Were Information Intermediaries Sensitive to the Financial Statement-based Leading Indicators of Bank Distress prior to the Financial Crisis?

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Abstract:

In this paper we address two questions that emerged in the aftermath of the 2008 financial/banking crisis. First, did the financial statements of bank holding companies provide an early warning of their impending distress? Second, were the actions of four key financial intermediaries (short sellers, equity analysts, Standard and Poor's credit ratings and auditors) sensitive to the information in the banks' financial statements about their increased risk and potential distress? We find a significant cross-sectional association between banks' 2006 4Q financial information and bank failures over 2008-2010, suggesting that the financial statements reflected at least some of the increased risk of bank distress in advance. The mean abnormal short interest in our sample of banks increased from 0.66 percent in March 2005 to 2.4 percent in March 2007 and the association between short interest and leading financial statement indicators also increased. In contrast, we observe neither a meaningful change in analysts' recommendations, Standard and Poor's credit ratings and audit fees nor an increased sensitivity of these actions to financial indicators of bank distress over this time period. Our results suggest that actions of short sellers likely provided an early warning of the banks' upcoming distress prior to the 2008 financial crisis.

JEL Classification: G01, G21, M41

Keywords: banking, analysts, short sellers, auditors, rating agencies, financial crisis

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1. Introduction

We address two questions linked to the speed and the scale of bank failures during the 2008 financial/banking crisis. The first is whether bank financial statements prior to 2008 provided an early warning of their upcoming distress. Commentators have argued that inadequate transparency in banks' financial statements allowed them to mask their deteriorating health (e.g., Herz 2008, Turner 2008, Norris 2009, Group of Thirty 2009, Rajan 2010, Linsmeier 2011). The second question is why few observers, specifically sophisticated financial intermediaries, foresaw impending problems at banks. We examine the actions of information intermediaries to provide evidence on whether they were sensitive to leading indicators of bank distress, especially those reported in the banks' publicly available financial statements.[1] Given bank regulators' interest in market-related oversight of financial institutions (Flannery, 1998), our evidence sheds light on the role of capital market discipline or oversight of banks.

Prior research has identified several financial statement-based leading indicators of bank distress and failure (Demirguc-Kunt 1989, FDIC 1997, Gonzalez-Hermassillo 1999, among others). We focus on two sets of such indicators: (i) variables shown by prior research to be associated with past bank failures; and (ii) variables identified as unique to the 2008-2009 financial crisis, based on a synthesis of research and comments made by academics, practitioners and regulators. We investigate whether these two sets of indicators, calculated from the banks' 4Q 2006 financials, are associated with bank failures during the period 2008-2010. Our intent is not

[1] To investigate this issue, the U.S. Congress set up hearings to probe whether financial intermediaries could have served as potential whistleblowers for the impending crisis (http://www.fcic.gov/hearings/ and http://www.house.gov/apps/list/hearing/financialsvcs_dem/cpthrg_05212010.shtml).

to develop a new model of bank failure or distress but instead to examine whether financial statement-based leading indicators of bank distress are associated with bank failures during the 2008 financial crisis.

We then investigate the association between these indicators and short interest, analysts' recommendations, credit ratings of bank holding companies provided by Standard and Poor's (S&P) and audit fees in the period leading up to 2008. To account for the availability of value-relevant information from sources other than financial statements, we control for contemporaneous stock returns, the sensitivity of bank stock returns to changes in the index of credit default swaps (CDS) and other market-based variables such as idiosyncratic risk, returns momentum and the book-to-market ratio. Of course, we cannot rule out the possibility that short sellers and other intermediaries we examine used financial statement indicators in conjunction with some other market indicators that are untested in this paper.

Our results show that several financial statement indicators measured in 4Q 2006 are significantly associated with bank failures during the 2008-2010 period suggesting that financial statements did reflect some of the risks that were building up prior to 2008. In terms of the actions of the intermediaries, we find an increase in the level of abnormal short interest from 0.66 percent in March 2005 to 2.4 percent in March 2007, and to 4.48 percent in March 2008. We also find a cross-sectional association between the level of abnormal short interest in March of 2005, 2006 and 2007 and the financial statement indicators in 4Q 2004, 4Q 2005 and 4Q 2006. Moreover, the explanatory power of the financial statement indicators for variation in abnormal short interest increases over time. These results suggests that (i) the information set of short sellers was correlated with information in banks' financial statements; and (ii) short sellers apparently recognized impending financial distress in banks before the crisis unfolded. In contrast, there was little or no change, on average, in equity analysts' recommendations over the period March 2005 to March 2008 and no meaningful change in the cross-sectional association between their

recommendations and banks' financials over time. These findings suggest that sell side analysts' recommendations were not sensitive to the information in the banks' financial statements.

We do not observe either a meaningful change in the average S&P credit rating for our sample or an increase in average audit fees over this period, and we do not find a consistent cross-sectional association between financial statement indicators and credit ratings or audit fees. However, our sample contains only 59 bank credit ratings. As to audit fees, one can argue that the job of an auditor is to certify whether financial statements are prepared in accordance with Generally Accepted Accounting Principles (GAAP) and not to opine on the future performance.

Finally, we investigate the lead-lag relation between the quarterly time-series observations of short interest and (i) analysts' recommendations and (ii) credit ratings using a bivariate panel-data vector auto-regression (VAR) methodology. Our results show that actions of short sellers appear to lead analysts' recommendations and credit ratings appear to lag analysts' recommendations. This evidence suggests that short sellers were the first to react to the increased buildup of risk at the banks followed by analysts, with credit ratings slowest in responding to financial statement information about bank distress.

Our findings contribute to the debate on the predictability of bank distress, oversight of financial institutions and the regulation of financial intermediaries. First, our work suggests that financial statements provided leading indicators of impending bank distress and therefore were not as uninformative as some commentators had suggested. Second, our findings suggest that actions of short sellers can be informative for bank regulators. If so, arguments for restrictions on short selling proposed by politicians, regulators and CEOs (e.g., Senators Kaufman, Isakson, Tester and Specter 2009, Mack 2008, Fuld 2008) need to be tempered in light of the evidence that short sellers were sensitive to red flags of the upcoming bank distress and their actions provided a timely warning about that distress.

Finally, we provide evidence that compares the actions of four intermediaries in their

sensitivity to the indicators of an upcoming crisis. These results raise questions about why some intermediaries responded more slowly than others to information about increasing risk at the banks, including information in publicly available financial statements.

The rest of the paper is organized as follows. Section 2 presents background discussion related to claims about the crisis and the incentives of the four investigated intermediaries. Section 3 lays out the empirical methodology. Section 4 reports results from our empirical work and section 5 concludes.

2. Institutional Background

Predictability of bank failures and banking crisis

A significant body of research has examined whether bank failures and banking crises can be forecasted using firm-specific indicators usually derived from banks' financial statements. Prior research in financial economics (e.g., FDIC 1997, Gonzalez-Hermosillo 1999, and other papers cited in sections 3.2 and 3.3) has identified financial statement-based indicators of distress that capture credit risk, market risk, interest rate risk, liquidity risk and moral hazard risk. In addition, Rajan (2005) relied partly on financial statements to warn that banks were becoming riskier despite the growth of securitization that was meant to take risky loans off the banks' balance sheets. Hence, one should expect to see information about impending bank failures or distress in banks' financial statements.

Instead, several observers have argued that banks' financial statements, leading up to the 2008 crisis, did not adequately reflect their risk, especially their exposures to risky assets such as asset backed securities, and such lack of transparency affected both the pricing of these securities and pricing of banks' stocks which contributed to the financial crisis (Shadow Financial Regulatory Committee 2008, Herz 2008, Turner 2008, Norris 2009, Group of Thirty 2009, Rajan 2010, Doty 2011, Linsmeier 2011, among others). However, consistent with prior work, we find

that bank-specific financial statement indicators are significantly associated with subsequent bank failures. This result raises the question of whether market participants were sensitive to this information.

The role and incentives of the information intermediaries

We focus on the observable actions of four intermediaries - short sellers, equity analysts, a credit rating agency (S&P) and auditors - to evaluate whether their actions are linked to distress indicators from the banks' financial statements.[2] These intermediaries obtain information about firms from sources that include financial statements and then express their views in the form of some action. Short sellers, if their view is sufficiently bearish, will short the stock and their actions, in turn, inform the trading decisions of other investors. Equity analysts release their opinions in the form of recommendations. A credit rating agency's action can take the form of a rating change if it believes the information indicates a sufficiently large change in the probability of default. Auditors can issue a going concern opinion modification if they believe the bank's survival is in doubt or price-protect themselves from potential reputational and litigation risks by increasing their audit fees. Thus, actions of each of these intermediaries can provide information about banks' future performance.

Short sellers

We examine the actions of short sellers for three reasons. First, the regulatory apparatus

[2] We do not examine the actions of audit committees, boards of directors or bank regulators because their decisions are not readily observable. We do not investigate the bond market because bond prices are available for only 31 bank holding companies. The credit default swaps (CDS) market participants would qualify as another potential intermediary that could have identified bank distress. We do not formally examine changes in CDS spreads because CDS contracts are available only for eight bank holding companies in our sample. On the issue of other intermediaries, Ryan, Tucker and Zhou (2014) show that insiders exploited their informational advantage related to the profitability of securitized transactions.

overseeing banks and capital market oversight of such institutions are complements (Flannery 1998). Thus, evidence on the actions of short sellers as a component of capital market oversight of U.S. banks is likely to be of interest to bank regulators. Second, a number of CEOs [John Mack (2008) of Morgan Stanley and Dick Fuld (2008) of Lehman Brothers] and Congressmen (Kaufman, Isakson, Tester and Specter 2009) have questioned the "watchdog" role played by short sellers, arguing, for instance, that short sellers caused declines in stock prices and precipitated the bank crisis, instead of providing a timely warning thereof. Third, prior research has shown that short sellers are able to identify overvalued stocks (Dechow et al. 2001, Desai et al. 2002, Hirshleifer, Teoh and Yu 2011) and are sensitive to poor earnings quality (Desai et al. 2006). This suggests that short sellers could have been expected to be sensitive to the build-up of risks in the banking system prior to the recent crisis.

Our empirical measure of short sellers' action is monthly short interest reported on NYSE and NASDAQ. We examine whether short positions (the level of short interest) increased prior to 2008 and if so, whether the increase in short interest is related to financial statement indicators of bank distress. Evidence of association between short interest and these indicators would weaken the case for opaque financial statements and/or unfair targeting of banks stocks by short sellers.

Sell side equity analysts

A large body of prior work finds that the market responds to changes in recommendations of sell-side equity analysts, suggesting that analysts impound value relevant information in forming or revising their recommendations (for example, Womack 1996).[3] Hence, one would

[3] We do not emphasize earnings forecasts because these are typically available for one quarter at a time. Recommendations, on the other hand, are likely to reflect the analyst's expectation of the stock's performance over a horizon longer than a quarter. In untabulated analyses, we find that none of the financial statement-based variables measured in Q4 2006 is significantly associated with forecast dispersion in the predicted direction. The only variable significant in that regression

expect that analysts' recommendations should be sensitive to financial statement indicators of bank distress. However, a long standing concern in the literature is that sell-side analysts suffer from potential conflicts of interest (e.g., Lim 2001, Francis and Philbrick 1993) and tend to be optimistic in both their earnings forecasts and stock recommendations, especially for their employers' investment banking clients or potential clients (e.g., Lin and McNichols 1998, Michaely and Womack 1999, Dechow, Hutton and Sloan 2000).

