Should Short-Selling be Restricted during a Financial Crisis?

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Abstract

This paper investigates the short selling of financial company stocks around the time of the SEC September 2008 short-selling ban. More specifically, this paper examines whether this short selling, mainly by hedge funds and other types of sophisticated investors, was purely speculative or whether it was driven by rational behavior in response to a financial company's risk exposure, such as its holdings of subprime-related assets and its credit risk exposure. Our results show that during the crisis period the short-selling of financial firms stock was not significantly greater than that of non-financial firms, even after controlling for size and risk. More importantly, our results show that short sellers rationally short sold those financial company stocks with the greatest subprime and insolvency risk exposures. This finding has important implications regarding banning short selling, since it suggests that such a regulation may mute the disciplining effects of investors in the financial market on those financial companies with the greatest risk exposures and would be contrary to the intentions of bank regulators who have emphasized an increased reliance on market discipline.

Keywords: short selling, subprime assets, financial crisis, short-sale ban, CDS spread

JEL Classifications: G01, G14, G18, G28, G33

1. Introduction

Short sellers (mainly hedge funds) have been accused of using short-sale strategies to push down the prices of the equities of financial companies below fundamental values during the 2007–2009 crisis. A sequence of actions taken by the SEC seems to be consistent with the belief that this allegation was indeed true. Specifically, on July 15, 2008 the SEC issued an emergency rule to limit certain types of short selling, namely "naked" short selling (short selling without actually borrowing the shares), of 19 major financial firms. On September 17, 2008 the SEC announced that this rule was extended to all publicly traded firms. On September 18, 2008 the SEC announced a ban on all types of short selling of the stocks of 797 public financial companies (effective immediately), which continued until October 8, 2008. At the time, the SEC's Chairman Christopher Cox claimed that this short-selling ban was an effort "to combat market manipulation that threatens investors and capital markets"[1]. Within a week, the prohibition on short selling had spread to markets overseas, such as the United Kingdom, Australia, Taiwan, and the Netherlands. However, hedge fund managers actively opposed the ban, arguing that regulators were actually punishing short sellers for the mistakes made by financial companies that had exposed themselves to risky subprime assets, such as subprime mortgage-backed securities.

The crux of the debate between the SEC and hedge funds is whether short-selling activity could be justified by the fundamental weaknesses of the targeted financial companies, e.g. due to over-investment in risky subprime assets, or whether it was just largely speculative manipulation of target companies' stock prices. If companies with greater exposure to the subprime market were actually sold short to a larger degree, then hedge fund managers' opposition to the SEC's

[1] See SEC Press Release 2008-211 on 19 September 2008.

ban on short selling seems reasonable. Indeed, as has been shown in a more general context, short-selling activity enhances the informational efficiency of asset prices (see Boehmer, Jones and Zhang 2008 and Boehmer and Wu 2009). By short selling, informed traders such as hedge funds inject additional information (and potentially more accurate information) into the marketplace.[2] Thus, banning short selling causes unfavorable consequences[3]. In particular, stock prices may no longer be accurate reflections of the full information set in the marketplace.

Interestingly, Gagnon and Witmer (2009) have demonstrated, via a natural experiment crafted around cross-listed stocks, that the short-sale ban of 2008 actually caused stock prices to trade above their fundamental values.[4] This is consistent with an opinion piece published in the Wall Street Journal, in which Bris (2008) argues that *"*the emergency ban imposed last Monday by the Securities and Exchange Commission on short selling for all 'financial' stocks has done more harm than good".[5] Since the market liquidity of the 797 stocks targeted by the short-sale ban was weakened, bid–ask spreads increased significantly, and intra-day price ranges almost doubled. In general, short sellers, especially informed short sellers, play an important monitoring and disciplining role for those targeted companies by discouraging incautious, value-destroying investments.[6] As another example, Lorenzo Di Mattia, manager of hedge fund Sibilla Global Fund, argued at the time of the ban: "… Funny they don't understand that it is because there is short selling that the market didn't crash. If there were no shorts in this market, there would be

[2] See Desai, Ramesh, Thiagarajan, and Balachandran (2002), Asquith, Pathak, and Ritter (2005), and Diether, Lee, and Werner (2009), for example.
[3] Our paper is also related to Battalio and Schultz (2010), which shows the unintended impact of the 2008 short sale ban on the option market.
[4] See Miller's (1977) price optimism theory for a framework supporting this argument.
[5] See the article in the Wall Street Journal: Shorting Financial Stocks Should Resume, by Arturo Bris, 29 September 2008.
[6] Balasubramanian and Cyree (2008) show evidence that the short selling of bank stocks can provide a signal about the future performance of the banks.

only sellers".[7] Finally, banning short selling limits investors' hedging of their market risks. Short selling those financial companies' stocks with significant exposure to risky subprime assets might be viewed as a crucial self-rescue strategy for some institutional investors.[8]

To address the key question of whether the short-selling ban was a deterrent to speculative attacks on financial company stocks, we conduct three different tests. First, we examine whether short-selling activities prior to the short-sale ban were much larger for those financial companies on the short-sale ban list relative to either non-financial companies or other non-financial companies with similar risk exposures. Secondly, we examine whether short sellers actually differentiated between financial companies with substantial exposure to the subprime market and those with little exposure over the 2007–2008 period prior to the SEC's short-sale banning rule (which became effective on September 19, 2008). Thirdly, we examine credit default swap (CDS) spreads during the same period as an alternative, but broader, measure of a financial company's insolvency risk exposure. If short selling is not pure speculative manipulation, we might expect that companies with greater risk exposure (measured by their subprime-to-assets ratio and CDS spreads) were short sold more. [9]Thus, in our analysis, we investigate whether short-selling activity rationally reflected financial companies' insolvency risk exposure.

To examine whether the short-selling activities prior to the short-sale ban were much larger for financial companies on the short-sale ban list relative to non-financial companies, we first compare the short-selling activities of those financial firms on the short-sale ban list with

[7] See the article in the Dow Jones Newswires: UPDATE: Short Selling Limit May Have Unintended Consequences, by Rob Curran, July 15, 2008.
[8] Brunnermeier (2009) mentioned a Wall Street saying: "If you can't sell what you want to sell, sell what you can sell."
[9] Acharya and Johnson (2007) showed evidences that CDS spread changes predict stock returns of the borrowing companies.

those of non-financial companies traded on similar exchanges. In general, we find that that the short-selling activities were mostly significantly lower for financial firms especially in the period one month to two years before the short-sale ban. One can argue that a relevant comparison should be related to a firm's risk exposure. Thus, in another test, we match the financial firms to the non-financial firms based on three dimensions: credit risk exposure, firm size, and trading venue. Again, we find that there is no significant difference between the short-selling activities for financial and non-financial firms prior to the short-sale ban. These results suggest that short-selling activities were not excessive for financial firms relative to non-financial firms prior to the imposition of the ban.

