December 22, 2008

Mr. Christopher Cox, Chairman
U.S. Securities and Exchange Commission
100 F Street, N.E.
Washington, D.C.20549

Dear Chairman Cox,

I appreciate the opportunity to provide comments to the Securities and Exchange Commission (SEC) related to the study to be conducted by the SEC of "mark-to-market" accounting applicable to financial institutions under the Emergency Economic Stabilization Act (EESA) of 2008.

The EESA requires the SEC to study, at a minimum, the impact of mark-to-market accounting on bank failures in 2008 and the effect of fair value accounting standards on a financial institution's balance sheet. As a Ph.D. student in accounting at the University of Washington, Seattle, in my dissertation titled "Did fair value accounting contribute to systemic risk in the banking industry?" I investigate whether fair value accounting is associated with an increase in the risk of systemic failure in the banking industry. Using U.S. bank holding company data, I find that the extent of fair value reporting is associated with an increase in bank contagion and the increase in bank contagion is most severe during periods of market illiquidity. Further, my 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.

In my dissertation I provide empirical evidence of the impact of mark-to-market accounting on the systemic risk in the banking industry. I believe the evidence presented can help the SEC in weighing the costs and benefits of fair value accounting for financial instruments and deciding whether fair value accounting has a) worsened the credit crunch that has followed the Subprime crises, and b) contributed to bank failures in 2008. Attached below is my dissertation for your reference.

I would again like to thank the SEC for granting the opportunity to provide feedback on this important issue. Please feel free to contact me at 206.543.0502 or ukhan@u.washington.edu with any comments or questions regarding this letter or the related attached materials.

Sincerely,

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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.

I thank my dissertation chairman, Shiva Rajgopal, for his continuous guidance in the development of this paper. I also thank the other members of my dissertation committee – Robert Bowen, Richard Hartman, Jon Karpoff, Ed Rice, and Terry Shevlin – as well as Dave Burgstahler, Elizabeth Chuk, Jarrad Harford, Frank Hodge, Todd Kravet, Dawn Matsumoto, Mark Soliman, Abhishek Varma, Jenny Zhang and seminar participants at the University of Washington for their helpful comments and suggestions.

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 has 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 an 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 has 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., propagation of poor performance from one bank to another) among banks, thereby increasing the systemic risk in the banking industry. Kaufman and Scott (2000) defines systemic risk as "the risk or probability of breakdowns in an entire system, as opposed to breakdowns in individual parts or components."

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

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

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 even 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. 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).

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

[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.

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 the price fall 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).[3] 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 and increase in systemic risk in the bank industry is greater during periods of market illiquidity.

Finally, I examine whether the increase in systemic risk associated with a more fair value-oriented accounting regime is more likely to affect banks with certain

[3] 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.

characteristics: (i) the proportion of a bank's assets and liabilities reported at fair value (i.e., the extent to which a bank is fair value oriented) and, (ii) a bank's capital adequacy.

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 the price fall 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.

Systemic risk can occur in the banking system in two ways (Staub 1999; Schroder and Schuler 2003). First, a macro shock (e.g., a cyclical downturn or a stock market crash) can simultaneously have adverse effects on the entire banking industry leading to systemic failure. Second, contagion in the banking industry can result in systemic risk, i.e., an initial shock that causes one bank to fail subsequently leads to the failure of other banks in the system. Cifuentes et al. (2005) and Plantin et al. (2008) argue that fair value accounting can increase the systemic risk in the banking industry by enhancing contagion among 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 run logit regressions to test whether a more fair value-oriented accounting regime is associated with increase in contagion among banks. More specifically, 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. 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 all assets and 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, i.e., the probability that more banks experience extreme negative returns when the money center 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.

In summary, 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. 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 (commonly referred to as the *bailout package* for the U.S. financial system) gave SEC the power to suspend mark-to-market accounting and asks SEC to complete a study on mark-to-market accounting's effect on bank failures in 2008 by January 2, 2009. 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.