Our empirical measure of sell-side analysts' view is the average analyst recommendation for the month (*MEANREC*).[4] We also examine the recommendations of affiliated and un-affiliated analysts to examine whether conflicts of interests affected affiliated analysts' recommendations.

Rating agencies

A U.S. Senate subcommittee report dated April 13, 2011 identified inaccurate credit ratings as a cause of the 2008 financial crisis (Wall Street and Financial Crisis: Anatomy of Financial Collapse 2011). The report alleges that conflicts of interests resulting from the "issuer pays" model resulted in credit rating agencies weakening their standards and competing to provide the most favorable rating to achieve greater market share and higher revenue.[5] While much of the criticism faced by the rating agencies relates to their ratings of structured products, we examine the ratings of bank holding companies, partly because machine readable data for structured products are not available. Moreover, we reason that this was a real estate driven crisis, starting

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is the book-to-market ratio. However, only 155 bank holding companies have four or more analysts' earnings forecasts to calculate forecast dispersion.

[4] Our results are robust to using the percentage of analysts' "Sell" recommendations for the month as a measure of analysts' action. Because analysts are more likely to use "Underperform" or "Hold" to express negative views, we argue that *MEANREC* better reflects the change in analysts' opinions.

[5] Beaver et al. (2006) point out that ratings of Egan Jones Ratings Co. (EJR), which are paid for by investors, will be more sensitive to information while ratings of agencies such as S&P, which are paid for by issuers, may not respond in a speedy manner to adverse information. Data limitations cause us to rely on ratings issued by S&P.

with the decline in housing prices which began in July 2006, and banks had significant risk exposure to real estate and AAA rated structured products backed by real estate loans.[6] We argue that rating agencies should have been sensitive to the buildup of concentrated real-estate related risks at the bank holding company level.

The counter argument against the charge of lowered rating standards is that rating agencies simply made an honest mistake. Skreta and Veldkamp (2009) point out that all rating agencies potentially underestimated the correlation of defaults, particularly in residential mortgage-backed securities. Moreover, rating agencies insist that their ratings are only as good as the information they receive (Sy 2009).

Our empirical measure of rating agencies' view is the monthly S&P domestic long term issuer credit rating from COMPUSTAT. The data are available for only 59 banks, precluding a detailed analysis of the timeliness of credit ratings in predicting bank failures.

Auditors

Although one can argue an auditor is not expected to opine on its client's performance, including in the case of banks, liquidity, capital adequacy or risks (Doty, 2011), some have asserted that auditors should have been sensitive to the risks accumulating at the banks (Bajaj and Creswell 2008, Sikka 2009). For example, the court examiner in New Century Financial's bankruptcy case concluded that its auditor (KPMG) was not skeptical enough and that creditors could pursue charges of negligence. KPMG subsequently settled the case for $44.75 million. Critics of the audit profession also allege that auditors are too beholden to their clients, because of the large audit fees at stake, to be objective about their audit opinions. In addition, Arnold (2009)

[6] For example, Acharya and Richardson (2009) point out that 47% of major banks' assets are real estate related (for smaller banks the percentage is 67%). Furthermore, they state that almost 30% of all AAA rated asset-backed securities remained within the banking system. That percentage is 50% when the assets of ABCP conduits and structured investment vehicles (SIVs) affiliated with the banks are considered.

reports that the major accounting firms, as advisers to investment banks, performed due diligence work and offered accounting and tax advice on off-balance sheet entities and securitizations, and assisted with setting up several trillion dollars of investments in mortgage backed securities (MBS) and collateralized debt obligations (CDOs).

Regardless of their professional obligation, one would expect auditors to be sensitive to increased client risk, which should result in higher audit fees. Prior literature finds that audit fees are a function of audit effort and audit risk, and that audit fees are responsive to client risk (O'Keefe et al. 1994, Bell et al. 2001). Bedard and Johnstone (2004) show that audit firms increase their fees in response to higher earnings management and corporate governance risk of their clients. This research suggests that audit fees should increase in response to the increased risk of bank failure reflected in banks' financial statement-based indicators. Accordingly, we use audit fees (*LOGAUDITFEE*) as a continuous measure of risk perceived by the auditor.

3. Data and Methodology

Sample and data sources

We obtain quarterly financial data from regulatory Y-9C reports filed by U.S. bank holding companies with total consolidated assets of $150 million or more with the Federal Reserve.[7] As Chen, Liu and Ryan (2008) point out, Y-9C reports provide "far more standardized and detailed" information about banks than financial report data. All of our financial statement leading indicators are constructed using data items in the Y-9C report. The appendix provides definitions of these indicators, as well as details on how we obtain and calculate short interest (*SI_RATIO*), analyst recommendation (*MEANREC*), S&P credit rating (*RATING*) and audit fee (*LOGAUDITFEE*).

[7] The total asset threshold was increased to $500 million beginning March 2006. We have replicated all our results on a constant sample of banks for the time periods examined as well as requiring all sample banks to have total assets of at least $500 million during 2004-2006.

The consolidated financial statements for bank holding companies (form Y-9C) are required to be submitted within 40 calendar days after the end of calendar quarters such as March 31, June 30, and September 30 ("as of" dates) and within 45 calendar days after the December 31 quarter end "as of" date.[8] We measure short interest, analyst recommendation and credit rating in the third month after the end of the bank's Y-9C reporting quarter so that short sellers, analysts and credit rating agencies have about a month to take positions or update their recommendations (ratings) after the banks' quarterly financial statements become publicly available.[9] Auditor variables are matched with the Y-9C data of each bank-quarter by requiring the signature date of the auditor opinion to fall in the three-month window starting from the end of the Y-9C report quarter.[10] Following prior literature, institutional ownership and momentum returns are matched to the short interest report month. All other variables are measured on the Y-9C report "as of" date.

Financial statement variables identified in previous research assessing bank risk

Prior work (for example, Gonzalez-Hermosillo 1999) has argued that five major risks affecting banks are (i) credit risk (default); (ii) market risk, the risk that the bank's loan portfolio is concentrated in sectors subject to boom-bust cycles; (iii) liquidity risk, the vulnerability to a liquidity shock stemming from the mismatch in the bank's liquid liabilities and illiquid assets; (iv) interest rate risk due to the duration mismatch of the bank's assets and liabilities; and (v) moral

[8] The Federal Reserve requires bank holding companies to prepare consolidated financial statements as of the end of the calendar quarter, regardless of their actual fiscal year ends.
[9] For example, the Y-9C report as of December 31, 2006 has to be filed with the Federal Reserve by February 14, 2007, and our variables of interest, short interest, credit rating and analysts' recommendations, are measured in March 2007. Since short positions reported are as of settlement on the 15th of each month, or the preceding business day if the 15th is not a business day, short interest as of March 15, 2007 or earlier will be matched with the accounting data as of December 31, 2006. We allow the analysts' recommendations (and credit ratings) to be updated as late as March 31, 2007, potentially granting them an edge over the short sellers.
[10] Auditor opinions and audit fees are reported annually. In most cases they are matched with financial statement information as of December 31 on the Y-9C report. The auditor's opinion date could be as late as March 31, 2007 for the matched financial statement information as of December 31, 2006.

hazard risk from excessive reliance on loans with upfront fees or high interest rates when default risk is transferred to a third party. We review prior research to identify indicators expected to be correlated with these risks or signs of distress in a bank. These variables are discussed next.

The FDIC (1997) finds that loans-to-total assets ratio (*LAS*) was a significant predictor of U.S. bank failures during 1980-1988. We use this ratio as an indicator of credit risk, along with the ratio of non-performing loans to total loans (*NPL*).[11] Managers have relatively little discretion over this measure as loans that are more than 90-days past due are classified as non-performing (Liu and Ryan 1995). Higher market risk arises from a concentration of loans in sectors prone to booms and busts or in sectors where returns earned by the bank exceed those earned by the market as a whole. Given that the real estate bubble was a major contributor to the recent crisis, we use the following three ratios to capture market risk: (i) *LCOMRE*: the ratio of construction loans plus loans secured by multifamily, nonresidential, and farm real estate to total loans; (ii) *LRESI*: the ratio of residential loans secured by 1-4 family real estate to total loans; and (iii) *LCON*: the ratio of consumer loans to total loans. Barth, Beaver and Landsman (1996) and Liu and Ryan (1995) suggest that loan portfolios affect default risk.

Relying on prior research (Flannery and James 1984, Avery and Berger 1991, Schrand 1997 and Chen, Liu and Ryan 2008), we capture interest rate risk using the short-term maturity mismatch of the bank's assets and liabilities (*GAP*). We calculate this mismatch as the absolute value of the difference in assets and liabilities expected to re-price within the next 12 months scaled by total assets.

Following Gonzalez-Hermosillo (1999), we use the ratio of large certificate of deposits ($100,000 or more) to total assets to capture liquidity risk (*DEPLGE*). Large deposits are unlikely

[11] *NPL* has been used by prior work such as Beaver et al, 1989, Barth, Beaver, and Stinson 1991, Wahlen 1994, Beatty, Chamberlain, and Magliolo 1995, and Peek and Rosengren 1997 among others. We also considered loan loss provisions/allowance and loan charge offs in un-tabulated work. These variables do not outperform *NPL*.

to be FDIC insured and are hence more likely to be recalled by depositors at the first hint of trouble.

Akerlof and Romer (1993) suggest that banks might be willing to lend money on projects with a small probability of a positive payoff if the loan carries either or both large origination fees and high interest. The incentive to lend money on such projects is expected to be higher when a third party is expected to bear the future credit losses. We represent this type of moral hazard using the ratio of interest and fee income on loans and leases to total loans, *INTAS*.

