounting and bank contagion using the returns performance of an equally-weighted index of seventeen random small- or medium-sized banks as a proxy for difficulties in the banking industry. If there is something mechanical about my results or if the results are driven by an omitted correlated variable I would expect to find a positive association between fair value accounting and bank contagion for any set of banks used to estimate the equally-weighted bank index. Therefore, if I fail to find a positive association between fair value accounting and contagion from small- and medium-sized banks then it is less likely that the results in Tables 3 and 4 are a consequence of a mechanical relationship in the data or an omitted correlated variable.

I re-estimate equations (1) and (2) after substituting D_BANKRET with D_RDMRET. D_RDMRET is an indicator variable that equals one when the monthly return for an equally-weighted index of seventeen random small- or medium-sized banks is in the bottom quartile and D_BANKRET is not equal to one, and zero otherwise. I use Nissim and Penman's (2008) cutoff of total assets of \$10 billion or less to identify small- and medium-sized bank holding companies. The results are reported in Table 7. In model 1, the coefficient on D_RDMRET, β_2 , is positive and statistically significant. This is evidence consistent with existence of contagion from small- and medium-sized banks. The coefficient on the interaction of D_RDMRET and FV_ALL, β_4 , is negative and statistically insignificant. This suggests that a more fair value-oriented accounting regime is not associated with an increase in contagion from the small- and medium-sized banks. Further, when I classify the sample period into periods of market liquidity and illiquidity, I find no evidence of fair value accounting being associated with an increase in contagion from small- or medium-sized during periods of market illiquidity. In model 2, the coefficient on the interaction of D_RDMRET, D_ILLIQ, and FV_ALL, β_6 , is negative and statistically insignificant. Thus, the placebo test adds robustness to the findings in Table 3 and Table 4 suggesting that it is unlikely that the positive association between fair value accounting and bank contagion (which is exacerbated during periods of market illiquidity) is due to a mechanical relationship in the data or a result of an omitted correlated variable.

9. CONCLUSION

In this paper, I study whether increased use of fair value accounting is associated with additional contagion in the banking system. I proxy for the extent to which fair value accounting is used by estimating the ratio of the sum of all assets and liabilities

recognized or disclosed using fair value by the banks in my sample to the sum of total assets of these banks. I find that increase in the use of fair value accounting is associated with additional bank contagion. The increase in bank contagion is most severe during periods of market illiquidity. Further, my cross-sectional analyses indicate that additional bank contagion associated with fair value accounting is more likely to spread to banks: i) that are poorly capitalized, or ii) that have relatively higher proportion of fair value assets and liabilities.

Like any other archival empirical study, I do not claim to have found causal links between fair value accounting and additional bank contagion. Though I only provide evidence of a positive association between fair value accounting and additional bank contagion, I do believe my findings can be of interest to policy-makers and regulators. The Emergency Economic Stabilization Act of 2008 gave the SEC the power to suspend mark-to-market accounting because several parties have blamed fair value accounting for exacerbating the credit crunch that has followed the Subprime crisis. The findings of this paper should be useful to the SEC in weighing the costs and benefits of a fair value-oriented accounting regime for banks and deciding whether a) fair value accounting has worsened the credit crunch that has followed the Subprime crises, b) should fair value accounting rules be suspended or modified, and c) whether fair value is the appropriate measurement and reporting basis for financial instruments when markets are distressed or illiquid.

To address the concern that the current application of fair value accounting rules has led to fire-sale asset pricing and contributed to the credit crunch that has followed the Subprime crisis, FASB issued additional guidance on the estimation of fair value of an asset or liability that is traded in a market that is not active on April 9, 2009 (FASB Staff

Position (FSP) No. FAS 157-4, *Determining fair value when the volume and level of activity for the asset or liability have significantly decreased and identifying transactions that are not orderly*). In FSP No. FAS 157-4, FASB noted that a significant decrease in the volume and activity in a market for an asset or liability may be indicative of markets that are not orderly and a significant adjustment to the transactions or quoted prices may be necessary to estimate fair value for such assets and liabilities. The guidance provided by FASB is consistent with the findings in this paper that marking assets and liabilities to market during periods of market illiquidity can increase bank contagion, therefore fair values estimates should not be based on quoted prices or transaction prices when markets are disorderly or transactions are distressed.