To examine the extent to which financial firm have been exposed to the subprime market, we consider two sources of subprime asset exposure. First, we create, by hand, a unique data set of subprime activity at the financial company level collecting subprime-assets-related accounting information from financial company annual reports, over the September 2005 to September 2008 period A period ending just prior to the short-selling ban on September 18, 2008. Since, on average, there is a three-month lag between a company's filing date and its fiscal year ending date (following Compustat's definition of the fiscal year end), our sample of financial report filings, from September 2005 to September 2008, covers the 2005 to 2007 fiscal years. Thus, for example, the fiscal year end for Meta Financial Group Inc of NASDAQ is on September 30. However, the filing dates for the fiscal year end 2005 to 2007 reports were approximately three months later, on 23 December 2005, 21 December 2006, and 11 January 2008, respectively. Thus the financial reporting disclosure at the time of the 18th September 2008 ban would not have included fiscal year 2008 data since this was not available until December 2008. It should

also be noted that, in general, prior to 2009, the subprime asset holdings of financial companies were primarily reported in footnotes to their annual financial accounts.

Second, for the same time period, September 2005 to September 2008, we collect different proxies for subprime-assets-related accounting information from firms' quarterly Reports of Condition and Income (Call Report) made to the Federal Deposit Institution Corporation (FDIC). This includes the fair values of investments in mortgage-backed securities (MBS), asset-backed securities (ABS), collateralized debt obligations (CDOs), and commercial paper conduits (which refer to the maximum amount of credit exposure arising from credit enhancements provided to conduit structures such as SIVs in the form of standby letters of credit, subordinated securities, and other enhancements).

Our results show that financial companies' exposure to the subprime market had a significantly negative impact on their equity performance around the filing dates of their 2007 (fiscal year) annual reports, when the unfavorable consequence of their over-investment in subprime assets was becoming apparent. By comparison, no such pattern is found around the filing dates of their 2005 and 2006 annual reports. More importantly, we find that the greater a financial company's exposure to the subprime market, the greater the short-selling activity of its equity around the filing date of its 2007 annual report.[10] Moreover, the equities of financial firms were subject to far more short selling around the 2007 fiscal year end filing date when compared with 2005 and 2006. Interestingly, we also find that if a financial company is adequately capitalized, the effect of subprime exposure on short selling was weakened. Both results suggest that short sellers were behaving rationally in the sub-period leading up to the September 2008 ban.

[10] We consider different day windows around the filing date: (-10, -2) and (-10, +10).

Our results using CDS spreads provide further confirmation that short selling reflected financial companies' risk exposure. We find that short selling responded to CDS spreads and to one-year changes in daily CDS spreads where the CDS spread can be viewed as reflecting a financial company's insolvency risk. In sum, our results suggest that short sellers differentiated between those financial companies with substantial insolvency risk exposure from those with little exposure. That is, our results do not support the SEC's claim that the short-selling of financial firms' stocks during the financial crisis was abusive or manipulative.

The paper is organized as follows. In section 2, we discuss our hypotheses. In section 3, we describe our data and variables. In section 4, we present our empirical results. We conclude in section 5.

2. Hypotheses

One of the major objectives of this paper is to investigate whether short sellers differentiated among financial firms based on their exposure to the subprime market during the crisis. Many financial firms, especially banks, incurred significant losses during the financial crisis due to the dramatic rise in mortgage delinquencies, defaults, and foreclosures. Hence, we expect that informed, sophisticated traders should short sell the equities of those financial companies with the greatest risk exposures. Thus, our first hypothesis (H1) is:

Hypothesis 1: Short selling of stocks was greatest for financial companies with the largest exposures to the subprime mortgage market.

We also use an alternative measure of a financial company's risk exposure, namely CDS spreads. In general, CDS spreads capture many of the risk factors that could potentially impact a

company's insolvency risk. Consequently, we hypotheses that around fiscal filing dates, the higher a company's CDS spread, the larger the scale of short selling of its equity. Thus H2 is:

Hypothesis 2: Short selling of equity was greatest for financial companies with the largest insolvency risk exposures measured by CDS spreads.

3. Data and Sample Construction

In this section, we discuss the construction of our sample and data sources. Initially our sample consists of the 797 financial companies that were put on the no-short-sale list by the SEC in September 2008. We then hand collect detailed accounting information on financial companies' exposures to the subprime market and the filing dates of that information from their annual reports (10-K).[11] After removing those observations without 10-K filing records or filing dates, our sample consists of 531, 538, and 536 financial companies listed on the short sale ban list for the fiscal years 2005, 2006, and 2007, respectively.

3.1 Measures of Exposure to the Subprime Market

We create a direct measure of the exposure to the subprime market that includes a financial company's investments in subprime mortgage loans as well as its holdings of securities backed by subprime mortgages. A large number of financial companies mention their total subprime exposure at the beginning of their annual reports (the firm performance review section). In such cases we directly assign those numbers as the total amount of exposure to the subprime market. In other cases, we look for the subprime investment information in the sections of the annual report with details on (1) loan portfolio and (2) investment portfolio holdings.

[11] We obtain the annual financial reports of the financial firms from SEC filings on Edgar-Pro online.

In the loan portfolio section of the annual reports, we identify and calculate the total amount of subprime exposure based on the following criteria: (1) the percentage of loans explicitly reported as sub-prime; (2) the percentage of loans indicated as being significantly impacted by the mortgage crisis. For firms that clearly state no exposure to subprime lending a zero is assigned. Otherwise, we code them as missing.

In the investment portfolio section of the annual reports, our primary focus is on the dollar amount of investment assets that are backed by subprime mortgages. Most of this information was first reported in fiscal year 2007. Additionally, subprime-related investments were largely undertaken by major banks. Many smaller publicly traded banks were not actively involved in subprime-market-related investments.[12] The exposure to the subprime market is standardized by a company's total assets.[13] We report summary statistics by each fiscal year in Panel A of Table I.

3.2 An Alternative Measure of Insolvency Risk Exposure

In addition to the above measure we utilize Markit's Credit Default Swap (CDS) database, which provides a measure of the CDS spreads on the underlying financial companies' debt. In general, the higher a CDS spread, the greater a company's insolvency risk exposure. The Markit CDS database records daily information, including the underlying currency of a swap, maturity, and seniority, etc. Here we choose the spreads of 5-year senior CDSs with the U.S. dollar as the underlying currency and non-restructuring of the debt in the event of default. The CDS spread data are available from January 2006 to September 2008. We merge the CDS database with our

[12] In most cases, they only had limited subprime exposure, which would not have significantly affected their performance, and these data were not separately reported. If so, they are coded as missing since their subprime-related investment activity is not clear.