Indicators of concerns related specifically to the 2008 financial crisis

To identify variables specifically associated with the 2008 crisis, we rely on comments by regulators, practitioners and academics (see Rajan 2005, Herz 2008, Kashyap et al. 2008, Acharya and Schnabl 2009, Diamond and Rajan 2009, Acharya, Schnabl and Suarez 2010 and Financial Crisis Inquiry Commission 2010). We identify two factors that contributed to increased risk of bank failures: (i) moving from an "originate to hold" model in which banks originate loans and hold them on their balance sheets to an "originate to distribute" securitization model, in which banks remain exposed to risks in off-balance sheet securitized loans; and (ii) reliance on off-balance sheet entities to hold risky assets and engage in regulatory arbitrage. We particularly focus on measures of banks' involvement in securitization of residential mortgages, off-balance sheet commitments to fund real estate and the holdings of capital-light assets.[12]

We measure banks' involvement in securitization using the outstanding principal balance of 1-4 family residential loans sold and securitized with servicing rights retained or with recourse or

[12] We acknowledge that some concerns related to the 2008 crisis might overlap with traditional sources of risk discussed earlier (e.g., "originate to distribute" could be considered a form of moral hazard).

other seller-provided credit enhancements, scaled by total assets (*SEC_RESI*). [13] We expect *SEC_RESI* to be positively associated with banks' risk.[14]

Acharya and Schnabl (2009) argue that banks used two credit risk transfer mechanisms to circumvent regulatory requirements. First, banks set up off-balance sheet asset-backed commercial paper conduits (ABCP) to hold assets that otherwise would have been held on their balance sheets. To attract investors, banks provided liquidity enhancements and credit enhancements to support these conduits. Such enhancements, treated as capital-light under the capital requirements, allowed banks to increase their effective leverage. Second, banks switched from holding loans to holding AAA-rated tranches of CDOs and collateralized loan obligations (CLOs) which had a lower capital charge because of their AAA ratings but offered a higher return than other AAA rated securities. Diamond and Rajan (2009) argue that higher returns coupled with low capital charges caused banks to become large investors in these securities resulting in (i) an increased exposure to these securities; and (ii) concentration of risks such as credit risk and

[13] Consistent with prior work (e.g., Niu and Richardson 2004, Chen, Liu and Ryan 2008), we considered other proxies for securitization activity such as securitized consumer loans, non-performing securitized loans, and retained interests from asset securitizations (measured as the sum of interest-only strips and subordinated asset-backed securities) scaled by total securitized assets. We did not use these measures because they are highly correlated with *SEC_RESI* and with one another. For instance, the Spearman correlation between *SEC_RESI* and retained interest is 0.71, between *SEC_RESI* and non-performing securitized loans is 0.73, between *SEC_RESI* and securitized consumer loans is 0.53 and between securitized consumer loans and non-performing securitized loans is 0.80 in our sample. Consistent with our findings, Chen, Liu and Ryan (2008) reports a Spearman correlation of 0.93 between securitized consumer loans and non-performing securitized consumer loans for their sample.

[14] Following the assertion in Herz (2008) that managers tend to avoid recognizing fair value based impairments, we computed two variables based on fair value data. First, we considered the sum of amortized cost of held-to-maturity securities and available-for-sale securities scaled by the sum of the fair value of held-to-maturity securities and available-for-sale securities, as a measure of the unrecognized fair value impairments. Second, we considered the sum of FAS 157 based level 2 and level 3 fair value assets drawn from COMPUSTAT Bank Quarterly tapes and scaled by total assets, as a proxy for illiquid assets that are more susceptible to unrecognized impairments. We do not tabulate results using these two variables because data on fair values under FAS 157 is not available for most banks on COMPUSTAT until March 2008. Moreover, the book-to-market ratios of securities exhibit very little cross-sectional variation and are tightly clustered around one.

market risk in the banking sector instead of spreading these risks to the other sectors or investors best capable of bearing these risks.

To capture such regulatory arbitrage, we construct a variable *REG_ARB*, defined as the sum of total assets, derivatives and off-balance sheet items in the 20 percent risk weight category, divided by the sum of total assets, derivatives and off-balance sheet items in all risk weight categories. The intuition is that banks holding a greater proportion of assets assigned a smaller risk weight as per Basel I capital guidelines and hence a lower charge for capital (capital-light assets) are more likely to have engaged in regulatory arbitrage. We expect *REG_ARB* to be positively associated with the probability of bank distress.

To capture banks' off-balance exposure to real estate, a sector characterized by significant overinvestment in the period leading up to the crisis, we create a variable *COMMIT_RE*, which measures banks' off-balance-sheet commitments to fund commercial real estate, construction and land development, scaled by total assets. We expect this variable to be positively associated with banks' distress risk.[15]

Finally, we include banks' Tier 1 leverage ratio (*TIER1_LEV*) in all specifications.[16] However, prior evidence on the association between banks' regulatory capital ratios and risk is

[15] We considered two other proxies for off-balance sheet structures, but we decided not to pursue them because of very limited data availability. First, we obtained reports by the rating firm Moody's on ABCP administrators published between March 1999 and March 2007. However, that report is restricted to the top 20 such administrators. Hence, the ABCP variable was populated for a handful of banks in our sample. Second, to ascertain exposure to SIVs in general, we obtained a report published by Credit Suisse First Boston (2003) on the anticipated impact of FIN 46, Consolidation of Variable Interest Entities, on S&P 500 firms based on these firms' public disclosures. FIN 46 provides guidance on whether a firm should consolidate an off-balance sheet entity and was effective from July 1, 2003. The report identifies the maximum potential VIE liability amount expected to be brought on-balance sheet as reported by firms. Again, this measure of FIN46 liabilities is available for only one year in the sample (2003) and is also not populated for most of the banks in our sample. We acknowledge that we might have handicapped the predictive ability of financial statement indicators by not incorporating explicit proxies for ABCPs and SIVs in our analysis.

[16] We also included risk based capital ratios. Results are virtually identical as these ratios are highly correlated.

inconsistent (Berger and Bouwman 2012); hence similar to Chen et al (2008), we make no prediction about the association between Tier 1 leverage and bank distress.

Control variables

In all regressions where intermediaries' actions are dependent variables, we use contemporaneous stock return for the holding period relevant to that test (*CUR_RET*) as a control for information other than that captured by financial statement indicators. As a further control for non-accounting information that intermediaries might have, we rely on Knaup and Wagner (2012) and construct an ex-ante market-based measure of banks' exposure to credit risk (credit risk indicator or *CRI*). *CRI* is available starting in 2006 and can be thought of as the sensitivity of bank stock returns to an index of credit default swap (CDS) contracts.[17] In addition, we include control variables to account for well-established relations from prior literature such as bank profitability (*NI*) and bank size (*SIZE*).

In our analysis of short interest levels, we further control for firm characteristics that have been shown to influence the level of short interest such as book-to-market ratio (*BTM*), institutional ownership (*INSTHOLD*) and return momentum (*MOMRET*).[18] To ensure comparability, we include the same set of variables in the regression of analysts' stock

[17] In un-tabulated analyses, we also constructed an *ABX_BETA* or the sensitivity of the bank's daily returns to changes in Markit ABX.HE.BBB.06-2 index (calculated similar to *CRI*, after controlling for market return and interest rate changes) to proxy for the expected future performance of sub-prime mortgages in particular and the housing market in general. We estimate *ABX_BETA* over the two-quarter window starting October 1, 2006 and ending March 31, 2007, to match financial statement information as of the 4th quarter of 2006. Our Table 3 results are virtually unchanged after including *ABX_BETA*. We also interact *ABX_BETA* with *LCOMRE* and *LRESI* (banks' exposure to the two real estate asset classes); the interaction coefficients are not significant. In fact, *ABX_BETA*, on its own, does not predict bank failures. The inclusion of *ABX_BETA* is useful in addressing the unavailability of data related to a bank's exposure to subprime mortgages and home equity loans during our sample period.

[18] Because institutional ownership is correlated with size (the Spearman correlation between *INSTHOLD* and *SIZE* is 0.74 in our sample), we drop *SIZE* from the regression analysis. The results are similar and our inference is not sensitive to the exclusion of *SIZE* from the regressions.

recommendations as in the short interest regression.

In the regression analysis of credit ratings, we follow Ahmed et al. (2002) and use book-to-market ratio (*BTM*), idiosyncratic equity risk (*STDRESID*), profitability (*NI*) and the log of total assets (*SIZE*) as control variables. Finally, following Hribar et al. (2014), we control for profitability (*NI*), *SIZE*, book-to-market ratio (*BTM*), and idiosyncratic equity risk (*STDRESID*) as determinants of audit fees.

4. Results

Summary statistics

To control for potential seasonality and to facilitate comparison, we focus on the fourth quarter financials (4Q, measured as of December 31) of each year 2004-2007, and examine the actions of short sellers and analysts in March of the following year. We stop in 2007 because (i) stock prices of banks fell precipitously in late 2008; (ii) we want to examine whether financial statements issued prior to 2008 reflected increased bank risk and whether the information intermediaries appreciated such risk. Moreover, Ryan (2008) states that problems with subprime mortgages became apparent "no later than the middle of 2006" and that the first wave of the crisis hit in February 2007.

Table 1 reports mean short interest, mean analyst recommendation, mean credit rating and mean audit fee from March 2005 to March 2008 for the full sample. [19] Mean short interest increases from 1.13 percent in March 2005 to 1.56 percent in March 2006 and then spikes to 2.86

[19] There is no look-ahead bias in our analysis as we ensure that the actions of intermediaries are measured after the public availability of financial statement information. Because bank holding companies are required to file Y-9C reports within 45 calendar days after December 31 of each year, the corresponding short interest, analysts' recommendations, credit ratings and audit fee are measured in March of the subsequent year.

percent in March 2007 and to 4.96 percent in March 2008.[20] Table 1 also reports statistics for the sample of banks that failed subsequently (2008-2010). The increase in short interest for the failed bank sample is even higher. For example, the mean short interest in banks that failed was 1.38 percent in March 2005, 4.11 percent in March 2007 and 7.78 percent in March 2008. These data suggest that short sellers were able to identify, ex-ante, banks whose performance was expected to deteriorate.

[Insert Table 1 about here]

Our primary analysis focuses on abnormal short interest as it controls for firm characteristics that have been shown to be associated with short interest. Following Karpoff and Lou (2010), we calculate ABSI_5F, or abnormal short interest, which is the residual monthly short interest ratio after adjusting for five factors: firm size, book-to-market ratio, and momentum, and two additional variables that have been shown to be related to short-sale constraints: turnover and institutional ownership (see the Appendix for variable details). The results show that sample-wide abnormal short interest increased from 0.66 percent in March 2005 to 2.40 percent in March 2007 and to 4.48 percent in March 2008. Abnormal short interest for failed banks increased from 0.95 percent in 2005 to 3.68 percent in March 2007 and then almost doubled to 7.34 percent in March 2008.

In contrast, we fail to observe any meaningful change in the mean analyst recommendation over this period. The mean analyst recommendation score was 2.63 in March 2005, 2.68 in March 2007 and 2.69 in March 2008. An examination of recommendations for the failed bank sample shows that the mean recommendation score was 2.62 in March 2005, 2.65 in March 2007 and 2.83 in March 2008. Because a score of 2 denotes "Buy," 3 denotes "Hold," 4 denotes "Underperform"

[20] The mean short interest for the Compustat sample (excluding our sample) in March 2005/2006/2007/2008 is 2.92%, 3.08% and 4.10% and 5.34%, respectively. Although, the average short interest in banks is smaller than average short interest in other firms, the increase for the banks is more pronounced around the financial crisis.

and 5 denotes "Sell," as late as March 2008, the average analyst recommendation was somewhere between "Buy" and "Hold." Thus, it appears that although short sellers were becoming increasingly pessimistic about the banking sector, analysts did not appear to share that view, at least as reflected in their recommendations.

Finally, mean credit ratings and mean audit fees remained essentially flat during March 2005 to March 2008. The mean credit rating (*RATING*) from March 2005 to March 2007 was constant at 7.28 (between "A" and "A+") and improved half a notch to 6.78 (between "A+" and "AA-") in March 2008. Mean audit fees increased from $1.77 million in March 2005 to $1.88 million in March 2008. For the failed bank sample, the mean credit rating became stronger over time, going from 7.5 (between "A" and "A+") in March 2005 to 7 ("A+") in March 2008. Similarly, mean audit fees also decreased over time for the sub-sample of failed banks. Untabulated data show that auditors issued one going concern opinion for our sample banks in 2005 and no going concern opinions for 2006 and 2007.