The remainder of the paper is organized as follows. 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. Finally, I conclude in Section 8.

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).

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 mark-to-market accounting 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 the 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.[4]

Plantin, Sapra, and Shin (2008) use a stylized 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.[5,6] In order to maximize the expected earnings of the bank, the manager has to

[4] The findings of Cifuentes et al. (2005) will 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 accounts, 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 to adjust the leverage back to its target.

[5] In their stylized 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.

[6] 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.

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 on to 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 manger whose tenure is shorter than the lives of the bank assets) 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 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. When others sell, there is a negative effect on all others, but especially on those who have chosen to hold on to the asset. Anticipating this negative outcome, a short-sighted bank manager is tempted to preempt the fall in price 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 lead to procyclical trades (i.e., selling assets when prices are falling and buying assets when prices are rising) that amplify the price fall and volatility in prices. Introduction of additional volatility in prices by fair value accounting 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 marked-to-market 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 pure historical cost-based 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 findings of Plantin et al. (2008) are not applicable in the real world where impairment in the value of long-lived assets needs to be reported. So, even under a historical cost-oriented accounting regime bank managers can face pressure to preempt sales by other banks when asset prices fall.

Though firms are required to record impairments to financial instruments under a historical cost-based accounting regime, firms have considerable discretion in recording impairments and they are not required to record impairments if the impairment is temporary in nature. 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. However, financial instruments, including investments in equity securities accounted for under the cost or equity method, are excluded from the scope of this standard.[7] 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.

[7] 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.

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." Similarly, 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*. Thus, 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.

Therefore, Plantin et al.'s (2008) findings may still be relevant for financial institutions despite the assumption of a "pure" historical cost-based accounting regime because of the discretion available to managers in avoiding recording impairments. The U.S. savings and loan (S&L) crisis is 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.

4. RESEARCH DESIGN AND VARIABLE MEASUREMENT

Kaufman and Scott (2000) defines systemic risk as "the risk or probability of breakdowns in an entire system, as opposed to breakdowns in individual parts or

components." There are two ways in which systemic risk can occur in the banking market (Staub 1999; Schroder and Schuler 2003). First, from a macro shock that can simultaneously impact several banks. For example, a cyclical downturn or a stock market crash can simultaneously have adverse effects on the entire banking industry. Second, systemic risk can occur as a result of contagion in the banking industry, i.e., an initial shock causes one bank to fail which subsequently leads to the failure of other banks.

Cifuentes et al. (2005) and Plantin et al. (2008) argue that fair value accounting increases systemic risk in the banking industry by introducing additional contagion. Additional contagion among banks increases the likelihood that poor performance spreads from one or more bank(s) to the entire network of banks, thereby increasing the risk of systemic failure in the network of banks. Therefore, to investigate whether fair value accounting is associated with an increase in systemic risk in the banking system, I examine whether a more fair value-oriented accounting regime is associated with increased contagion among banks.

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

Following 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. 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 banks can have serious negative consequences for the rest of the financial system participants, 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. 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 banks or the spread of financial difficulties from a few banks to the rest of the financial system.

FV_ALL measures the extent to which the accounting regime is fair value oriented. FV_ALL is the ratio of the sum of all assets and liabilities recognized or disclosed at fair value by the banks in my sample to the sum of total assets of these banks. I include both recognized and disclosed fair value amounts in the estimation of FV_ALL because Barth, Landsman, and Wahlen (1995) note that the Federal Deposit Insurance Corporation (FDIC) Improvement Act of 1991 requires regulatory accounting principles

be no less conservative than GAAP. So, unrealized fair value losses that may only be required to be disclosed and not recognized under GAAP could be used in the calculation of regulatory ratios by the bank regulators. For example, banks are required to deduct net unrealized holding losses on available-for-sale equity securities with readily determinable fair value in estimating tier 1 capital. Whereas, under GAAP firms are not required to deduct unrealized losses on available-for-sale securities in estimating net income.