[13] We obtain qualitatively similar results if we use collaterized debt obligation (CDO) as an alternative measure of a financial company's risk exposure.

financial company sample by ticker and year and then by name and year (we manually check the merged results to ensure accuracy). Since our main interest is to investigate whether, prior to the short-selling ban, short-selling activities were related to the riskiness of the firm, we calculate a firm's specific CDS spread using 2 approaches. First, for every firm, we calculate the 1-year change in the average of the daily 5-year CDS spread for the period from September 2007 to 17 September 2008; we call this variable ΔCDS. Specifically, to compute ΔCDS, we calculate the average daily CDS for 2 periods, *t* and *t-1*, where *t* is the period from 18 September 2007 to September 17, 2008 (1 day prior to the short-sale ban) and *t-1* is the period from September 18, 2006 to September 17, 2007. The difference between CD_t and CD_{t-1} is the 1-year change in CDS spreads (ΔCDS). Second, we compute for every firm the average daily 5-year CDS spread for the 90 days immediately after the filing dates of its fiscal reports. The assumption here is that CDS spreads adjust to reflect exposure to risky assets as reported in the financial statements of the firm. In Table I, we report the summary statistics for ΔCDS over the period September 2007 to 18 September 2008 and the 90-day average 5-year CDS spreads for the fiscal years 2005, 2006, and 2007. Not surprisingly, the CDS spreads, on average, were much higher after the filing dates of 2007 annual reports.

3.3 Call Report Variables

Banks and bank holding companies are required by law to file the Report of Condition and Income (or "Call Report") and the FRY-9 Report, respectively. Both types of reports include detailed balance sheet information, such as total assets and investments in mortgage-backed securities (MBS), etc. We use the Bank Regulatory Database (which collects information from the *quarterly* "Call Reports" and FRY-9 Reports) to create four additional variables measuring banks' and bank holding companies' exposure to the subprime market. MBS and ABS refer to

the fair values of investments in mortgage-backed securities (held-to-maturity) and asset-backed securities (held-to-maturity), respectively. Commercial paper conduit refers to the maximum amount of credit exposure arising from credit enhancements provided to conduit structures in the form of standby letters of credit, subordinated securities, and other enhancements. CDO refers to the amount of collateralized debt obligations (including synthetic CDOs and other types). We report the summary statistics of these four variables (standardized by total assets) as well as the tier-1 and tier-2 capital ratios collected from the Bank Regulatory Database in Panel B of Table I.

3.4 Other Control Variables

We merge our sample of financial companies with Compustat data and calculate different measures of financial firm characteristics and performance. Firm size refers to the natural logarithm of a financial company's total assets (in millions of dollars). Option refers to an indicator variable as to whether a financial company's equity has associated options traded within 3 months before and after the filing dates of its annual reports according to the OptionMetrics database. The intuition of adding an option indicator is that a long position in a put option of a stock could be viewed as an alternative bearish investment strategy to taking a short position in the firm's equity. Additionally, we merge our database with the Compustat/Bank database to acquire the tier-1, tier-2, and combined risk-based capital ratios for banks and bank holding companies.[14] In general, when compared with the fiscal years 2005 and 2006, the fiscal year 2007 shows that banks experienced a deterioration in their capital ratios measured by both the tier-1 and the combined risk-based capital ratios.

<Insert Table I>

[14] The number of observations of the capital ratios is smaller than any other control variable, because some of the financial companies are not banks or bank holding companies and therefore they are not required to report the capital ratios.

3.5 Short-Selling Data

According to the Regulation SHO (REGSHO) rule adopted by the SEC in mid 2004, all self-regulatory organizations (SROs) had to report tick data on short sales, including information on ticker name, short-sale volume, short-sale price, listing exchange, etc. Our REGSHO database includes short sales made on the New York Stock Exchange (NYSE), American Stock Exchange (AMEX), National Association of Securities Dealers Automated Quotations (NASDAQ), National Stock Exchange (NSX), Archipelago (ARCHA), Boston Stock Exchange (BSE), Chicago Stock Exchange (CHX), National Association of Securities Dealers (NASD), and Philadelphia Stock Exchange (PHLX).[15]

Importantly, it should be noted that the REGSHO short-selling data covered only the period from 2 January 2005 to 6 July 2007. We complemented this database by purchasing short-sale data over the period 1 July 2007 to 18 September 2008 from the NYSE and ARCHA, two exchanges that still report daily short selling after the REGSHO period ended. In total this combined short-sale database covers 539 of the 797 financial companies.

Following the short-selling literature, we focus on "abnormal" short selling. We measure abnormal short selling by adjusting the short-selling activity around the filing dates of financial reports by "normal" short-selling activity and then scaling it by the number of shares outstanding (Short/SHROUT) or by the average daily trading volume over the window (-120, -61), adjusted to any change in the number of shares outstanding (Short/Avol). We use 3 alternative measures

[15] Please see Massoud, Nandy, Saunders, and Song (2010) for a detailed discussion of the REGSHO database.

for “normal” short selling. In the first definition, called abnormal Short/SHROUT1, we define “normal” short selling as the contemporary median short-selling activity ratio on the stock exchange of the financial firm. In the second definition, called abnormal Short/SHROUT2, we define the “normal” short selling as the mean short-selling ratio of the financial firm over the 6-month period before and after the financial report filing date but excluding an event period (-30, +30), where 0 is the report filing date. In the third definition, abnormal Short/Avol, we define “normal” as the average short-selling ratio over the period within 6 months before and after the filing date but excluding the event period. In this paper we use both cumulative short-selling and cumulative abnormal short-selling activities based on the test under consideration.

4. Empirical Results

In this section, we discuss the empirical results relating to hypotheses 1 and 2. In addition, to motivate our tests, we first examine whether short-selling activities for financial firms were different from those for non-financial firms prior to the short-sale ban. Secondly, we examine how the market reacted to financial firms’ filings of their annual reports with the SEC, sorting financial firms by their subprime-to-asset exposure ratios.

4.1 Comparison of Short-Selling Activities for Financial versus Non-Financial Firms

The SEC allegation of abusive short selling on financial firm equity prior to the short-sale ban raises an important question: what was the level of short selling for financial versus non-financial firms prior to the short-sale ban? To answer this question we first provide a simple plot (Figure 1, Panel A) that compares the average daily short selling (measured as the ratio of short volume to the number of the outstanding shares (short/SHROUT)) for the financial versus (unmatched) non-financial firms that were traded on similar exchanges for the period from

January 2007 to September 2008 (the SEC short-sale ban month). During this period, there were 523 financial firms and 5,240 non-financial firms with short-selling data. Interestingly, as can be seen in Figure I, Panel A, the average daily short selling of financial firms was not higher than that of non-financial firms. In fact, it was mostly lower for the financial firms. In addition, in Table II, Panel A, we conduct a t-test for the difference in both the average cumulative short selling and the average cumulative abnormal short selling (with contemporaneous stock exchange median short selling as the benchmark) for financial versus non-financial firms over different periods. This is reported in Panel A.1 for the period from September 18, 2006 to September 17, 2007, in Panel A.2 for the period from September 8, 2007 to September 17, 2008, and in Panel A.3 for the periods two weeks, one month, and three months prior to the short-sale ban (September 18, 2008). Consistent with Figure 1, Panel A, our results in Table II show that the cumulative short-selling activities for different windows was mostly significantly lower for the financial firms than for non-financial firms, although they are insignificantly different from each other in the period just prior to the short-sale ban. For example, for the two-week window prior to the short-sale ban, the cumulative short sale volume was 2.0019% for the financial firms and 2.504% for the non-financial firms, the difference being insignificant at normal levels of significance. Although the crisis was mostly related to financial companies, we did not observe an excessive increase in short-selling activities of those firm's stocks.