One feature of the recent crisis was that the performance of subprime mortgages and home equity loans deteriorated before that of other less risky varieties such as Alt-A and commercial mortgage loans. However, during our sample period, banks did not disclose their exposures to these instruments in their Y-9C reports. To provide some evidence on this issue, we use the geographical focus of banks' lending activities. We identified banks headquartered in the four states that experienced major housing bubbles (California, Nevada, Arizona and Florida). We assume these banks are most likely to be exposed to the subprime crisis. In untabulated analyses we find that short interest in Q4 of 2006 was statistically higher for banks located in these states and there was no discernible difference in the actions of the other three intermediaries for these banks. Also, the ABX Index, introduced in January of 2006 to price sub-prime risk, is virtually flat until January 22, 2007 and does not drop significantly until June 2007. However, short interest started going up much earlier than the decline in the ABX index suggesting that short

sellers relied on other indicators of performance of sub-prime mortgages and the housing market.

In un-tabulated analysis, we also find that the credit default swaps (CDS) spread curves, available for eight banks in our sample, are virtually flat up to June 2007. The CDS spreads jump to a higher level in July 2007 and onwards. Furthermore, for most of the eight banks, CDS spreads are mostly flat from July 2006 to December 2006, in contrast to the steady increase in short interest during the same period, when the risk in the banking sector was increasing. In sum, it is not obvious that investors in the ABX and CDS markets, unlike short sellers, were sensitive to the risks building up in the banking sector.

In general, the univariate statistics suggest that short sellers viewed the valuation of bank stocks as increasingly unsustainable in the months leading up to the crisis. In contrast, the actions of other information intermediaries do not appear to indicate they were concerned about the sustainability of the banking sector's performance.

Turning to financial metrics of bank distress, we find that some indicators of banks' fragility related to credit risk, market risk, interest rate risk and liquidity risk increased during our sample period. Panel B of Table 1 shows that for the full sample, the average ratio of total loans-to-total assets (*LAS*) increases from 0.65 in Q4 2004 to 0.71 in Q4 2007. The biggest driver of this increase appears to be the ratio of commercial real estate loans to total loans (*LCOMRE*), which increased from 0.44 in Q4 2004 to 0.50 in Q4 2007. The ratio of non-performing loans to total loans ratio (*NPL*) increases sharply from Q4 2005 (0.66 percent) to Q4 2007 (1.21 percent) suggesting a spike in credit risk in 2007. Liquidity risk, proxied by banks' reliance on large unsecured deposits (*DEPLGE*), also increases from 0.12 in Q4 2005 to 0.16 (0.14) in Q4 2006 (Q4 2007). The absolute value of GAP shows a decline from 0.18 in Q4 2006 to 0.15 in Q4 2007 suggesting a decrease in asset/liability maturity mismatch. Activity in loans that result in higher upfront fees and commissions, as indicated by *INTAS*, also increased over the sample period from 6 percent in Q4 2004 to 7 percent in Q4 2007.

Turning to indicators associated with 2008 crisis, we find that banks' off-balance sheet commitments to fund real estate, construction and land development (*COMMIT_RE*) increased from 5 percent of total assets in Q4 2004 to 6 percent in Q4 2007, consistent with growing exposure to commercial real estate – both on and off-balance sheet. In contrast, our measure of regulatory arbitrage (*REG_ARB*) decreased during the same period. Finally, the ratio of residential loans securitized with recourse to total assets (*SEC_RESI*) increased from 0.76 percent in Q4 2005 to 0.97 percent in Q4 2006, then declined to 0.85 percent in Q4 2007.

Panel B of Table 1 also reports the same variables for the sample of 30 bank holding companies that failed from 2008 to 2010. The increase in risk suggested by the leading financial statement indicators is clearer for this sample. For example, mean *NPL* increases from 0.56 percent in Q4 2004 to 2.08 percent in Q4 2007; mean LCOMRE increases from 0.63 in Q4 2004 to 0.72 in Q4 2007; and *DEPLGE* increases from 0.14 in Q4 2004 to 0.19 in Q4 2007. The loans-to-total assets ratio increases from 0.72 in Q4 2004 to 0.79 in Q4 2007. In panel C of Table 1, we report summary statistics for the control variables. Two variables exhibit notable changes over time. The book-to-market ratio increases from 0.52 at the end of 2004 to 0.60 by the end of 2006 and to 0.88 by the end of 2007, consistent with the banks' deteriorating performance. Stock return momentum decreases from 14 percent at the end of 2004 to 5 percent by the end of 2006 and to -14 percent by the end of 2007. Overall, the descriptive statistics suggest that various financial statement indicators revealed increased risk taken on by banks over the period 2004-2007, with a particularly large increase in 2006 and 2007.

Table 2 reports Pearson and Spearman correlations among all the independent variables as of Q4 2006. We find that abnormal short interest is positively related with many of the financial indicators of risk such as *NPL*, *LCOMRE* and *INTAS*. It is also positively correlated with proxies for banks' involvement in securitizations (*SEC_RESI*) and off-balance sheet exposure to real estate (*COMMIT_RE*). Analysts' recommendations and S&P's credit ratings are also generally

positively correlated with these indicators (a higher numerical score implies a weaker recommendation and a weaker rating). Finally, *NPL* is positively associated with moral hazard risk (*INTAS*) and banks' involvement in securitization.

[Insert Table 2 about here]

Validation of the indicators

We validate the proposed financial statement indicators by documenting their cross-sectional association with subsequent bank failures and four other measures of financial distress (future delisting for performance reasons, future stock returns, future stock return volatility, and future ROA). In model (1) of Table 3, we estimate a logistic regression where the dependent variable, *BANK_FAILURE*, is coded as 1 if a bank holding company failed during 2008-2010 and as zero otherwise. The independent variables are obtained from the banks' 4Q 2006 filings.[21] This design ensures that there is no look-ahead bias in our analysis.

[Insert Table 3 about here]

The results reported in model (1) reveal that non-performing loans (*NPL*), commercial loans (*LCOMRE*), large deposits (*DEPLGE*) and off-balance sheet commitments to fund real estate (*COMMIT_RE*) are significantly correlated with subsequent bank failures. Higher levels of *LCOMRE*, *DEPLGE*, *INTAS* and *COMMIT_RE* are positively associated with the performance based stock delisting (model 2). Model (4) shows that higher levels of *LCOMRE*, *DEPLGE*, *SEC_RESI* and *COMMIT_RE* are predictably associated with negative future stock returns, and higher levels of *NPL*, *DEPLGE* and *COMMIT_RE* are associated with greater future return

[21] Results are similar if we use any of the other three quarters of 2006. The results are also similar if we use a broader definition of bank failure to include rescue mergers such as Wachovia and National City. When we include pre-crisis short interest (measured in March 2007) as an additional variable in Table 3, we do not find that it is significantly associated with subsequent bank failures. However, in univariate regressions, when short interest is the only explanatory variable, we find that the level of short interest in March 2007 is significantly associated with subsequent bank failures. This is because financial statement indicators are themselves associated with abnormal short interest (as shown in Table 4).

volatility (model 3). There is no noteworthy association between financial statement indicators and future ROA (model 5).[22] In sum, the evidence suggests that financial statement indicators are informative about banks' subsequent poor performance and eventual failure.

An analysis of short selling activity in bank stocks

Table 4 reports results of three regressions, where the dependent variable is the level of abnormal short interest in March 2004, 2005 and 2006, respectively. The independent variables are the same indicators used in Table 3, measured at 4Q of 2004, 2005 and 2006, respectively, along with control variables that prior research has shown to be related to short interest.[23] We include *CUR_RET* and *CRI* as control variables for non-accounting information available to market participants.

[Insert Table 4 about here]

The results of the first model show that there is a modest association between 4Q 2004 financial information (available in February of 2005) and short interest in March 2005. None of the leading indicators is significantly associated with short interest in the predicted direction. During this period, most of the cross-sectional variation in short interest is explained by the control variables such as institutional holdings and contemporaneous returns. The results of model 2 show that the explanatory power of the model improves over model 1. The coefficients on several indicators measured in 4Q 2005 are significantly associated with the level of short

[22] *CRI* is insignificant in predicting bank failure here unlike the findings of Knaup and Wagner (2012). One plausible reason is that the sample for their bank failure prediction test ranges from the third quarter of 2007 to the first quarter of 2010. In particular, they estimate CRI using data as close as one or two quarters prior to each bank failure (most occurred in 2009 and 2010). Hence, their *CRI* measure is based on bank stock prices and CDS indices in late 2007, 2008, 2009 or even early 2010, when the stock market and the CDS market demonstrated dramatic reactions as the crisis became apparent. In contrast, our CRI estimation window falls in the 4th quarter 2006 and 1st quarter 2007, during which period the CDS indices were largely flat.

[23] The results are not sensitive to our choice of the fourth quarter to measure financial statement indicators. In untabulated analyses, we find the results to be stronger when we use information from all four quarters.

interest in March 2006. However, when we estimate this specification for short interest in March 2007 with values of the indicators in 4Q 2006 as independent variables (model 3), the adjusted R^2 of the model with only control variables is 31.8 percent and that of the full model is 46.1 percent.

A plausible interpretation of the above results is that as the leading indicators of some banks began to show signs of distress and the cross-bank variability in the leading indicators increased, short sellers responded by increasing their positions (particularly for distressed banks). Therefore, the cross-sectional association between the leading indicators and short interest became stronger. For example, credit risk, measured as non-performing loans (*NPL*) and market risk, measured as the exposure to commercial real estate loans (*LCOMRE*) and residential loans (*LRESI*) exhibits a positive and significant association with short interest (*t*-statistics of 2.18, 3.73 and 2.64, respectively in 4Q 2006 data). The coefficient on the absolute value of *INTAS*, a proxy for moral hazard risk, is positive and marginally significant (*t*-statistic = 1.8), suggesting that short sellers were sensitive to the banks' moral hazard risk.

We also find a positive and significant association between off-balance sheet commitments to fund real estate (*COMMIT_RE*) and regulatory arbitrage (*REG_ARB*) and short interest (*t*-statistics = 4.53 and 2.25, respectively). Hence, short sellers appear to be sensitive to the increased risks from banks' exposure to commercial real estate and securities issued by SIVs even though such exposure is unlikely to be fully reflected in the banks' regulatory ratios. *CRI* is not statistically significant in the Q4 2006 regression but current returns are significant (*t*-statistic = -8.07). Despite controlling for non-accounting information, the results in Table 4 indicate that short sellers increased their positions well in advance of the onset of the banking crisis and that their positions were related to the increased riskiness of the banks as reflected in their financial statements.[24]

[24] We acknowledge that since the information set of short sellers is not observable, we cannot be sure that short sellers actually used the information in the financial statements. Given that this was

One implication of these results is that short sellers' actions potentially provided oversight and discipline of that bank regulators have long been interested in. Thus, the negative rhetoric directed at short sellers by politicians, regulators and CEOs (e.g., Mack 2008, Fuld 2008, Senators Kaufman, Isakson, Tester and Specter 2009) needs to be tempered as the actions of short sellers provided a timely warning about the fragility of the banking system.