In this paper, my attempt is not to document the superiority of a historical cost-based accounting regime over one based on fair value. Rather my intentions are to document an alleged unintended externality of fair value accounting in the banking industry. The advantages of more timely and relevant information under a fair value-oriented accounting regime may overwhelm those of a historical cost-based regime if markets are liquid and competitive. Since the prices at which transactions occur in markets that are not deep and competitive can deviate significantly from fundamental prices in hypothetical frictionless competitive markets, the superiority of a fair value reporting regime is not obvious in this context. As pointed out by Plantin et al. (2008), when there is more than one imperfection in a competitive economy, removing just one of these imperfections may not be welfare improving. Instead, removal of one of the imperfections could magnify the negative effects of the other imperfections to the detriment of overall welfare. However, it is important to note that fair value accounting rules by themselves may not increase contagion among banks. It is only when fair values

are used as inputs in regulatory ratios, internal control mechanisms or incentive contracts for management that a more fair value-oriented reporting regime can interact with market conditions to increase bank contagion.

Appendix 1: Money Center Banks Included in the Equally-Weighted Money Center

Bank Index

Serial No.	Name
1.	Bank of America Corporation
2.	Canadian Imperial Bank of Commerce
3.	Citigroup Inc.
4.	JPMorgan Chase & Co.
5.	KeyCorp
6.	Ohio Legacy Corp.
7.	Oriental Financial Group Inc.
8.	PNC Financial Services Group I
9.	Royal Bank of Canada
10.	SunTrust Banks Inc.
11.	TCF Financial Corporation
12.	The Bank of New York Mellon Co.
13.	The Bank Of Nova Scotia
14.	Toronto-Dominion Bank
15.	United Bancshares Inc.
16.	Wachovia Corporation
17.	Wells Fargo & Company

Appendix 2: Major Fair Value Standards for Financial Instruments

Three important standards that require the disclosure of the fair value estimates of financial instruments are SFAS No. 107, *Disclosures about fair value of financial instruments*, SFAS No. 119, *Disclosures about derivative financial instruments and fair value of financial instruments*, and SFAS No 161, *Disclosures about derivative instruments and hedging activities – an amendment of FASB statement no. 133*.

FASB issued SFAS No. 107 in December 1991 and it was effective for fiscal years ending after December 15, 1992. SFAS No. 107 requires all entities, including commercial banks, to disclose the fair value of all their financial instruments either in the body of the financial statements or in the accompanying footnotes. The entities were also required to disclose the methods and assumptions used to arrive at the fair values.

Issued in October, 1994, SFAS No. 119 required disclosure of fair value estimates of derivative financial instruments. It also required disclosure of estimates of holding gains and losses for instruments that are held for trading purposes. This standard was effective for fiscal years ending after December 15, 1994. SFAS No. 119 was subsequently superseded by SFAS No. 133.

SFAS No. 161 was issued in March, 2008 and is effective for all fiscal years and interim periods beginning after November 15, 2008. This statement requires additional disclosures about an entity's derivative and hedging activities beyond those that were required under SFAS No. 133. More specifically, an entity is required to disclose (a) how and why an entity uses derivative instruments, (b) how derivative instruments and related hedged items are accounted for under SFAS No. 133 and its related interpretations, and (c) how derivative instruments and related hedged items affect an entity's financial position, financial performance, and cash flows.

The most significant fair value recognition standards for financial instruments include SFAS No. 115, *Accounting for certain investments in debt and equity securities*, SFAS No. 133, *Accounting for derivative instruments and hedging activities*, and SFAS No. 159, *The fair value option for financial assets and financial liabilities – including an amendment of FASB statement no. 115*.

Issued in May, 1993 and effective for all fiscal years ending after December 15, 1993, SFAS No. 115 requires classification of debt and equity securities in to three categories: held-to-maturity, trading, and available-for-sale securities. The securities that are classified as held-to-maturity continued to be recognized at amortized cost while those classified as trading and available-for sale were required to be recognized at fair value. Trading securities are classified as current assets on the balance sheet and change in their fair values is included in earnings. Available-for-sale securities can be classified as current or noncurrent based on their time period to maturity and changes in their fair values are included in other comprehensive income.

SFAS No. 133 was issued in June 1998 and became effective for all fiscal quarters of fiscal years beginning after June 15, 2000. SFAS No. 133 requires that a firm recognize all derivatives as assets or liabilities on the balance sheet at fair value. Accounting for changes in the fair value of derivatives depends on the intended use of the derivative and the resultant designation of the derivative. If certain conditions are met, a derivative may be specifically designated as a (a) fair value hedge, (b) cash flow hedge, or (c) foreign currency hedge. Changes in fair value of derivatives are recognized in earnings or carried through comprehensive income depending upon the designation of derivatives and the effectiveness of hedges. Broadly, any change in the fair value of derivatives designated as hedges is either carried through other comprehensive income or

if recognized in earnings, the change in the fair value of the derivative is offset by an opposite change in the fair value of the hedged item. Changes in the fair value of derivatives that do not qualify as hedges and changes in the fair value of the ineffective portion of hedges are included in earnings.