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-9 report on a quarterly basis, I use the most recently filed FR Y-9 data to calculate FV_ALL for each month. 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 show what extent of bank balance sheets are accounted for using fair value.

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.

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. De Bandt and Hartman (2000) find 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 and because of omitted bank-specific characteristics, I include fixed-year effects and fixed-firm effects in my model.

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:

$$EXTREMENEG_{i,t} = \beta_1 + \beta_2 D\_BANKRET_t + \beta_3 FV\_ALL_t + \beta_4 D\_BANKRET_t * FV\_ALL_t + \beta_5 D\_ILLIQ_t + \beta_6 D\_BANKRET_t * D\_ILLIQ_t * FV\_ALL_t + \beta_7 MKTRET_t + \beta_8 TBILL_t + Fixed\text{-}Year\ Effects + Fixed\text{-}Firm\ Effects + error_{i,t} \quad (2)$$

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.

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.[8] 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 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

[8] 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.

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.[9]

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.[10] 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-9 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 data on CRSP.[11] In my sample there are 793 unique bank holding companies and a total

[9] 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

[10] Federal Register/ Vol. 72, No. 235/Friday, December 7, 2007/ Rules and Regulations available at http://www.fdic.gov/regulations/laws/federal/2007/07basel2dec7.pdf

[11] The Bank Holding Companies Database collects financial data included in the FR Y-9 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.

of 98,162 bank-month observations. Table 1 reports the summary statistics of the variables used in this study.

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 values 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 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.[12] 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 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.

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_BANRKET with D_FV_ALL and

[12] 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.

D_ILLIQ, and perform t-tests for differences in means. For the purpose of the unvariate 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 three test variables, D_BANKRET, 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.

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.

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 is not associated with an increase in bank contagion. However, 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. 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. Further, the positive 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 accounting) 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:

$$EXTREMENEG_{i,t} = \beta_1 + \beta_2 D\_BANKRET_t + \beta_3 FV\_ALL_t + \beta_4 D\_BANKRET_t * FV\_ALL_t + \beta_5 FV\_BANK_{i,t} + \beta_6 D\_BANKRET_t * FV\_BANK_{i,t} * FV\_ALL_t + \beta_7 MKTRET_t + \beta_8 TBILL_t + Fixed\text{-}Year\ Effects + Fixed\text{-}Firm\ Effects + error_{i,t} \quad (3)$$

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 all assets and 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) show that the interaction of mark-to-market accounting with externally imposed solvency requirements has the potential of increasing contagion in the financial system. They 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.[13] 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

Based on values of these ratios a bank is classified as well-capitalized, adequately capitalized, undercapitalized, significantly undercapitalized, or critically undercapitalized.

[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

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. Since the violation of capital adequacy rules can have serious consequences for the bank, strong efforts are made by banks' management keep their bank adequately capitalized.

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:

$$EXTREMENEG_{i,t} = \beta_1 + \beta_2 D\_BANKRET_t + \beta_3 FV\_ALL_t + \beta_4 D\_BANKRET_t * FV\_ALL_t + \beta_5 CAP_{i,t} + \beta_6 D\_BANKRET_t * CAP_{i,t} * FV\_ALL_t + \beta_7 MKTRET_t + \beta_8 TBILL_t + Fixed\text{-}Year\ Effects + Fixed\text{-}Firm\ Effects + error_{i,t} \quad (4)$$

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 introduced by 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. 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 all 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 gives 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 fair value accounting a) has worsened the credit crunch that has followed the Subprime crises, and b) should be suspended.

In this paper, my attempt is not to document the superiority of a historical cost-based accounting regime over one based on fair values. 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 illiquid markets 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.