Analysis of analysts' consensus recommendations

Table 5 report results of analysts' consensus recommendations. A higher numerical score is a weaker rating as a "strong buy" rating is coded as 1 and a "sell" rating is coded as 5. Results reported in the first column relate mean analyst recommendation scores in March 2005 to leading financial indicators as of 4Q of 2004 (released in February of 2005). Three indicators (*LCOMRE, LRESI* and *REG_ARB*) are significantly associated with the mean analyst recommendation score in the predicted direction, and two other indicators (*DEPLGE* and *COMMIT_RE*) are significant but with signs opposite to those predicted by theory (Gonzales-Hermosillo 1999). When we estimate this regression using values of indicators in 4Q of 2006, we find that coefficients on *NPL* (*t*-statistic = 2.82) and *LAS* (*t*-statistic = 2.45) are significant. *REGARB* (*t*-statistic = 4.15) and *CRI* (*t*-statistic = 2.67) are also significant. However, in contrast to results for short sellers, we do not observe a large increase in adjusted R^2 over time and the improvement in adjusted R^2 is partly driven by control variables and some financial statement indicators that are significant but with signs opposite to those predicted by theory. These results are consistent with univariate statistics reported earlier, that the mean analyst recommendations did not change much from March 2004 to

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a real estate driven crisis, they could have focused on signs of decline in housing market and targeted banks with high real estate exposure. To partially address this concern, we create a financial statement-based bank-specific measure of real estate exposure by summing the residential and commercial real estate loans made by the banks. We find a strong cross-sectional association between this aggregate measure of real estate exposure and abnormal short interest in each of the years (2005-2007).

March 2007, suggesting that analysts did not exhibit increased sensitivity to increasing bank risks in the period leading up to the 2008 crisis.[25]

[Insert Table 5 about here]

One possibility is that conflict of interests may have affected recommendations of affiliated analysts. To investigate this conjecture, we examine whether unaffiliated analysts' recommendations have a stronger association with the financial statement indicators of risk than underwriter-affiliated analysts' recommendations. Following Jacob, Rock and Weber (2008), we use the I/B/E/S Broker Translation file to find the brokerage firm employing each analyst in the I/B/E/S Recommendations Detail file. Next, we use the SDC Global New Issues database to identify whether the brokerage firm has an underwriting relationship with the firm that the analyst follows. We define an analyst as "affiliated" if his/her employer was the lead manager on an equity issue by the firm that the analyst follows at any time during 2001-2008, and "unaffiliated" if no such underwriting relationship exists during the period.[26] We construct a dichotomous independent variable, *AFFILIATED*, that takes the value 1 if the dependent variable is the average recommendation of "affiliated" analysts for the bank-quarter observation, and zero if the dependent variable is the average recommendation of "unaffiliated" analysts for the bank-quarter observation.

In a fully interactive model (not tabulated for brevity) , where *AFFILIATED* is interacted with all other independent variables, none of the interaction terms is statistically significant, and

[25] One reason for the lack of meaningful change in mean recommendation over this period could be that instead of issuing an unfavorable recommendation, analysts simply stop covering the bank (McNichols and O'Brien 1997). To examine this conjecture, we define *COV_DROP*, our dependent variable, as 1 if the number of analysts issuing a recommendation for the bank in Q4 of the year is fewer than in the same quarter of the previous year and zero otherwise. Untabulated results do not indicate a significant association between financial statement indicators and analysts' decision to drop coverage.

[26] Results are similar if we use an alternative definition where an analyst is defined as "affiliated" if its employer was the lead manager on an equity issue by the firm that he/she follows during the three-year window (-2, +1) surrounding the analyst recommendation date.

the main effects of the financial statement variables are qualitatively the same as those reported in Table 5. In addition, we compare mean recommendations by affiliated analysts and unaffiliated analysts each year, focusing on a sub-sample where the bank-quarter has at least one affiliated analyst and at least one unaffiliated analyst. The differences between these recommendations are not statistically significant for any of the years 2004 to 2007. Thus, analysts' lack of responsiveness is unlikely to be attributable to conflicts of interest.

Overall, the results show that unlike the actions of the short sellers, the actions of the analysts did not appear to respond to the signs of bank distress reflected in their financial statements. One possible explanation is that analysts gain little by publicizing bearish views, but risk losing access to management if they issue bearish recommendations.

Analysis of S&P's credit ratings

Table 6 reports results of an ordinal logistic regression of credit ratings on the financial statement indicators previously discussed in Table 4. A higher numerical rating indicates weaker credit worthiness. The results show that larger and more profitable banks have more favorable ratings but there does not appear to be a strong or a consistent association between the financial statement indicators and credit ratings in any of the three years examined. The lack of association between most of the financial statement indicators and mean credit ratings is perhaps not surprising given that summary statistics presented in Table 1 showed little variation in credit ratings. The lack of association between credit ratings and financial statement indicators is also consistent with results in Acharya and Richardson (2009) that credit ratings remained high for some of the worst affected banks until 2008. However, our results that credit ratings of banks in our sample were not sensitive to financial statement indicators of banks should be interpreted with two caveats: (1) it is possible that credit ratings could be affected by the complicated nature of regulatory and government policy responses to bank failure (for instance, expectations of a bank's

bailout); (2) the ratings data are available for only 59 bank holding companies.

[Insert Table 6 about here]

Analysis of audit fees

As discussed earlier, audit fees should reflect audit effort and a risk premium. Given the evidence that banks were becoming riskier over time, one would expect that audit fees to have increased over time, especially for the riskier banks. The results of the multivariate analysis reported in Table 7 validate the inference from the univariate analysis in Table 1 that audit fees were not sensitive to increased risk of the banks. The results show that audit fees are positively related to firm size and negatively related to net income, consistent with prior evidence. However, only one of the risk proxies, *INTAS*, is statistically significant in the predicted direction in each of the three specifications. Similar to prior work, we find a very high adjusted R^2 primarily due to the inclusion of firm size, but there is no meaningful change in the explanatory power of the model over time. Overall, we find no meaningful association between financial statement indicators of bank risk and audit fees.

[Insert Table 7 about here]

To address the possibility that auditors may have dropped risky clients, we remove banks with auditor changes and our inferences remain unaffected. Furthermore, we do not find evidence that in the sample of auditor switches, the incidence of Big 4 to non-Big 4 switches (likely due to an auditor dropping a risky client) is higher relative to other switches. We also examine the possibility that non-audit fees may have compromised auditor independence (Kinney et al. 2004). We construct an indicator variable, *HIGHBIAS*, equal to 1 if a bank-quarter's ratio of non-audit fees to the sum of audit fees and non-audit fees is above the sample median, and 0 otherwise. In a fully interactive model where *HIGHBIAS* is interacted with all independent variables in Table 7,

none of the interaction terms is statistically significant (results not tabulated).[27] Finally, we estimate our models using auditor turnover as the dependent variable. None of the models is statistically significant suggesting that auditor turnover does not appear to be related to financial statement risk indicators.

Lead-lag relations among intermediaries' actions

Results presented so far suggest that short sellers responded to increased bank risk in a timely manner, at least relative to sell-side equity analysts, S&P's credit ratings and auditors. To investigate the dynamics among these intermediaries more formally, we examine the lead–lag relation between the quarterly time-series of short interest and (i) analysts' recommendations and (ii) credit ratings. We want to assess whether the quarterly average of short interest leads or lags the quarterly average of analysts' recommendations and credit ratings. We do not estimate these models for audit fees because fee data are available only on an annual basis.

These lead-lag relations are estimated using a bivariate panel-data vector auto-regression (VAR) methodology, as proposed by Holtz-Eakin, Newey and Rosen (1988) and implemented by Love and Ziccino (2006). This technique combines the traditional time-series VAR approach, which treats all the variables in the system as endogenous, with the panel-data approach, which

[27] Our results contrast with evidence in Doogar et al. (2014) that audit fees are positively associated with two proxies for bank risk in 2006 and 2007: non agency mortgage backed securities (*NMBS*) and loan charge offs. In an attempt to reconcile our conflicting results, we modified our analysis, in untabulated work, by (i) using banks' holdings of *NMBS* instead of *REG_ARB*; and (ii) adding loan charge offs to our regression. However, these variables are not statistically significant. To address the possibility that including market based variables, such as *CRI*, book-to-market ratio, stock return volatility and contemporaneous stock returns, in our model may affect the coefficients on these two variables, we also estimate this specification without any market based variables but still find that neither of their test variables is statistically significant. One possible reason for the difference in results is that we include proxies for the five primary risks faced by the banks and their variables perhaps overlap with these primary risks.

allows for unobserved individual heterogeneity.[28] We specify a first-order bivariate VAR model as follows: $Z_{i,t} = \beta_0+\beta_1 Z_{i,t-1}+f_i+\varepsilon_t$, where Z_{it} ($Z_{i,t-1}$) is one of the following three bivariate vectors, {*SI_RATIO*, *MEANREC*} or {*SI_RATIO*, *RATING*} or {*RATING*, *MEANREC*}, for bank i measured at quarter t (quarter t-1), and f_i is bank fixed effects included to allow for heterogeneity for each cross-sectional unit. To illustrate consider the following specification:

$$SI\_RATIO_{it} = \beta_0+\beta_1 SI\_RATIO_{it-1} + \beta_2 MEANREC_{it-1} + f_i + \varepsilon_t \quad (1)$$

$$MEANREC_{it} = \beta_0+\beta_1 SI\_RATIO_{it-1} + \beta_2 MEANREC_{it-1} + f_i + \varepsilon_t \quad (2)$$

In equation (1), SI_RATIO_{it} is the short interest ratio for bank i in quarter t and $MEANREC_{it}$ is the analysts' mean recommendation for bank i in quarter t.

Given that fixed effects may be correlated with the lagged dependent variables, we follow Love and Zicchino (2006) and use forward mean-differencing ("Helmert Procedure") to remove only the forward mean (the mean of all the future observations available for each bank-quarter). This transformation preserves orthogonality between transformed variables and lagged regressors. The models are estimated by system-wide Generalized Method of Moments (GMM).

Table 8 presents the panel-data VAR estimates. Panel A shows that the *SI_RATIO* series is very persistent. For example, the lagged *SI_RATIO* has a coefficient estimate of 0.96 (*t*-statistic= 70.14) in predicting the current *SI_RATIO*. More important, we find that lagged *SI_RATIO* predicts the current levels of *MEANREC* while lagged *MEANREC* is not a significant predictor of current *SI_RATIO*. Thus, actions of short sellers appear to lead analysts' recommendations. Turning to panel B, we find no evidence of any lead-lag relation between short interest and credit ratings suggesting that the information set of S&P is not correlated with the information set of short sellers. Finally, when we consider the lead-lag relation between credit ratings and analyst

[28] We obtain similar but slightly weaker results using the traditional time series VAR approach, in which cross-sectional quarterly averages of *SI_RATIO*, *MEANREC* and *RATING* are calculated for each quarter assuming the underlying structure is the same for each bank. Under this approach, VAR estimation is based on only 24 quarterly observations, which reduces the power of the tests.

recommendations in panel C, we find that credit ratings lag analysts' recommendations. Overall, these analyses confirm our earlier evidence that actions of short sellers provided an early warning about banks' impending distress and that analysts' recommendations and S&P's credit ratings were slower to respond.