<Insert Figure I> <Insert Table II >

Secondly, to improve the financial versus non-financial firm short-selling comparison we matched the financial firms with non-financial firms based on three dimensions: CDS spreads, asset size, and venue of exchange. Figure 1, Panel B, presents the average daily short selling for the financial versus matched non-financial firms for the period from January 2007 to September

2008. There were 79 financial firms with CDS and Compustat data available. As you can see in Panel B, in general, the short selling for the financial and their matched non-financial firms have very similar magnitudes and follow a similar pattern throughout the whole period except for the two weeks before the short-sale ban when the average daily short selling for the financial firms is slightly higher. In Table II Panel B, we conduct t-tests for the difference in both the average cumulative short selling and the average cumulative abnormal short selling for financial versus their matched non-financial firms over different periods. This is reported in Panel B.1 for the period from September 18, 2006 to September 17, 2007, in Panel B.2 for the period from September 8, 2007 to September 17, 2008, and in Panel B.3 for the period two weeks, one month, and three months prior to the short-sale ban. We also report the total assets and the 5-year CDS spread in panels B.2 and B.3 to show how close the characteristics of the financial firms are to their matches. As you can see, for the period from September 18, 2006 to September 17, 2007, Panel B.1, the cumulative short selling of equity is significantly lower for financial firms. Note also that the CDS spread is slightly lower for the financial firms but the difference is insignificant. On the other hand, the cumulative short selling is slightly higher for financial firms for the period from September 8, 2007 to September 17, 2008 in Panel B.2 and for some windows before the short-sale ban, but the differences are statistically insignificant for all the windows.

In summary, our results in this section do not support the SEC allegations of abusive or excessive short selling of financial firms stock during the crisis. If short selling was "excessive" for financial firms then it was also "excessive" for the non-financial firms. Accordingly, if the short-sale ban had been a correct policy solution to stabilize financial markets then it should have been extended to all firms and all industries.

4.2 Results for Announcement Day Returns

We conduct an analysis of a financial company's stock price performance around the announcement date of its annual reports. The abnormal return (AR_{it}) of a given company i on day t is defined as the difference between the daily return of firm *i* on day *t* and the contemporaneous return on the CRSP Equal Weighted Index (EWRETD) on day *t*. Day *0* is defined as the filing date of an annual report, or the next trading day if the filing date is not a trading day. We first sort the financial firms into three groups according to their subprime-to-assets ratios for each fiscal year. Group 1 and group 3 contain the observations with the lowest and the highest subprime-to-assets ratios, respectively. These results are presented in Panel A of Table III. We then sort the observations into 3 groups according to the 5-year CDS spreads for each fiscal year. Group 1 and group 3 contain the observations with the lowest and the highest CDS spreads, respectively. We report t-tests of abnormal returns for each group and each fiscal year. These results are presented in Panel B of Table III.

<Insert Table III>

As you can see from Panel A of Table III, for the fiscal years 2005 and 2006, none of the groups had significant abnormal announcement returns over virtually all the event windows (except the group with the highest exposure over the window (-1, +10) for the fiscal year 2006). However, around the 2007 annual reports announcements, the *CARs* of the group with the highest subprime-to-assets ratios are significantly (both economically and statistically) negative over all the windows. For example, the *CAR* over window (-1, +1) of group 3 (the highest exposure group) around the 2007 fiscal year filing is -1.92% and significant at the 1% level. By

contrast, the *CARs* of group 1 (the lowest exposure group) are insignificant over all the windows around the announcements dates of the 2007 annual reports.[16] Using a mean-difference test between the group 1 and group 3 *CARs*, we find that the average *CAR* of group 1 is significantly higher than that of group 3 around the filing dates for 2007 annual reports only.

We obtain similar results when we sort the *CARs* by 90-day average daily CDS spreads post the annual report filings by financial companies; see Panel B of Table III. In particular, for the fiscal year 2007 annual reports, the group with the lowest CDS spreads had significantly lower negative *CARs* than those with the highest spreads. Again, these results suggest that the market reacted rationally to the public announcement of these exposures.

4.3 Results for Testing H1

In this section we use a variety of proxies to measure the financial firms' exposure to subprime assets to test H1. In section 4.3.A, we create an annual direct measure of a financial firm's exposure to the subprime market by hand collecting subprime assets from SEC filings while in section 4.3.B we create four different proxies for the subprime asset exposures from the quarterly call reports and FRY-9 reports.

We use univariate analysis as well as multivariate regressions to test H1. For the univariate analysis, we use the three different measures of cumulative abnormal short selling discussed above. Around the financial report filing date, we compute the cumulative short selling of a financial firm's equity for the (-10, +10) event window. For each fiscal year end from 2005 to 2007, we separate the observations into 3 groups based on the measure under consideration for subprime assets exposure. For each fiscal year end and for each group, we test whether its mean

[16] The intermediate group *CARs* are generally significantly negative.

cumulative abnormal short selling is different from zero and whether the mean difference between the abnormal short selling of groups 1 (the lowest exposure to subprime assets) and 3 (the highest exposure to subprime assets) is significantly different from zero.

In the multivariate analysis, we use year fixed-effect regressions and clustered error terms at the firm level. The dependent variable is cumulative abnormal short-selling activity relating to a financial firm's stock for the (-10, +10) event window around the filing date of its annual or quarterly reports.[17]

4.3. A Annual Subprime Asset Exposure

The univariate results for testing H1 are presented in Table IV and those for the multivariate tests are presented in Table V. Table IV shows the average cumulative abnormal short selling, using the three alternative definitions, as well as the raw contemporaneous cumulative short-selling ratio.[18] In general, cumulative abnormal short selling was most positive and significant around the announcement dates of the 2007 annual reports for the group with the highest exposure to the subprime market. The results are mixed for groups 1 and 2 (lower exposures to the subprime market). Specifically, the mean difference between the cumulative abnormal short selling of group 1 firms' equity (the firms with the lowest exposure) and group 3 firms' equity (the firms with the highest exposure) is negative using all three definitions of abnormal short selling and is statistically significant for two measures out of the three. In addition, the raw contemporaneous cumulative short-selling ratio is negative and significant at the 1% level.