SFAS No. 159 was issued in February, 2007 and was effective as of the beginning of an entity's first fiscal year that begins after November 15, 2007. This statement permits entities to choose to measure many financial instruments and certain other items at fair value. The objective behind this statement was to improve financial reporting by providing entities with the opportunity to mitigate volatility in reported earnings caused by measuring related assets and liabilities differently without having to apply complex hedge accounting provisions. On its website, FASB states that it expects SFAS 159 to "expand the use of fair value measurement, which is consistent with the Board's long-term measurement objectives for accounting for financial instruments."

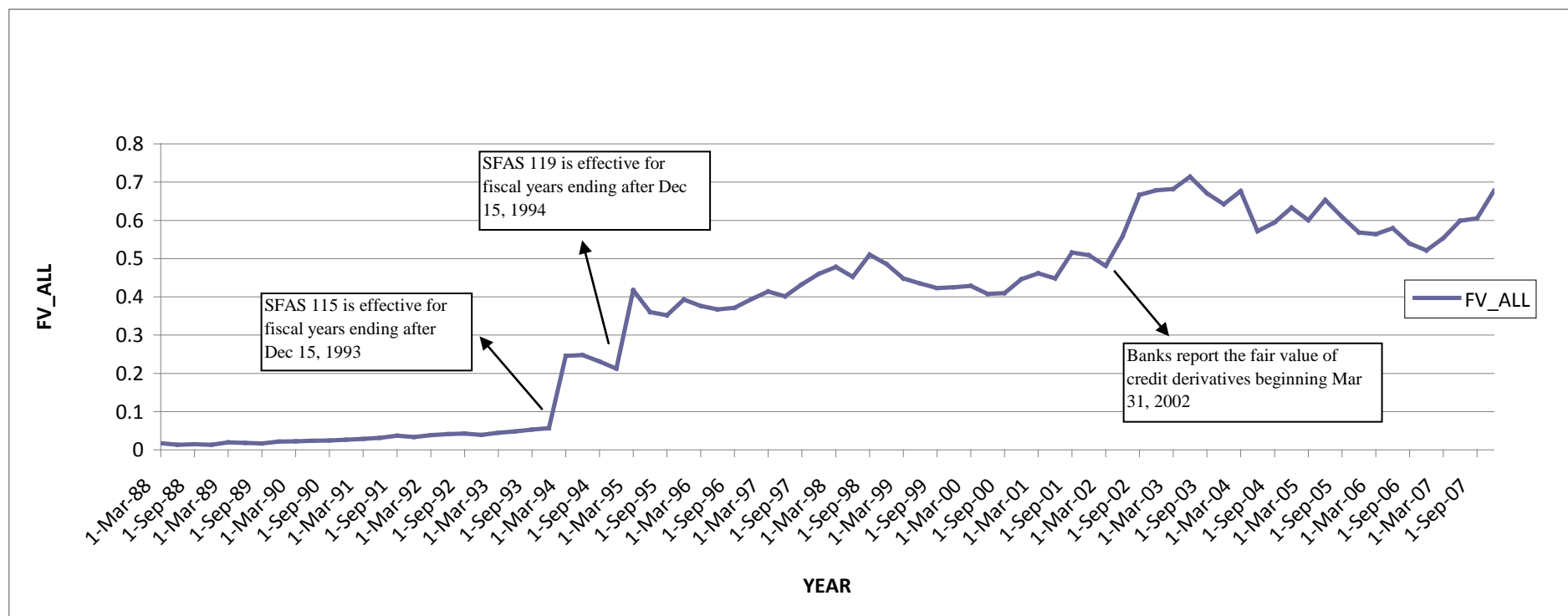
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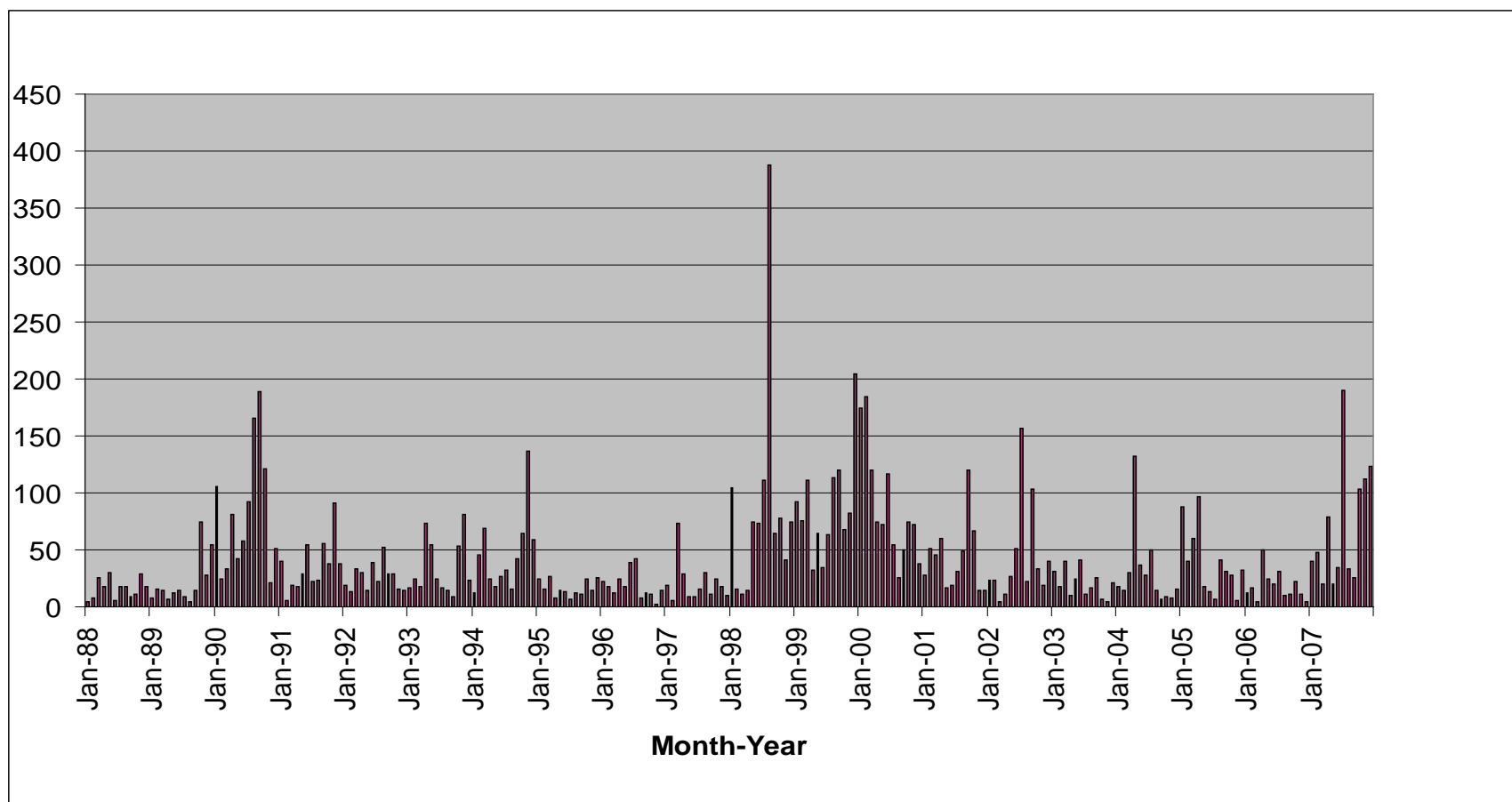
Figure 1: Trends in the Extent to which the Accounting Regime is Fair Value-Oriented over Time



Notes to Figure 1:

FV_ALL – Sum of assets and liabilities (held-to-maturity securities, available-for-sale securities, trading assets, mortgage servicing rights, other financial assets, derivative contracts, trading liabilities, other financial liabilities and servicing liabilities) disclosed or recognized at fair value by the banks in the sample scaled by the sum of total assets of these banks

Figure 2: Number of Banks Experiencing Returns in the Lowest Decile of their Time-Series of Returns per Month



Notes to Figure 2:

The monthly distribution of the number of banks experiencing returns in the lowest decile of their time-series of returns over the sample period (i.e., January, 1988 to December, 2007).

Table 1: Summary Statistics

This table reports the summary statistics for the variables used in the study.