[Insert Table 8 about here]

5. Conclusions

We address two questions raised in the aftermath of the 2008 financial crisis: (i) did financial statements of banks provide an early warning of their upcoming distress? (ii) were information intermediaries sensitive to banks' increased risk as reflected in financial statements?

With regard to the first question, our results show that financial statements from as early as 4Q of 2006 reflect the increased risk of the banks, as several of financial statement indicators measured at that date are associated with subsequent bank failures. This result suggests that banks' financial statements were not as uninformative as some observers have suggested. With regard to the second question, our results suggest that short sellers were particularly sensitive to the information in leading indicators of bank distress, as they increased their positions in response to increased risk reflected in banks' financials well before 2008. In contrast, recommendations of sell-side analysts, S&P's credit ratings and audit fees were not sensitive to increasing risks of the banks leading up to the financial crisis of 2008.

One implication of our analysis is that actions of short sellers provided an early warning about unsustainable performance of banks and the build-up of risk in the banking sector. This suggests that short sellers' actions potentially provided a form of market-related discipline and oversight that is of interest to bank regulators. Thus, the negative rhetoric directed at short sellers is not supported by our evidence. Our findings also raise questions as to why equity analysts, credit rating agencies and auditors were not sensitive to the financial indicators of bank distress reflected in the banks' publicly available financial statements.

Appendix

Variable Definitions

Dependent variables:

SI_RATIO: monthly short interest normalized by the number of shares outstanding, expressed in percentage points. We purchased short interest data from NASDAQ. Short interest for NYSE firms was originally obtained from shortinterestsite.com and Professor Adam Kolasinski at Texas A&M University. COMPUSTAT has recently added short interest data on Security Monthly File and we cross-checked our data with COMPUSTAT for accuracy.

ABSI_5F: abnormal short interest, defined as the residual SI_RATIO after adjusting for five factors (size, book-to-market, momentum, turnover and institutional ownership) as in Karpoff and Lou (2010).

RATING: S&P domestic long term issuer credit rating for the month from COMPUSTAT Ratings file, coded as 2 for "AAA", 4 for "AA+", 5 for "AA", 6 for "AA-", and so on, and 27 for "D". A higher score denotes higher default risk.

MEANREC: the mean analyst recommendation for the month, as reported on the I/B/E/S consensus recommendations file. According to the standardized Thomson Reuters recommendation scale, 1 denotes "Strong Buy", 2 denotes "Buy", 3 denotes "Hold", 4 denotes "Underperform" and 5 denotes "Sell". A higher score denotes weaker consensus analyst recommendation.

LOGAUDITFEE: logarithm of total audit fee for the year reported by Audit Analytics.

BANK_FAILURE: 1 if the bank holding company fails during 2008-2010, 0 otherwise. The list of failed banks is obtained from Wikipedia and hand matched with corresponding bank holding companies.

Traditional financial statement indicators (specific data items on Federal Reserve Y-9C report used in constructing each variable are identified in parentheses):
LAS: the ratio of total loans (bhck2122) to total assets (bhck2170).

NPL: nonperforming loans (bhck5525+bhck5526), scaled by total loans (bhck 2122).

LCOMRE: construction loans plus loans secured by multifamily, nonresidential, and farm real estate (bhck1410-bhdm1797-bhdm5367-bhdm5368), scaled by total loans (bhck2122).

LRESI: loans secured by 1-4 family real estate (bhdm1797+bhdm5367+bhdm5368), scaled by total loans (bhck2122).

LCON: the ratio of consumer loans (bhdm1975) to total loans (bhck2122).

DEPLGE: the ratio of large certificates of deposit (bhcb2604: time deposits of $100,000 or more) to total assets (bhck2170).

INTAS: interest and fee income on loans and leases (bhck4010+bhck4059+bhck4065), scaled by total loans (bhck2122).

GAP: absolute value of the difference between assets that reprice or mature within one year and liabilities that reprice or mature within one year (bhck3197 – bhck3296 – bhck3298 – bhck3408 – bhck3409), scaled by total assets (bhck2170).

Proxies for variables specific to the 2008 crisis (specific data items on Federal Reserve Y-9C report used in constructing each variable are identified in parentheses):

SEC_RESI: outstanding principal balance of 1-4 family residential loans sold and securitized with servicing retained or with recourse or other seller-provided credit enhancements (bhckB705), scaled by total assets (bhck2170).

REG_ARB: the sum of total assets, derivatives and off-balance sheet items in the 20 percent risk weight category, divided by the sum of these items in all risk weight categories (bhckB697/(bhckB696+bhckB697+bhckB698+bhckB699)).

COMMIT_RE: off-balance-sheet commitments to fund commercial real estate, construction and land development (bhck3816+bhck6550), scaled by total assets (bhck2170).

TIER1_LEV: bank's Tier-1 leverage ratio (bhck7204), defined as Tier-1 equity capital divided by average total assets, expressed in percentage points.

CRI: Knaup and Wagner (2012)'s Credit Risk Indicator. It exploits differences in the sensitivity of bank stock price to the high-risk and low-risk CDS indices to measure the perceived share of high-risk loan exposures in a bank's portfolio. Since reliable CDS data are available starting in 2006, we estimate CRI over October 1, 2006 to March 19, 2007 to match our financial statement indicators as of the 4th quarter 2006 and intermediary actions as of March 2007. Our estimation

window ends on March 19, 2007 because new rolls of CDS indices come out on March 20, 2007 with different underlying reference entities which may cause a jump in the index unrelated to a change in credit risk.

Control variables:

CUR_RET: contemporaneous stock return for the holding period relevant to the test. For example, for the short interest regression, CUR_RET is the stock return for the 3-month window ending on the short interest report date.

NI: Ratio of trailing twelve month net income (constructed based on data item bhck4340 on Y-9C report) to average total assets (data item bhck3368 on Y-9C report).

SIZE: logarithm of total assets (data item bhck2170 on Y-9C report).

BTM: book value of equity (data item bhck3210 on Y-9C report) divided by market value of equity.

MOMRET: momentum return, measured as cumulative stock return from month -6 to month -1 relative to the fiscal quarter end.

INSTHOLD: institutional ownership, calculated as the total number of shares held by institutions (from Thomson Reuters Institutional Holdings file) divided by the number of shares outstanding at the quarter end, expressed in percentage points.

STDRESID: standard deviation of market model residual of daily returns during the quarter.

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TABLE 1
Descriptive statistics

Table 1 reports year-by-year summary statistics for the Full Sample: 1,484 bank-quarters from 2004 to 2007 (4th quarter only), and the Failed Banks Sample: 30 bank holding companies that failed during 2008-2010. In panel A, mean values of intermediaries' actions are reported as of March of each year, with standard deviation in brackets. In panel B and C, all financial statement indicators and control variables are measured as of December 31 of each year and quarterly mean values are reported for the 4th quarter of each year. See Appendix for variable definitions.

Panel A: summary statistics for actions of intermediaries

Variable	March 2005	March 2006	March 2007	March 2008
Full Sample				
SI_RATIO	1.13	1.56	2.86	4.96
	(1.80)	(2.22)	(3.55)	(5.92)
ABSI_5F	0.66	1.08	2.40	4.48
	(1.48)	(1.88)	(3.31)	(5.54)
MEANREC	2.63	2.60	2.68	2.69
	(0.61)	(0.63)	(0.57)	(0.62)
RATING	7.28	7.03	6.98	6.78
	(2.22)	(2.01)	(2.29)	(2.12)
LOGAUDITFEE	0.51	0.50	0.54	0.54
	(0.66)	(0.66)	(0.67)	(0.67)
Failed Banks Sample				
SI_RATIO	1.38	2.20	4.11	7.78
	(2.33)	(4.12)	(6.96)	(9.93)
ABSI_5F	0.95	1.81	3.68	7.34
	(2.05)	(3.91)	(6.80)	(9.58)
MEANREC	2.62	2.51	2.65	2.83
	(0.65)	(0.76)	(0.68)	(0.89)
RATING	7.50	7.50	7.50	7.00
	(3.54)	(3.54)	(3.54)	(2.83)
LOGAUDITFEE	0.60	0.49	0.56	0.52
	(0.52)	(0.45)	(0.50)	(0.45)

TABLE 1 (Cont'd)

Panel B: summary statistics for financial statement indicators

Variable	2004Q4	2005Q4	2006Q4	2007Q4
Full Sample				
LAS	0.65	0.68	0.69	0.71
NPL (%)	0.66	0.58	0.65	1.21
LCOMRE	0.44	0.47	0.48	0.50
LRESI	0.28	0.28	0.26	0.25
LCON	0.07	0.06	0.06	0.06
DEPLGE	0.12	0.14	0.16	0.14
INTAS	0.06	0.06	0.07	0.07
GAP	0.18	0.17	0.15	0.15
SEC_RESI (%)	0.88	0.76	0.97	0.85
COMMIT_RE	0.05	0.06	0.06	0.06
REG_ARB	0.23	0.21	0.20	0.18
TIER1_LEV (%)	9.31	9.44	9.37	11.56
Failed Banks Sample				
LAS	0.72	0.76	0.77	0.79
NPL (%)	0.56	0.58	0.81	2.08
LCOMRE	0.63	0.67	0.69	0.72
LRESI	0.17	0.17	0.16	0.14
LCON	0.04	0.03	0.03	0.03
DEPLGE	0.14	0.19	0.24	0.19
INTAS	0.06	0.06	0.08	0.08
GAP	0.23	0.20	0.19	0.19
SEC_RESI (%)	1.64	1.34	1.86	2.22
COMMIT_RE	0.10	0.11	0.12	0.12
REG_ARB	0.20	0.17	0.16	0.14
TIER1_LEV (%)	10.42	10.34	9.89	9.00

TABLE 1 (Cont'd)

Panel C: summary statistics for control variables

Variable	2004Q4	2005Q4	2006Q4	2007Q4
Full Sample				
BTM	0.52	0.57	0.60	0.88
MOMRET	0.14	0.07	0.05	-0.15
INSTHOLD (%)	0.26	0.28	0.33	0.34
SIZE	7.52	7.61	7.91	7.95
STDRESID	0.01	0.01	0.01	0.03
NI	0.03	0.03	0.03	0.02
CUR_RET	-0.03	0.03	-0.04	-0.06
Failed Banks Sample				
BTM	0.53	0.59	0.62	1.32
MOMRET	0.17	0.08	0.04	-0.33
INSTHOLD (%)	0.27	0.28	0.33	0.32
SIZE	7.40	7.37	7.70	7.73
STDRESID	0.01	0.01	0.01	0.04
NI	0.02	0.02	0.03	0.02
CUR_RET	-0.03	0.02	-0.05	-0.12