<Insert Table IV>

[17] Our results are similar if we consider short selling around the (-10, -2) event window.

[18] As we discussed in section 3, the cumulative Abnormal Short/SHROUT1 ratio (the "normal" is defined as the mean Short/SHROUT of the exchange where a given financial company is traded) compares the short selling of a financial company's equity with the mean of a stock exchange on the same trading day.

Table V reports our multivariate analysis of short-selling activity, measured as the cumulative abnormal Short/SHROUT1 over the (-10, +10) event window. We present our results in four columns (models) based on adding or dropping alternative control variables. Model II includes all our explanatory variables. First, we include a bank dummy variable that equals 1 if a financial firm is a bank based on Compustat identification and 0 otherwise. This may reflect a greater propensity of regulators to support banks in financial distress compared with other financial firms. Second, since well-capitalized banks are generally perceived to be less risky, we include a variable that measures the interaction between the bank dummy variable and its tier-1 capital ratio (CAPR1). Third, we include a quadruple interaction variable between a bank's capital ratio (CAPR1), the bank dummy variable, its subprime-to-assets ratio, and a report filing dummy in 2007 (Year_2007), for reports filed between September 2007 and 8 September 2008 (10 days prior to the short-sale ban).[19] This interaction variable allows us to test whether the market accounts for the potential of a well-capitalized bank to withstand enhanced insolvency risk due to a high subprime-to-assets ratio. Fourth, we include an interaction variable between the subprime-to-assets ratio and annual report filings for 2007. Fifth, we include an interaction variable between the subprime-to-assets ratio and annual report filings for 2006. The last two variables allow us to test whether there were differences in the behavior of short sellers over the period when the financial crisis was developing. We expect to observe an increase in the abnormal short-selling activities around the 2007 annual report filings for the firms with the greatest exposure to the subprime market. Our key variables are the subprime-to-assets ratios (Subprime) and the subprime ratio interacted with: (i) a 2007 year dummy, Year_2007, and (ii) a bank dummy, CAPR1, and Year_2007 dummy.

[19] That is, the dummy for filings in 2006 and 2005 is zero.

<Insert Table V>

Consistent with the univariate above, the coefficient on the subprime-to-assets ratio is insignificant over the whole 2005–2007 sample period; however, its interaction with the Year_2007 dummy is positive and significant at the 5% level in all models. This implies that investors engaged in short selling, based on the financial firms' exposure to the subprime market when subprime exposure was perceived to have reached a significant threshold. Interestingly, the coefficient on the quadruple interaction variable, between the capital ratio (CAPR1), the bank dummy, the subprime-to-assets ratio, and the Year_2007 dummy is significantly negative at the 5% level in Model II and at the 10% level in Model IV. This result suggests that the impact of subprime exposure on short-selling activity in the fiscal year 2007 was weaker for well-capitalized banks.

In summary, our results provide support for hypothesis 1, i.e., *short selling of stocks was greatest for financial companies with the largest exposure to the subprime mortgage market.*

4.3. B Quarterly Subprime Asset Exposure

In Table VI, for the same time period, September 2005 to September 2008, we conduct an analysis of cumulative abnormal short selling using subprime-assets-related accounting information from firms' quarterly Report of Condition and Income (call report) with the Federal Deposit Institution Corporation (FDIC). This includes the fair values of investments in mortgage-backed securities (MBS/Assets), asset-backed securities (ABS/Assets), collateralized debt obligations (CDOs/Assets), and commercial paper conduits (Com. Paper Conduit/Assets), which refers to the maximum amount of credit exposure arising from credit enhancements

provided to conduit structures in the form of standby letters of credit, subordinated securities, and other enhancements.

<Insert Table VI>

Panels A to D of Table VI report the results of the univariate analysis of abnormal short selling (reporting the raw cumulative short-selling ratio (Cum. Short/SHROUT) and the abnormal cumulative short-selling ratio (Cum. Ab. Short/SHROUT)) by sorting the quarterly call report variables into three groups. Note that the number of observations with a positive number for ABS, CDOs, and commercial paper conduits drops significantly since not all the banks were required to report these variables prior to the short-sale ban. Accordingly, in Panels B to D the number of groups drops to two. In addition, because of this limitation our results in this subsection are a little weaker in comparison with those in Section 4.3.A. In general, for the group with the highest exposure to the subprime market, cumulative abnormal short selling was mostly positive and significant in two to four quarters prior to the short-sale ban. The mean difference between the cumulative abnormal short selling for the firms with the lowest and highest subprime asset exposure is mostly negative in two to four quarters prior to the short-sale ban while it is only significant in Panels C (Com. Paper Conduit/Assets Ratio) and D (CDO/Assets Ratio).

Panel E of Table VI reports the multivariate analysis results of short-selling activity, measured as the cumulative abnormal Short/SHROUT over the (-10, +10) event window. We present our results in four columns (models) based on adding or dropping alternative variables. In addition to the control variables we defined above, our key explanatory variables are MBS/Assets, ABS/Assets, CDOs/Assets, and Com. Paper Conduit/Assets. We expect to observe

an increase in the abnormal short-selling activities for the firms with the greatest exposure to the subprime market. This is expected to be higher around the financial crisis as measured in the dummies 2008 and 2007. The coefficients on MBS/Assets, ABS/Assets, Com. Paper Conduit, Year 2007 dummy, and Year 2008 dummy are positive and significant.

Consistent with Section 4.3.A, our results, in general, provide support for hypothesis 1, i.e., *Short selling of stocks was greatest for financial companies with the largest exposures to the subprime mortgage market.*

4.4 Results for Testing H2

Our results for hypothesis 2 are presented in Tables VII and VIII. In Table VII, we present our univariate tests. In Panel A, we group abnormal short selling based on the average 5-year CDS spread computed over the 90 days the filing date of annual financial reports. In Panel B, we analyse 3 different measures of short selling based on the average 1-year change in daily 5-year CDS spreads (ΔCDS).

<Insert Table VII> <Insert Table VIII>

The results in Panel A of Table VII show that for the fiscal year 2007 abnormal short selling was positive and significant at the 1% level for group 3, using all 4 different specifications and the difference between group 1 (the lowest CDS spread) and group 3 (the highest CDS spread) was negative and significant at the 1% level for 2 measures, cumulative abnormal Short/SHROUT1 and cumulative contemporary Short/SHROUT. For the fiscal years 2006 and 2005, the difference in short selling between groups 1 and 3 was also negative and significant at the 1% level for 2 measures (cumulative abnormal Short/SHROUT1 and cumulative contemporary Short/SHROUT).