Variables	Mean	Median	25th Percentile	75th Percentile	Standard Deviation	Number of Observations
MKTRET	0.0124	0.0161	-0.0208	0.0416	0.0504	98,162
TBILL (in %)	4.2926	4.7199	3.0199	5.2799	1.8429	98,162
FV_ALL	0.3787	0.4285	0.2120	0.5584	0.2240	98,162
BANKRET	0.0162	0.0162	-0.0141	0.0510	0.0576	98,162
ILLIQ	-1.26E-11	1.32E-10	-1.36E-9	1.35E-9	2.44E-9	98,162
FV_BANK	0.1643	0.1506	0.0306	0.2425	0.2444	86,314
TIER1 RBC RATIO	13.80	12.74	11.61	14.46	12.107	33,124
TOTAL RBC RATIO	12.13	11.27	10.01	13.01	5.2066	33,124
TIER1 LEVERAGE RATIO	9.06	8.60	7.70	9.72	8.0287	33,124

Notes to Table 1:

MKTRET – Monthly CRSP equally-weighted market return

TBILL – Monthly 3-month Treasury bill rate

FV_ALL – Sum of assets and liabilities disclosed or recognized at fair value by the banks in the sample scaled by the sum of total assets of these banks

BANKRET – Monthly return for an equally-weighted index of money center banks

ILLIQ – Amihud's (2002) proxy for market illiquidity as modified by Boyson et al. (2008). See section 4.2 for details about the estimation of ILLIQ

FV_BANK - Ratio of the sum of assets and liabilities disclosed or recognized by a bank at fair value scaled by its total assets

TIER1 RBC RATIO – Tier 1 risk-based capital ratio estimated as tier 1 capital divided by risk-weighted assets

TOTAL RBC RATIO – Total risk-based capital ratio estimated as the sum of tier 1 and tier 2 capital divided by risk-weighted assets

TIER1 LEVERAGE RATIO – Tier 1 leverage ratio estimated as tier 1 capital divided by average total consolidated assets

Table 2: Univariate Analysis

This table reports the conditional mean of the variable EXTREMENEG for the indicator variables D_BANKRET, the interaction of D_BANKRET and D_FV_ALL, and the interaction of D_BANKRET, D_FV_ALL, and D_ILLIQ. EXTREMENEG equals one if a bank's monthly return is in the bottom decile of its time-series of returns, and zero otherwise. The sample period is 1988 to 2007.

	Number of Observations	Mean of EXTREMENEG
Indicator Variable = D_BANKRET		
D_BANKRET = 0	73,639	0.06
D_BANKRET = 1	24,523	0.21
Difference in EXTREMENEG Means		0.15***
Indicator Variable = D_BANKRET and D_FV_ALL		
D_BANKRET*D_FV_ALL = 0	87,199	0.09
D_BANKRET*D_FV_ALL = 1	10,963	0.24
Difference in EXTREMENEG Means		0.15***
Indicator Variable = D_BANKRET and D_ILLIQ and D_FV_ALL		
D_BANKRET*D_ILLIQ*D_FV_ALL = 0	93,709	0.09
D_BANKRET*D_ILLIQ*D_FV_ALL = 1	4,453	0.31
Difference in EXTREMENEG Means		0.22***

Notes to Table 2:

Differences in means with ***, **, and * are statistically significant at the 1%, 5%, and 10% levels, respectively.

Variable Definitions:

D_BANKRET – Equals one when the monthly return for an equally-weighted index of money center banks is in the bottom quartile, and zero otherwise

D_FV_ALL – Equals one when the proxy for the extent to which the accounting regime is fair value oriented, FV_ALL, is above the median, and zero otherwise

D_ILLIQ – Equals one when Amihud's (2002) modified proxy for market illiquidity is in the top quartile, and zero otherwise

Table 3: Test of H1 - Fair Value Accounting and Bank Contagion

This table reports the results from a logit regression that examines whether fair value accounting is associated with an increase in bank contagion. The model estimated is as below:

$$EXTREMENEG_{i,t} = \beta_1 + \beta_2 D_BANKRET_t + \beta_3 FV_ALL_t + \beta_4 D_BANKRET_t * FV_ALL_t + \beta_5 MKTRET_t + \beta_6 TBILL_t + error_{i,t}$$

EXTREMENEG equals one if a bank's monthly return is in the bottom decile of its time-series of returns, and zero otherwise. The logit regression is determining the likelihood of the dependent variable being equal to '1'. The sample period is 1988 to 2007. Model 1 excludes fixed-year effects and fixed-firm effects. Model 2 includes fixed-year effects only, and model 3 includes both fixed-year and fixed firm-effects.