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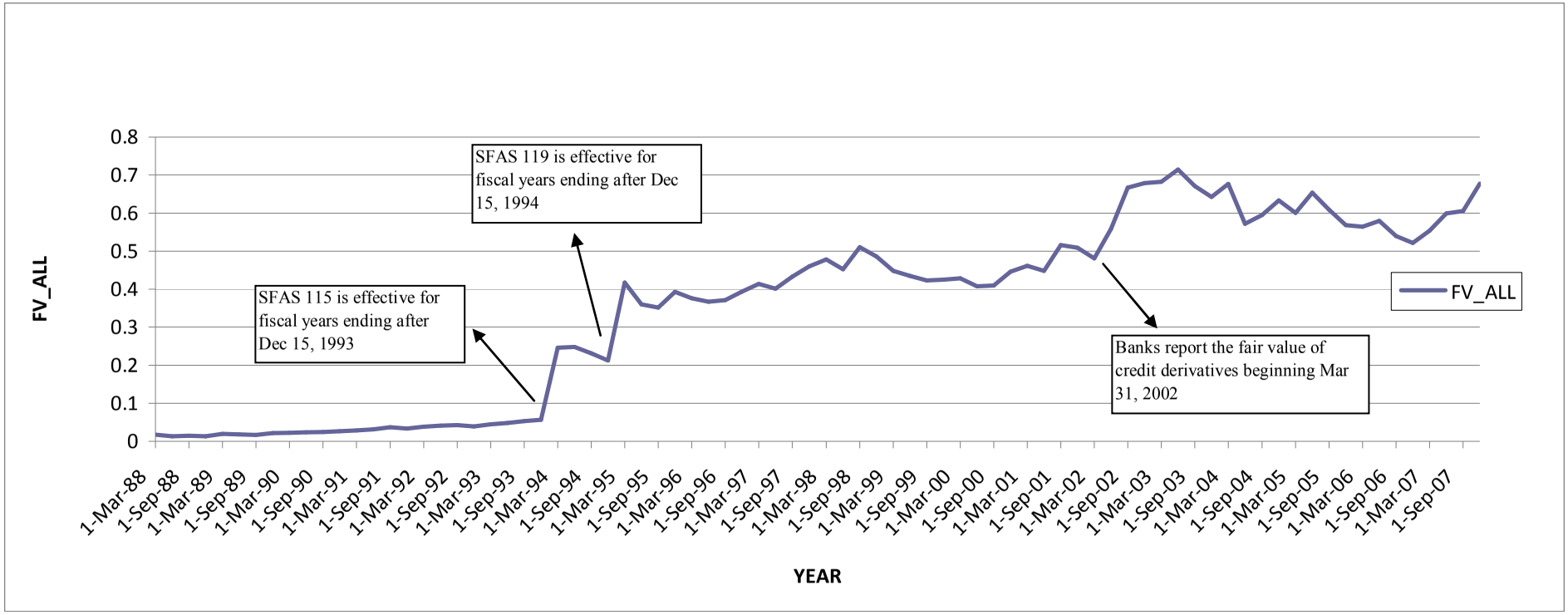
Figure 1: Trends in the Extent to which the Accounting Regime is Fair Value-Oriented over Time



Notes to Figure 1:
FV_ALL – Sum of all 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

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 all 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 all 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 - Bank Contagion and Fair Value Accounting

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:

$EXTREMENEG_{i,t} = \beta_1 + \beta_2 BANKRET_t + \beta_3 FV\_ALL_t + \beta_4 D\_BANKRET_t * FV\_ALL_t + \beta_5 MKTRET_t + \beta_6 TBILL_t + error_{i,t}$

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.

	Pred.	Model 1		Model 2		Model 3	
Independent Variables	**Sign**	**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 all 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 bank contagion and fair value accounting. 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.

	Pred.	Model 1		Model 2		Model 3	
Independent Variables	**Sign**	**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 all 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.

	Pred.	Model 1		Model 2		Model 3	
Independent Variables	**Sign**	**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 all 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 all 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.

	Pred.	Model 1		Model 2		Model 3	
Independent Variables	**Sign**	**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 all 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 four if a bank is classified as well-capitalized, three if a bank is adequately capitalized, two if a bank is undercapitalized, and one if a bank is significantly or critically undercapitalized
MKTRET – Monthly CRSP equally-weighted market return
TBILL – Monthly 3-month Treasury bill rate