In Panel B, our results show that for ΔCDS, the difference in short selling between groups 1 (the lowest ΔCDS) and 3 (the highest ΔCDS) is negative and significant at the 1% level in all 3 specifications of annual cumulative short selling.

Table VIII reports a multivariate analysis of the determinants of short-selling activity using both ΔCDS in Panel A and CDS spread in Panel B as control variables. In Panel A, the coefficient of ΔCDS is positive and significant at the 1% level in all the models (Models I to IV) using the 2 different measures of 1-year cumulative short selling, 1-year Cum. Abnormal Short/SHROUT1, and 1-year ΔCum. Short/SHROUT. Similarly, the results in Panel B show that the coefficient on the CDS spread is positive and significant at the 1% level in Model V and at the 10% level in Model VI using the Cumulative Abnormal short/SHROUT1 as the dependent variable over the window (-10,-2).

In summary, our results also provide strong support for hypothesis 2 in this paper; S*hort selling of equity was greatest for financial companies with the largest insolvency risk exposures measured by CDS spreads.*

5. Conclusion

In conclusion, the evidence presented in this paper shows that there was no significant difference between the short-selling activities for financial and non-financial firms prior to the short-sale ban, even after controlling for insolvency risk, firm size and trading venue. More importantly, the results of this paper provide evidence that short sellers clearly differentiated between target financial firms according to market participants' perceptions of their risk exposures. More specifically, the greater a financial company's exposure to the subprime mortgage market during the financial crisis, the larger the amount of short selling of the equity of

that firm around annual financial report filing dates in the year immediately prior to the ban on short selling by the SEC. Using different measures of abnormal cumulative short selling, we also find that the higher the average 5-year CDS spread and/or the 1-year change in the daily 5-year CDS spread, the higher the short-selling activity related to a financial firm's equity.

Our results, generally, support the arguments of hedge fund managers that banning short selling may cause market deviations from market fundamentals such as firms' insolvency risk exposure. Accordingly, our findings have important implications regarding the current debate over limiting short selling and suggest that such a regulation may well mute the disciplining effects of financial markets on those financial firms with the greatest exposures to insolvency risk. The latter disciplining role of investors being an important pillar (pillar 3) of the Basel 2 (BIS) regulatory reform.

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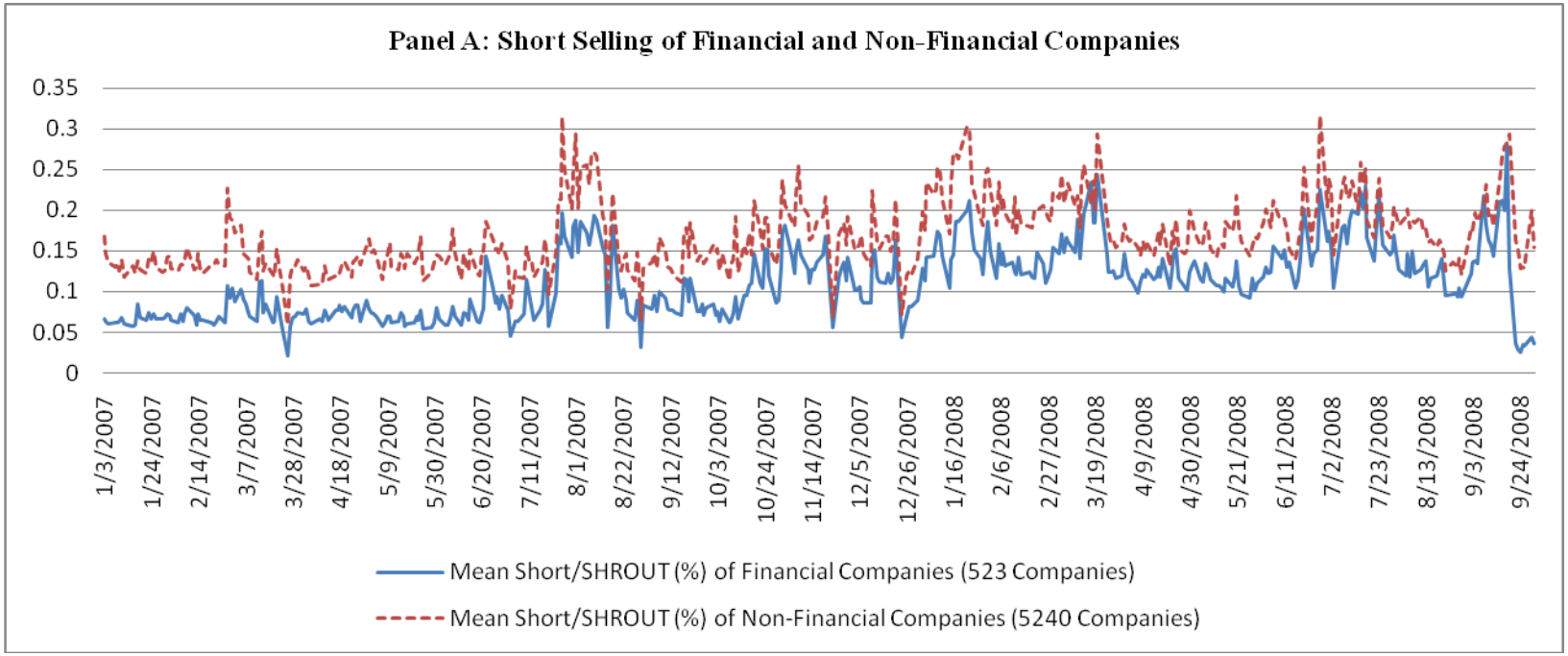
Figure I: Short Selling Activity of Financial and Non-Financial Companies

Panel A of Figure I plots the mean daily short selling, measured as the ratio of short volume to number of shares outstanding (Short/SHROUT), for financial companies versus non-financial companies. In Panel B, we plot the short selling after matching the financial companies with non-financial companies based on Credit Default Swap (CDS) spreads and size. First, for each financial company, we look for the non-financial companies whose average CDS spreads are within ±10% of the financial company's spread. Then among candidate matching companies, we choose the one with total assets closest to the financial company's CDS spread.