TABLE 2
Correlation analysis

Table 2 reports the correlation coefficients between all variables based on a final sample of 348 banks in the 4th quarter 2006 that we use in Table 3 and all remaining tables. Pearson (Spearman) correlation coefficients are below (above) the diagonal.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1. *ABSI_5F*	1	0.27	0.58	-0.49	-0.02	0.08	0.36	-0.30	-0.20	0.36	-0.21	0.08	-0.31	0.13	0.03	0.28	0.05	0.03	-0.04	-0.57	0.22	-0.23	0.07
2. *MEANREC*	0.25	1	0.22	-0.36	0.45	0.16	0.24	0.01	-0.03	0.41	0.06	0.13	-0.16	0.35	-0.27	0.18	0.10	0.03	-0.23	-0.25	-0.01	-0.07	-0.13
3. *RATING*	0.71	0.41	1	-0.68	0.19	0.10	0.49	-0.23	-0.26	0.42	-0.17	0.09	-0.44	0.31	0.19	0.37	0.20	-0.40	-0.31	-0.75	0.18	-0.29	0.08
4. *LogAuditFee*	0.04	-0.01	-0.70	1	-0.15	-0.03	-0.48	0.23	0.02	-0.33	0.03	-0.03	0.41	-0.27	-0.33	-0.31	0.08	0.08	0.44	0.80	0.07	0.15	0.06
5. *LAS*	-0.01	-0.08	0.27	-0.41	1	0.15	0.34	0.00	-0.06	0.42	0.03	0.29	-0.18	0.54	-0.61	0.21	0.02	-0.18	-0.27	-0.15	-0.12	0.09	0.29
6. *NPL*	0.15	0.21	0.40	0.05	-0.03	1	-0.19	0.33	0.25	0.17	-0.13	0.59	0.19	-0.02	0.05	-0.09	0.31	-0.16	-0.06	-0.06	0.14	-0.17	-0.24
7. *LCOMRE*	0.15	-0.13	0.41	-0.40	0.46	-0.12	1	-0.58	-0.33	0.34	0.07	0.17	-0.33	0.60	-0.07	0.22	0.01	0.00	-0.50	-0.43	-0.13	-0.04	0.27
8. *LRESI*	-0.11	0.12	0.01	0.12	-0.19	0.17	-0.62	1	0.13	-0.02	-0.05	0.05	0.25	-0.24	0.09	-0.36	0.11	-0.05	0.08	0.23	0.10	0.00	-0.26
9. *LCON*	-0.03	0.03	-0.23	0.26	-0.20	0.05	-0.44	0.05	1	-0.15	-0.11	0.13	0.39	-0.22	0.21	-0.14	-0.02	0.26	-0.21	0.15	-0.15	-0.01	-0.21
10. *DEPLGE*	0.11	-0.18	0.39	-0.23	0.33	0.05	0.42	-0.33	-0.19	1	-0.16	0.26	-0.27	0.46	-0.16	0.14	0.01	-0.29	-0.34	-0.49	0.33	-0.18	0.21
11. *INTAS*	0.00	-0.04	-0.25	0.14	-0.10	-0.07	0.00	-0.17	0.00	-0.23	1	0.16	0.03	0.29	0.10	0.32	-0.08	0.11	0.05	0.15	-0.21	0.34	0.02
12. *GAP*	0.18	0.03	0.24	-0.18	0.26	0.24	0.37	-0.38	0.04	0.26	0.09	1	0.09	0.27	-0.06	-0.08	0.02	-0.20	-0.19	-0.10	0.05	0.04	0.06
13. *SEC_RESI*	0.15	0.15	0.13	0.29	-0.09	0.38	-0.16	0.17	0.04	-0.03	-0.04	0.06	1	-0.07	0.04	-0.23	0.05	0.35	0.17	0.53	-0.03	0.23	-0.11
14.*COMMIT_RE*	0.33	-0.05	0.24	-0.14	0.39	-0.09	0.56	-0.38	-0.24	0.24	0.17	0.33	-0.07	1	-0.18	0.28	-0.06	-0.21	-0.30	-0.22	-0.09	0.21	0.34
15. *REG_ARB*	0.03	0.18	0.19	-0.03	-0.68	0.03	-0.27	0.14	0.11	-0.13	-0.01	-0.01	-0.02	-0.29	1	0.00	0.00	0.02	-0.13	-0.23	-0.01	-0.07	-0.21
16. *TIER1_LEV*	-0.06	-0.12	-0.03	-0.37	-0.04	-0.09	0.06	-0.15	0.22	0.02	0.11	0.21	-0.10	0.04	0.05	1	-0.04	-0.06	0.13	-0.38	-0.04	0.24	0.14
17. *BTM*	-0.05	0.09	0.31	0.02	-0.14	0.41	-0.08	0.20	0.03	0.03	-0.08	0.01	0.28	-0.11	0.04	-0.10	1	-0.10	-0.14	0.17	0.11	-0.47	0.01
18. *MOMRET*	-0.02	0.12	-0.54	0.00	-0.01	-0.24	-0.05	-0.04	0.09	-0.15	0.11	-0.04	-0.16	-0.03	-0.04	0.04	-0.29	1	-0.02	0.27	-0.37	0.13	-0.25
19. *INSTHOLD*	0.42	0.08	-0.16	0.58	-0.23	0.03	-0.25	-0.03	0.14	-0.10	0.16	-0.15	0.13	0.05	0.02	-0.07	0.02	-0.03	1	0.25	0.07	0.22	0.01
20. *SIZE*	0.15	0.10	-0.72	0.88	-0.38	0.09	-0.44	0.08	0.30	-0.26	0.18	-0.22	0.26	-0.13	-0.01	-0.19	0.07	0.03	0.67	1	-0.18	0.26	-0.07
21. *STDRESID*	0.20	0.10	0.51	-0.21	0.00	0.26	0.17	-0.06	-0.14	0.16	-0.02	0.16	0.27	0.11	0.08	-0.04	0.24	-0.19	-0.09	-0.23	1	-0.28	-0.06
22. *NI*	0.02	-0.07	-0.23	0.16	-0.16	-0.17	-0.07	-0.22	0.35	-0.12	0.20	0.25	-0.04	0.01	0.04	0.74	-0.29	0.15	0.11	0.16	-0.16	1	-0.03
23. *CUR_RET*	-0.43	-0.19	-0.13	0.01	-0.09	-0.17	-0.02	-0.02	0.01	-0.08	0.04	-0.03	-0.14	-0.09	0.13	0.00	0.03	-0.12	-0.12	-0.05	0.03	0.02	1

TABLE 3
Validation of financial statement indicators

Table 3 examines the association of the financial statement indicators with (1) Subsequent bank failures (indicator variable equals 1 for bank failures during 2008-2010, 0 otherwise); (2) Performance-based delisting from 07/01/2007 to 06/30/2008 (indicator variable equals 1 if delisting code is between 500 and 599, 0 otherwise); (3) Daily return volatility from 07/01/2007 to 06/30/2008; (4) Buy-and-hold returns from 07/01/2007 to 06/30/2008; (5) *ROA* from 07/01/2007 to 06/30/2008. Financial statement indicators are measured as of December 31, 2006, and *CRI* is measured using bank return and CDS indices from 10/1/2006 to 3/19/2007. *t*-statistics are reported in parentheses. *** and ** indicate statistical significance at the 1% and 5% levels respectively. See Appendix for variable definitions.

	Pred. Sign	Model (1): *Bank Failure*	Model (2): *Delisting*	Model (3): *Return Volatility*	Pred. Sign	Model (4): *Future Return*	Model (5): *ROA*
LAS	+	2.38	-0.47	-0.01	-	0.10	0.01
		(0.42)	(-0.12)	(-1.15)		(0.62)	(0.51)
NPL	+	59.56**	21.71	0.26***	-	-0.20	0.04
		(1.96)	(0.72)	(3.17)		(-0.10)	(0.14)
LCOMRE	+	8.58***	5.51**	0.00	-	-0.28**	0.01
		(2.69)	(2.21)	(0.78)		(-2.33)	(0.36)
LRESI	+	3.26	2.73	-0.00	-	-0.01	0.02
		(0.95)	(1.05)	(-0.08)		(-0.06)	(1.08)
LCON	+	-2.88	-8.68	-0.00	-	-0.19	0.04
		(-0.29)	(-1.10)	(-0.03)		(-0.83)	(1.23)
DEPLGE	+	6.55**	5.25**	0.02***	-	-0.82***	-0.01
		(2.55)	(2.40)	(3.14)		(-4.81)	(-0.39)
GAP		1.81	0.56	-0.00		-0.50***	0.05
		(0.81)	(0.31)	(-0.56)		(-4.31)	(3.02)
INTAS	+	26.90	49.18*	0.07	-	-0.81	-0.07
		(0.79)	(1.69)	(1.02)	-	(-0.45)	(-0.27)
SEC_RESI	+	-3.54	-5.11	0.00		-0.53**	0.01
		(-0.40)	(-0.46)	(0.49)		(-2.50)	(0.19)
COMMIT_RE	+	11.00**	11.15**	0.04***	-	-0.86***	0.03
		(2.10)	(2.45)	(2.93)		(-2.62)	(0.75)
REG_ARB	+	0.73	0.11	-0.01	-	0.65	0.00
		(0.11)	(0.02)	(-1.41)		(3.26)	(0.15)
TIER1_LEV	-	-0.01	-0.11	0.00	+	-0.00	-0.00
		(-0.06)	(-0.99)	(0.12)		(-0.36)	(-1.89)
CRI	+	0.01	-0.02	-0.00	-	0.01	-0.00
		(0.08)	(-0.26)	(-1.15)		(1.31)	(-0.80)
Intercept		-14.90**	-9.87**	0.02***		-0.03	0.01
		(-2.28)	(-2.15)	(3.65)		(-0.21)	(0.35)
N		347	340	339		340	311
Pseudo R^2		0.386	0.286				
Adjusted R^2				0.146		0.306	0.013

TABLE 4
The association of abnormal short interest with financial statement indicators

Table 4 examines whether short sellers respond to financial statement indicators of bank risk. In models (1) through (3), the dependent variable is abnormal short interest (*ABSI_5f*) measured as of March of 2005, 2006 and 2007 respectively and independent variables are financial statement indicators measured as of December 31 of 2004, 2005 and 2006, respectively. *t*-statistics are reported in parentheses. *** and ** indicate statistical significance at the 1% and 5% levels respectively. See Appendix for variable definitions.

	Pred. Sign	Model (1): 2004 Q4	Model (2): 2005 Q4	Model (3): 2006 Q4
LAS	+	-0.03	0.57	-1.91
		(-0.04)	(0.56)	(-1.19)
NPL	+	7.01	16.79	48.92**
		(0.71)	(1.13)	(2.18)
LCOMRE	+	1.02	0.91	4.95***
		(1.55)	(1.13)	(3.73)
LRESI	+	0.75	1.59**	3.49***
		(1.17)	(2.04)	(2.64)
LCON	+	-1.74	-0.32	2.63
		(-1.51)	(-0.24)	(1.10)
DEPLGE	+	1.88	2.44**	0.96
		(1.77)	(2.19)	(0.54)
GAP		-0.82	-0.82	-1.90
		(-1.36)	(-1.17)	(-1.62)
INTAS	+	9.71	19.52	35.06*
		(0.94)	(1.26)	(1.80)
SEC_RESI	+	-1.18	2.44	2.04
		(-0.97)	(1.35)	(0.92)
COMMIT_RE	+	-2.05	5.65***	15.71***
		(-1.25)	(3.02)	(4.53)
REG_ARB	+	0.12	2.85**	4.58**
		(0.11)	(2.20)	(2.25)
TIER1_LEV	-	-0.00	-0.03	-0.10*
		(-0.20)	(-1.37)	(-1.74)
CRI	+			0.02
				(0.56)
BTM		-0.26	-0.76**	-1.10**
		(-0.79)	(-2.15)	(-2.14)
MOMRET		0.46	0.16	-0.14
		(0.86)	(0.20)	(-0.10)
INSTHOLD		0.03***	0.04***	0.06***
		(7.08)	(8.17)	(9.01)
NI		3.98	7.68	11.21
		(0.66)	(1.10)	(0.88)
CUR_RET		-3.26***	-1.12	-11.17***
		(-3.76)	(-1.12)	(-8.07)
Intercept		-1.27	-3.15***	-5.59***
		(-1.38)	(-2.60)	(-3.11)

TABLE 4 (Cont'd)

N	381	397	341
Adjusted R^2 (Full model)	0.194	0.224	0.461
Adjusted R^2 (control only)	0.177	0.157	0.318
Adjusted R^2 difference	0.017	0.067	0.143

TABLE 5
The association of sell-side analyst recommendations with financial statement indicators

Table 5 examines whether sell-side analysts are sensitive to financial statement indicators of bank risk. In panel A, the dependent variable is *MEANREC*, the consensus (mean) analyst recommendation. In panel B, the dependent variable is *COV_DROP*, a dichotomous variable for analyst coverage drop. In models (1) through (3), the dependent variable is measured as of March of 2005, 2006 and 2007 respectively and independent variables are financial statement indicators measured as of December 31 of 2004, 2005 and 2006, respectively. *t*-statistics are reported in parentheses. *** and ** indicate statistical significance at the 1% and 5% levels respectively. See Appendix for variable definitions.