Independent Variables	Pred. Sign	Model 1		Model 2		Model 3	
		Estimate	P-Value	Estimate	P-Value	Estimate	P-Value
INTERCEPT		-3.1168	<.01***	-3.4836	<.01***	-3.4445	<.01***
D_BANKRET	+	1.0172	<.01***	0.7204	<.01***	0.7201	<.01***
FV_ALL	?	0.4135	<.01***	3.1556	<.01***	3.1587	<.01***
D_BANKRET*FV_ALL	+	0.2074	0.02***	0.2879	<.01***	0.2907	<.01***
MKTRET		-4.9483	<.01***	-4.9628	<.01***	-5.0062	<.01***
TBILL		0.0952	<.01***	-0.0440	0.09*	-0.0464	0.07*
Fixed-Year Effects		NO		YES		YES	
Fixed-Firm Effects		NO		NO		YES	
N		98,162		98,162		98,162	
Adjusted R-square		0.05		0.06		0.06	

Notes to Table 3:

*, **, and ***: Significant at 10%, 5%, and 1% p-values. P-values are one-sided for variables with directional predictions. I report (1-p) values for coefficients that assume a sign opposite to the one predicted.

Variable definitions:

D_BANKRET – Equals one when the monthly return for an equally-weighted index of money center banks is in the bottom quartile, and zero otherwise

FV_ALL – Sum of assets and liabilities disclosed or recognized at fair value by the banks in the sample scaled by the sum of total assets of these banks

MKTRET – Monthly CRSP equally-weighted market return

TBILL – Monthly 3-month Treasury bill rate

Table 4: Test of H2 - Impact of Market Illiquidity on Fair Value Accounting and Bank Contagion

This table reports the results from a logit regression that examines the impact of market illiquidity on the association between fair value accounting and bank contagion. The model estimated is as below:

$$EXTREMENEG_{i,t} = \beta_1 + \beta_2 D_BANKRET_t + \beta_3 FV_ALL_t + \beta_4 D_BANKRET_t * FV_ALL_t + \beta_5 D_ILLIQ_t + \beta_6 D_BANKRET_t * D_ILLIQ_t * FV_ALL_t + \beta_7 MKTRET_t + \beta_8 TBILL_t + error_{i,t}$$

EXTREMENEG equals one if a bank's monthly return is in the bottom decile of its time-series of returns, and zero otherwise. The logit regression is determining the likelihood of the dependent variable being equal to '1'. The sample period is 1988 to 2007. Model 1 excludes fixed-year effects and fixed-firm effects. Model 2 includes fixed-year effects only, and model 3 includes both fixed-year and fixed-firm effects.

Independent Variables	Pred. Sign	Model 1		Model 2		Model 3	
		Estimate	P-Value	Estimate	P-Value	Estimate	P-Value
INTERCEPT		-3.1785	<.01***	-3.5768	<.01***	-3.5379	<.01***
D_BANKRET	+	1.0520	<.01***	0.7463	<.01***	0.7458	<.01***
FV_ALL	?	0.4566	<.01***	3.1669	<.01***	3.1704	<.01***
D_BANKRET*FV_ALL	+	-0.1080	0.84	0.0507	0.34	0.0551	0.32
D_ILLIQ	?	-0.0502	0.11	-0.0132	0.69	-0.0130	0.69
D_BANKRET*D_ILLIQ*FV_ALL	+	0.7497	<.01***	0.5406	<.01***	0.5375	<.01***
MKTRET		-4.4872	<.01***	-4.5805	<.01***	-4.6249	<.01***
TBILL		0.1062	<.01***	-0.0245	0.34	-0.0270	0.30
Fixed-Year Effects		NO		YES		YES	
Fixed-Firm Effects		NO		NO		YES	
N		98,162		98,162		98,162	
Adjusted R-square		0.05		0.06		0.07	

Notes to Table 4:

*, **, and ***: Significant at 10%, 5%, and 1% p-values. P-values are one-sided for variables with directional predictions. I report (1-p) values for coefficients that assume a sign opposite to the one predicted.