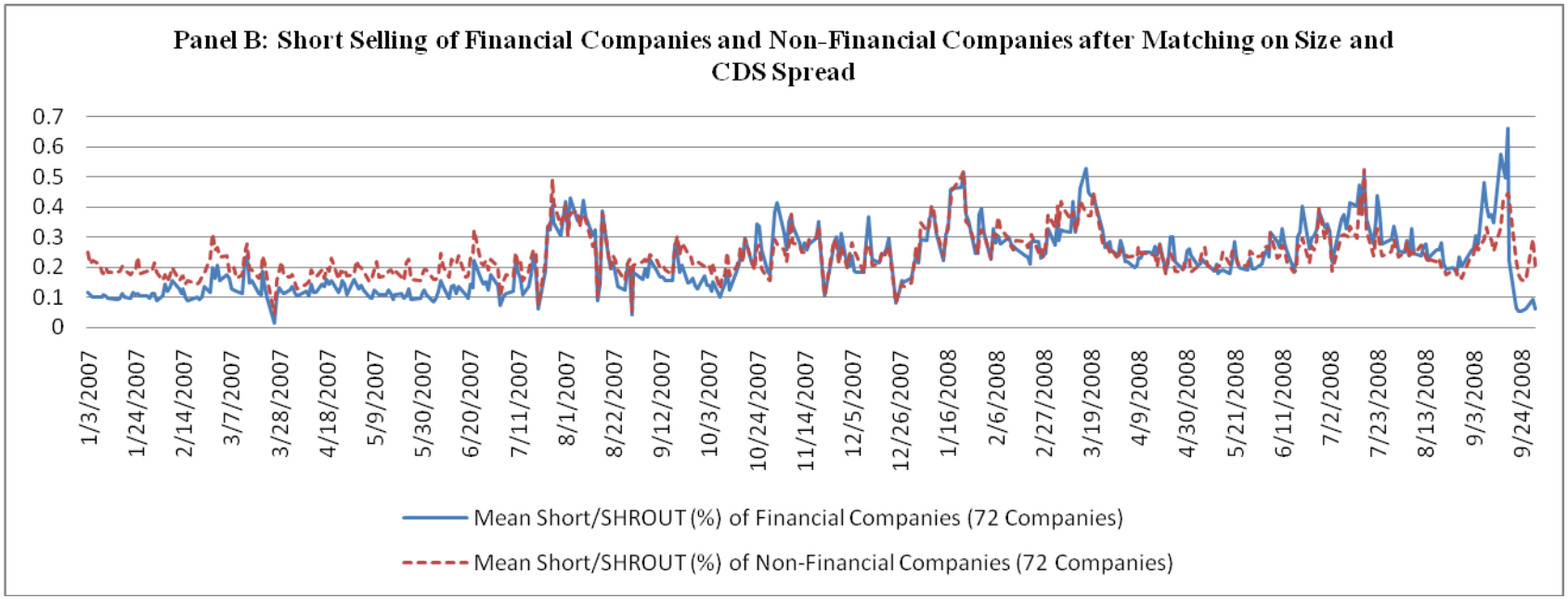

Panel B: Short Selling of Financial Companies and Non-Financial Companies after Matching on Size and CDS Spread
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1/3/2007
1/24/2007
2/14/2007
3/7/2007
3/28/2007
4/18/2007
5/9/2007
5/30/2007
6/20/2007
7/11/2007
8/1/2007
8/22/2007
9/12/2007
10/3/2007
10/24/2007
11/14/2007
12/5/2007
12/26/2007
1/16/2008
2/6/2008
2/27/2008
3/19/2008
4/9/2008
4/30/2008
5/21/2008
6/11/2008
7/2/2008
7/23/2008
8/13/2008
9/3/2008
9/24/2008
Mean Short/SHROUT (%) of Financial Companies (72 Companies)
Mean Short/SHROUT (%) of Non-Financial Companies (72 Companies)

Table I: Summary Statistics

Panel A of Table I include the summary statistics of annual variables. First we report financial companies' exposure to subprime assets contained in their annual reports and footnotes for fiscal years of 2005 2006 and 2007.[20] Subprime-to-assets ratio (Subprime) refers to the ratio of the total amount of investments in subprime assets to total assets. Then we report the change in average CDS spreads of a given financial company from the 90 days before the filing dates of its annual financial reports to the 90 days after the filing dates. In this paper we utilize the spreads of 5-year senior CDSs with U.S. dollars as the underlying currency and non-restructuring in the documentation clause. We also report different measures of financial companies' firm characteristics. Firm Size refers to the natural logarithm of total assets (in million dollars). Option is an indicator variable as to whether a financial company's equity has an option trading record in the OptionMetrics database within 3 months before and after the filing dates of annual reports. CAPR1, CAPR2 and CAPR3 refer to Tier 1, Tier2 and combined risk-adjusted capital ratios for the banks and bank holding companies, respectively. Last we report summary statistics of the one-year change in Credit Default Swap (CDS). To compute the one year ΔCDS, for every firm, we calculate the average daily CDS for two periods: *t* and *t-1,* where *t* is the period from18 September 2007 to September 17, 2008 (one day prior to the short-sale ban) and *t-1* is the period from September 18, 2006 to September 17, 2007. The difference between CD_t and CD_{t-1} is the one-year change in CDS spreads (ΔCDS). In Panel B we report quarterly variables using banks' call reports and bank holding companies' FRY-9 reports from Bank Regulatory database. MBS/Assets, ABS/Assets, Com. Paper Conduit/Assets, CDO/Assets refer to the ratios of mortgage-backed securities (held-to-maturity), asset-backed-securities (held-to-maturity), asset-backed commercial paper conduits and collateralized-debt obligations to total assets, respectively. All variables in Table Panel and Size and Capital Ratios in Panel B are winsorized at the 2 and 98 percentiles.

Panel A: Summary Statistics, Annual Data

		Fiscal Year		
		2005	2006	2007
Subprime-to-assets (Subprime)	N	51	75	316
	Mean	0.0287	0.0441	0.0091
	Median	0.0034	0.0051	0
	Max	0.1514	0.6779	0.1363
	Min	0	0	0

		2005	2006	2007
Δ 90-day Average 5-year CDS Spread (%) before and after Annual Report Filing Dates	N	45	57	50
	Mean	-0.1729	-0.0838	0.4604
	Median	-0.1606	-0.0735	0.2938
	Max	-0.0524	0.1265	3.7287
	Min	-0.4748	-0.5598	-0.4096
		2005	2006	2007
Size (log assets in million dollars)	N	531	538	536
	Mean	7.7242	7.8169	7.8766
	Median	7.2044	7.2862	7.3356
	Max	14.3384	14.5127	14.8974
	Min	2.5534	2.8549	2.8371

[20] As mentioned in the introduction, on average there is a three month lag between a company's filing date and its fiscal year end date. Following Compustat's definition of fiscal year end our financial report filing from September 2005 to September 2008 covers 2005 to 2007 fiscal years.