	Pred. Sign	Model (1): 2004 Q4	Model (2): 2005 Q4	Model (3): 2006 Q4
LAS	+	0.60	0.36	0.93**
		(1.45)	(0.94)	(2.45)
NPL	+	6.39	15.35**	15.42***
		(1.28)	(2.59)	(2.82)
LCOMRE	+	0.71**	0.09	-0.20
		(2.06)	(0.27)	(-0.63)
LRESI	+	0.73**	0.44	-0.16
		(2.02)	(1.27)	(-0.47)
LCON	+	0.31	-0.73	-0.58
		(0.51)	(-1.32)	(-1.04)
DEPLGE	+	-1.23**	-0.25	-1.42***
		(-2.27)	(-0.55)	(-3.31)
GAP		0.24	-0.07	-0.39
		(0.77)	(-0.24)	(-1.31)
INTAS	+	-1.59	4.49	-1.06
		(-0.28)	(0.71)	(-0.21)
SEC_RESI	+	-0.39	-0.86	0.38
		(-0.67)	(-1.28)	(0.79)
COMMIT_RE	+	-1.59	-2.22***	0.49
		(-1.95)	(-2.87)	(0.59)
REG_ARB	+	1.61***	1.23**	2.07***
		(2.86)	(2.36)	(4.15)
TIER1_LEV	-	0.00	-0.02	-0.02
		(0.11)	(-1.26)	(-1.47)
CRI	+			0.03***
				(2.67)
BTM		-0.00	-0.14	0.11
		(-0.00)	(-1.04)	(0.92)
MOMRET		-0.85***	-0.48	0.92***
		(-2.94)	(-1.52)	(2.84)
INSTHOLD		-0.00	0.00	0.00
		(-0.33)	(1.19)	(1.53)
NI		0.29	5.17	2.86
		(0.09)	(1.82)	(0.90)
CUR_RET		-0.91	-0.97**	-1.05***
		(-1.97)	(-2.35)	(-2.77)
Intercept		-1.27	-3.15***	1.87***
		(-1.38)	(-2.60)	(4.41)

TABLE 5 (Cont'd)

N	264	293	262
Adjusted R^2 (Full model)	0.108	0.123	0.183
Adjusted R^2 (controls only)	0.050	0.027	0.072
Adjusted R^2 difference	0.058	0.096	0.111

TABLE 6
Ordinal logistic regression of credit rating on financial statement indicators

Table 6 examines whether credit rating agencies are sensitive to financial statement indicators of bank risk. The dependent variable is S&P credit rating score (*RATING*). In models (1) through (3), the dependent variable is measured as of March of 2005, 2006 and 2007 respectively and independent variables are financial statement indicators measured as of December 31 of 2004, 2005 and 2006, respectively. *t*-statistics are reported in parentheses. *** and ** indicate statistical significance at the 1% and 5% levels respectively. See Appendix for variable definitions.

	Pred. Sign	Model (1): 2004 Q4	Model (2): 2005 Q4	Model (3): 2006 Q4
LAS	+	1.58	3.48	2.16
		(0.57)	(1.48)	(0.84)
NPL	+	8.36	43.09	48.59
		(0.10)	(0.60)	(0.62)
LCOMRE	+	-0.20	4.89**	3.44
		(-0.08)	(2.45)	(1.78)
LRESI	+	2.26	1.34	-1.36
		(0.85)	(0.58)	(-0.50)
LCON	+	-12.61	0.05	-8.73
		(-2.67)	(0.01)	(-1.85)
DEPLGE	+	4.00	0.84	-3.81
		(0.74)	(0.15)	(-0.71)
GAP		-0.84	-8.30	-4.15
		(-0.35)	(-3.28)	(-1.66)
INTAS	+	143.03***	124.11**	1.42
		(3.44)	(2.51)	(0.04)
SEC_RESI	+	-2.91	-1.02	-2.80
		(-1.09)	(-0.36)	(-1.12)
COMMIT_RE	+	8.28	4.78	14.20
		(0.60)	(0.39)	(1.16)
REG_ARB	+	9.07**	3.80	11.70**
		(2.12)	(0.81)	(2.22)
TIER1_LEV	-	0.19	0.37	0.14
		(1.19)	(1.86)	(0.76)
CRI	+			-0.02
				(-0.35)
BTM		8.34***	-0.23	1.05
		(2.58)	(-0.31)	(1.28)
STDRESID		114.57	203.81	151.53
		(1.89)	(1.91)	(1.39)
SIZE		-1.23***	-1.13***	-1.39***
		(-3.38)	(-3.47)	(-4.15)
NI		-33.10	-104.45***	-28.26
		(-1.20)	(-2.68)	(-0.81)
CUR_RET		-4.67	23.04***	-0.77
		(-0.92)	(3.47)	(-0.19)

TABLE 6 (Cont'd)

N	58	59	59
Pseudo R^2 (Full model)	0.351	0.364	0.377
Pseudo R^2 (controls only)	0.236	0.227	0.305
Pseudo R^2 difference	0.115	0.137	0.072

TABLE 7
The association of audit fees (*LOGAUDITFEE*) with financial statement indicators

Table 7 examines whether auditors increases audit fees in response to the growing risk as indicated by the key financial statement variables. The dependent variable is *LOGAUDITFEE*. In models (1) through (3), the dependent variable is measured as of March of 2005, 2006 and 2007 respectively and independent variables are financial statement indicators measured as of December 31 of 2004, 2005 and 2006, respectively. *t*-statistics are reported in parentheses. *** and ** indicate statistical significance at the 1% and 5% levels respectively. See Appendix for variable definitions.

	Pred. Sign	Model (1): 2004 Q4	Model (2): 2005 Q4	Model (3): 2006 Q4
LAS	+	-1.12	-1.81	-1.82
		(-5.41)	(-8.91)	(-8.83)
NPL	+	-1.21	-1.77	0.86
		(-0.54)	(-0.66)	(0.31)
LCOMRE	+	-0.39	-0.20	-0.07
		(-2.54)	(-1.32)	(-0.43)
LRESI	+	-0.27	-0.05	0.12
		(-1.83)	(-0.30)	(0.74)
LCON	+	-0.77	-0.27	-0.25
		(-2.95)	(-1.07)	(-0.88)
DEPLGE	+	0.39	0.30	0.36
		(1.70)	(1.45)	(1.77)
GAP		0.05	0.15	0.11
		(0.38)	(1.19)	(0.77)
INTAS	+	8.24***	9.58***	6.57***
		(3.56)	(3.59)	(2.76)
SEC_RESI	+	0.32	0.34	0.29
		(1.18)	(0.97)	(0.89)
COMMIT_RE	+	0.38	0.15	-0.26
		(1.06)	(0.47)	(-0.65)
REG_ARB	+	-1.25	-2.10	-2.02
		(-4.98)	(-8.61)	(-7.84)
TIER1_LEV	-	0.00	-0.01	0.01
		(0.09)	(-0.85)	(0.70)
CRI	+			-0.00
				(-0.81)
BTM		0.27***	-0.04	-0.27***
		(3.73)	(-0.63)	(-3.70)
STDRESID		2.72	10.60***	1.50
		(0.82)	(3.20)	(0.59)
SIZE		0.34***	0.33***	0.34***
		(22.89)	(23.19)	(22.54)
NI		-2.81	-5.75***	-5.27***
		(-1.79)	(-3.58)	(-2.82)
CUR_RET		0.23	0.09	0.35**
		(1.21)	(0.51)	(2.19)
Intercept		-1.35***	-0.74**	-0.73**
		(-4.30)	(-2.43)	(-2.33)

TABLE 7 (Cont'd)

N	357	374	323
Adjusted R^2 (Full model)	0.800	0.806	0.822
Adjusted R^2 (controls only)	0.776	0.766	0.783
Adjusted R^2 difference	0.024	0.040	0.039

TABLE 8
Panel-data VAR estimation to assess leads and lags in intermediaries' actions

Table 8 uses a panel-data vector auto-regression (VAR) methodology (Love and Ziccino 2006; Holtz-Eakin et al. 1988). This technique combines the traditional VAR approach, which treats all the variables in the system as endogenous, with the panel-data approach, which allows for unobserved individual heterogeneity. We specify a first-order bivariate VAR model as follows: $Z_{i,t} = \beta_0+\beta_1 Z_{i,t-1}+f_i+\varepsilon$, where Z_{it} ($Z_{i,t-1}$) is one of the following three bivariate vectors, {*SI_RATIO*, *MEANREC*} or {*SI_RATIO*, *RATING*} or { *RATING*, *MEANREC*}, for bank i measured at quarter t (quarter t-1), f_i is bank fixed effects included to allow for heterogeneity for each cross-sectional unit. Since the fixed effects may be correlated with the lagged dependent variables, we use forward mean-differencing ("Helmert Procedure") to remove only the forward mean, that is, the mean of all the future observations available for each bank-quarter. This transformation preserves the orthogonality between transformed variables and lagged regressors. The model is estimated by system GMM and *t*-statistics are reported in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels respectively. See Appendix for variable definitions.

Panel A:

	$SI\_RATIO_{i,t-1}$	$MEANREC_{i,t-1}$
$SI\_RATIO_{i,t}$	0.96***	-1.23
	(70.14)	(-1.38)
$MEANREC_{i,t}$	0.11***	0.47***
	(2.51)	(4.03)

Panel B:

	$SI\_RATIO_{i,t-1}$	$RATING_{i,t-1}$
$SI\_RATIO_{i,t}$	0.97***	0.39
	(8.06)	(0.29)
$RATING_{i,t}$	-0.02	0.59***
	(-1.53)	(3.77)

Panel C:

	$RATING_{i,t-1}$	$MEANREC_{i,t-1}$
$RATING_{i,t}$	1.02***	0.13*
	(13.75)	(1.86)
$MEANREC_{i,t}$	-0.03	0.81***
	(-0.42)	(15.76)