Variable definitions:

D_BANKRET – Equals one when the monthly return for an equally-weighted index of money center banks is in the bottom quartile, and zero otherwise

FV_ALL – Sum of assets and liabilities disclosed or recognized at fair value by the banks in the sample scaled by the sum of total assets of these banks

D_ILLIQ – Equals one when Amihud's (2002) modified proxy for market illiquidity is in the top quartile, and zero otherwise

MKTRET – Monthly CRSP equally-weighted market return

TBILL – Monthly 3-month Treasury bill rate

Table 5: The Extent to which a Bank is Fair Value Oriented and the Spread of Contagion

This table reports the results from a logit regression that investigates whether the positive association between a more fair value-oriented accounting regime and an increase in bank contagion is greater for banks that are more fair value oriented. The model estimated is as below:

$$EXTREMENEG_{i,t} = \beta_1 + \beta_2 D_BANKRET_t + \beta_3 FV_ALL_t + \beta_4 D_BANKRET_t * FV_ALL_t + \beta_5 FV_BANK_{i,t} + \beta_6 D_BANKRET_t * FV_BANK_{i,t} * FV_ALL_t + \beta_7 MKTRET_t + \beta_8 TBILL_t + error_{i,t}$$

EXTREMENEG equals one if a bank's monthly return is in the bottom decile of its time-series of returns, and zero otherwise. The logit regression is determining the likelihood of the dependent variable being equal to '1'. The sample period is 1988 to 2007. Model 1 excludes fixed year-effects and fixed-firm effects. Model 2 includes fixed-year effects only, and model 3 includes both fixed-year and fixed-firm effects.

Independent Variables	Pred. Sign	Model 1		Model 2		Model 3	
		Estimate	P-Value	Estimate	P-Value	Estimate	P-Value
INTERCEPT		-3.1734	<.01***	-3.5075	<.01***	-3.5446	<.01***
D_BANKRET	+	1.1121	<.01***	0.7949	<.01***	0.7954	<.01***
FV_ALL	?	0.6821	<.01***	3.1977	<.01***	3.2057	<.01***
D_BANKRET*FV_ALL	+	-0.2742	0.98	-0.1269	0.81	-0.1292	0.81
FV_BANK	?	-0.5109	<.01***	-0.3119	0.02**	-0.2890	0.10*
D_BANKRET*FV_BANK*FV_ALL	+	1.6177	<.01***	1.4509	<.01***	1.4866	<.01***
MKTRET		-4.6482	<.01***	-4.7318	<.01***	-4.7914	<.01***
TBILL		0.0999	<.01***	-0.0368	0.18	-0.0394	0.15
Fixed-Year Effects		NO		YES		YES	
Fixed-Firm Effects		NO		NO		YES	
N		86,314		86,314		86,314	
Adjusted R-square		0.05		0.07		0.07	

Notes to Table 5:

*, **, and ***: Significant at 10%, 5%, and 1% p-values. P-values are one-sided for variables with directional predictions. I report (1-p) values for coefficients that assume a sign opposite to the one predicted.

Variable definitions:

D_BANKRET – Equals one when the monthly return for an equally-weighted index of money center banks is in the bottom quartile, and zero otherwise

FV_ALL – Sum of assets and liabilities disclosed or recognized at fair value by the banks in the sample scaled by the sum of total assets of all the banks in the sample

FV_BANK – Ratio of the sum of assets and liabilities disclosed or recognized by a bank at fair value scaled by total assets

MKTRET – Monthly CRSP equally-weighted market return
TBILL – Monthly 3-month Treasury bill rate

Table 6: Bank Capital and Spread of Contagion

This table reports the results from a logit regression that investigates whether the positive association between a more fair value-oriented accounting regime and increased bank contagion is greater for banks that are poorly capitalized. The model estimated is as below:

$$EXTREMENEG_{i,t} = \beta_1 + \beta_2 D_BANKRET_t + \beta_3 FV_ALL_t + \beta_4 D_BANKRET_t * FV_ALL_t + \beta_5 CAP_{i,t} + \beta_6 D_BANKRET_t * CAP_{i,t} * FV_ALL_t + \beta_7 MKTRET_t + \beta_8 TBILL_t + error_{i,t}$$

EXTREMENEG equals one if a bank's monthly return is in the bottom decile of its time series of returns, and zero otherwise. The logit regression is determining the likelihood of the dependent variable being equal to '1'. The sample period is 2001 to 2007. Model 1 excludes fixed-year effects and fixed-firm effects. Model 2 includes fixed-year effects only, and model 3 includes both fixed-year and fixed-firm effects.

Independent Variables	Pred. Sign	Model 1		Model 2		Model 3	
		Estimate	P-Value	Estimate	P-Value	Estimate	P-Value
INTERCEPT		-3.9995	<.01***	-3.2131	<.01***	-3.3127	<.01***
D_BANKRET	+	0.1165	0.36	-0.3507	0.83	-0.3584	0.84
FV_ALL	?	2.0599	<.01***	1.7697	<.01***	1.7655	<.01***
D_BANKRET*FV_ALL	+	1.0562	0.03**	1.6717	<.01***	1.6740	<.01***
CAP	?	0.0562	0.21	0.0319	0.48	0.1473	0.01
D_BANKRET*CAP*FV_ALL	+	0.2068	0.03**	0.1939	0.04**	0.2007	0.04**
MKTRET		-6.0914	<.01***	-5.9936	<.01***	-6.0324	<.01***
TBILL		0.1056	<.01***	-0.0990	0.01***	-0.1017	<.01***
Fixed-Year Effects		NO		YES		YES	
Fixed-Firm Effects		NO		NO		YES	
N		33,124		33,124		33,124	
Adjusted R-square		0.05		0.06		0.06	

Notes to Table 6:

*, **, and ***: Significant at 10%, 5%, and 1% p-values. P-values are one-sided for variables with directional predictions. I report (1-p) values for coefficients that assume a sign opposite to the one predicted.

Variable definitions:

D_BANKRET – Equals one when the monthly return for an equally-weighted index of money center banks is in the bottom quartile, and zero otherwise

FV_ALL – Sum of assets and liabilities disclosed or recognized at fair value by the banks in the sample scaled by the sum of total assets of all the banks in the sample

CAP – Equals one if a bank is classified as well-capitalized, two if a bank is adequately capitalized, three if a bank is undercapitalized, and four if a bank is significantly or critically undercapitalized

MKTRET – Monthly CRSP equally-weighted market return

TBILL – Monthly 3-month Treasury bill rate

Table 7: Placebo Test: Fair Value Accounting and Contagion from Small- and Medium-Sized Banks

This table reports the results from logit regressions that examine whether fair value accounting is associated with an increase in contagion from small- and medium-sized bank holding companies. The following two models are estimated:

$$EXTREMENEG_{i,t} = \beta_1 + \beta_2 D_RDMRET_t + \beta_3 FV_ALL_t + \beta_4 D_RDMRET_t * FV_ALL_t + \beta_5 MKTRET_t + \beta_6 TBILL_t + error_{i,t}$$

$$EXTREMENEG_{i,t} = \beta_1 + \beta_2 D_RDMRET_t + \beta_3 FV_ALL_t + \beta_4 D_RDMRET_t * FV_ALL_t + \beta_5 D_ILLIQ_t + \beta_6 D_RDMRET_t * D_ILLIQ_t * FV_ALL_t + \beta_7 MKTRET_t + \beta_8 TBILL_t + error_{i,t}$$

EXTREMENEG equals one if a bank's monthly return is in the bottom decile of its time-series of returns, and zero otherwise. The logit regression is determining the likelihood of the dependent variable being equal to '1'. The sample period is 1988 to 2007.

Independent Variables	Pred. Sign	Model 1		Model 2	
		Estimate	P-Value	Estimate	P-Value
INTERCEPT		-3.2466	<0.01***	-3.4487	<0.01***
D_RDMRET	+	0.2759	<0.01***	0.3212	<0.01***
FV_ALL	?	4.0022	<0.01***	4.211	<0.01***
D_RDMRET*FV_ALL	+	-0.5476	0.99	-0.5512	0.99
D_ILLIQ				0.1373	<0.01***
D_RDMRET*D_ILLIQ*FV_ALL	+			-0.6692	0.93
MKTRET		-8.1235		-7.7638	<0.01***
TBILL		-0.0969		-0.0775	<0.01***
Fixed-Year Effects		YES		YES	
Fixed-Firm Effects		YES		YES	
N		94030		94030	
Adjusted R-square		0.06		0.06	

Notes to Table 7:

*, **, and ***: Significant at 10%, 5%, and 1% p-values. P-values are one-sided for variables with directional predictions. I report (1-p) values for coefficients that assume a sign opposite to the one predicted.

Variable definitions:

D_RDMRET – Equals one when the monthly return for an equally-weighted index of seventeen random small- and medium-sized banks is in the bottom quartile and

D_BANKRET is not equal to one, zero otherwise

FV_ALL – Sum of assets and liabilities disclosed or recognized at fair value by the banks in the sample scaled by the sum of total assets of these banks

D_ILLIQ – Equals one when Amihud's (2002) modified proxy for market illiquidity is in the top quartile, and zero otherwise
MKTRET – Monthly CRSP equally-weighted market return
TBILL – Monthly 3-month Treasury bill rate