		2005	2006	2007
Risk-Adjusted Capital Ratio (%) - Tier 1	N	365	402	403
	Mean	11.4659	11.3547	10.8102
	Median	10.7200	10.7050	10.1500
	Max	38.8300	54.3800	27.4800
	Min	6.2300	6.2400	5.4000

		2005	2006	2007
Risk-Adjusted Capital Ratio (%) - Tier 2	N	365	402	403
	Mean	2.6863	2.9455	2.9064
	Median	1.2600	1.3100	1.3000
	Max	29.6800	28.4300	28.3100
	Min	0.3700	0.2300	0.4100

		2005	2006	2007
Risk-Adjusted Capital Ratio - Combined	N	365	403	403
	Mean	14.1522	14.3317	13.7166
	Median	12.8000	12.7900	12.2700
	Max	48.9800	55.3900	50.2900
	Min	9.7600	9.1800	8.4400

		2005	2006	2007
Option	N	543	547	549
	Mean	0.2081	0.2340	0.2623
	Median	0	0	0
	Max	1	1	1
	Min	0	0	0

Δ One Year Average CDS Spread (%)	N	Mean	Median	Max	Min
	79	1.2167	0.5706	10.4353	-0.6287

Panel B: Quarterly Variables Using Call Reports and FRY-9 Reports

Panel B.1: MBS/Assets (%)

Report Date	N	Mean	Median	Max	Min
03/31/06	316	0.8820	0	30.1638	0
06/30/06	318	0.8204	0	28.3257	0
09/30/06	319	0.8107	0	27.5748	0
12/31/06	319	0.7916	0	27.2998	0
03/31/07	323	0.7758	0	25.4081	0
06/30/07	323	0.7319	0	25.0257	0
09/30/07	325	0.7095	0	24.3793	0
12/31/07	326	0.7038	0	24.4763	0
03/31/08	328	0.7653	0	27.6170	0
06/30/08	329	0.8185	0	27.6472	0

Panel B.2: ABS/Assets (%)

Report Date	N	Mean	Median	Max	Min
03/31/06	316	4.20E-03	0	1.0443	0
06/30/06	318	3.64E-03	0	0.9695	0
09/30/06	319	3.61E-03	0	0.9785	0
12/31/06	319	4.06E-03	0	0.8453	0
03/31/07	323	3.91E-03	0	0.8771	0
06/30/07	323	3.60E-03	0	0.7864	0
09/30/07	325	4.20E-03	0	1.0338	0
12/31/07	326	3.69E-03	0	0.9125	0
03/31/08	328	3.71E-03	0	0.8929	0
06/30/08	329	6.55E-03	0	0.7580	0

Panel B.3: Com. Paper Conduit/Assets (%)

Report Date	N	Mean	Median	Max	Min
03/31/06	318	1.47E-02	0	1.8802	0
06/30/06	320	1.50E-02	0	2.1241	0
09/30/06	321	1.53E-02	0	2.2219	0
12/31/06	321	1.59E-02	0	2.4707	0
03/31/07	325	1.56E-02	0	2.4866	0
06/30/07	325	1.54E-02	0	2.5121	0
09/30/07	327	1.07E-02	0	0.8461	0
12/31/07	328	9.84E-03	0	0.8298	0
03/31/08	330	8.73E-03	0	0.9554	0
06/30/08	331	7.84E-03	0	1.0212	0

Panel B.4: CDO/Assets (%)

Report Date	N	Mean	Median	Max	Min
03/31/08	146	3.28E-03	0	0.3327	0
06/30/08	153	8.05E-03	0	0.4510	0

Panel B.5: Size (Log Assets in Million Dollars)

Report Date	N	Mean	Median	Max	Min
03/31/06	318	7.5702	7.2600	11.8511	5.1786
06/30/06	320	7.5916	7.2998	11.8600	5.1550
09/30/06	321	7.6127	7.3114	11.8360	5.2207
12/31/06	321	7.6446	7.3397	11.8732	5.2747
03/31/07	325	7.6518	7.3416	11.8391	5.3044
06/30/07	325	7.6738	7.3682	11.8540	5.2967
09/30/07	327	7.7114	7.3925	12.0774	5.2856
12/31/07	328	7.7355	7.4188	12.0983	5.2626
03/31/08	330	7.7542	7.4093	12.0951	5.3191
06/30/08	331	7.7674	7.4347	12.0852	5.2994

Panel B.6: Capital Ratio-Tier 1 (%)

Report Date	N	Mean	Median	Max	Min
3/31/2006	316	11.1193	10.8700	19.9600	0.1263
6/30/2006	318	11.0945	10.8500	20.6500	0.1248
9/30/2006	319	11.0862	11.0100	19.4600	0.1510
12/31/2006	319	11.1268	11.0200	19.2300	0.1465
3/31/2007	323	11.0042	10.9500	18.8700	0.1404
6/30/2007	323	10.8421	10.6500	19.3300	0.1337
9/30/2007	325	10.7385	10.5500	18.9800	0.1302
12/31/2007	326	10.5356	10.2900	18.5900	0.1251
3/31/2008	328	10.3078	10.0400	18.3500	0.1184
6/30/2008	329	10.2474	10.0500	17.6500	0.1135

Panel B.7: Capital Ratio-Combined (%)					
Report Date	N	Mean	Median	Max	Min
3/31/2006	316	12.5663	12.3650	21.1500	0.1387
6/30/2006	318	12.5216	12.3250	21.7000	0.1357
9/30/2006	319	12.5378	12.4200	20.5300	0.1587
12/31/2006	319	12.5386	12.4400	20.3800	0.1545
3/31/2007	323	12.4146	12.2400	19.7800	0.1496
6/30/2007	323	12.2542	12.0700	20.5100	0.1462
9/30/2007	325	12.1591	11.9900	19.5600	0.1428
12/31/2007	326	11.9828	11.7650	19.2800	0.1360
3/31/2008	328	11.8015	11.6850	19.5500	0.1246
6/30/2008	329	11.7995	11.7100	18.9000	0.1239

Table II: Comparison of Short Selling Activities between Financial Companies and Non-Financial Companies

In this table we compare the short selling activities of financial companies and non-financial companies. In Panel A.1 and A.2 we summarize the cumulative short selling and cumulative abnormal short selling of the financial companies and non financial companies over two periods, the period from18 September 2007 to September 17, 2008 (one day prior to the short-sale ban) and the period from September 18, 2006 to September 17, 2007. We also include the cumulative short selling over two weeks, one month and three months just before the short selling ban (September 18, 2008). In Panel B, we restrict the samples to those companies with CDS information and report the total assets (in thousand dollars), natural logarithm of total assets, average CDS spreads (in percentage), cumulative short selling and cumulative abnormal short selling (contemporaneous stock exchange median short selling as benchmark). The average CDS spreads and cumulative short selling are calculated over two periods, the period from18 September 2007 to September 17, 2008 (one day prior to the short-sale ban) and the period from September 18, 2006 to September 17, 2007. We report the comparison results after matching. First, for each financial company, we look for the non-financial companies whose average CDS spreads are within ±10% of the financial company's spread. Then among candidate matching companies, we choose the one with total assets closest to the financial company's CDS spread. t-tests of short selling activities within each group and mean difference t-tests between the two groups are reported. * **, and *** indicate significance at 10%, 5%, and 1%, respectively.

Panel A: Unmatched Comparison between Financial Companies and Non-Financial Companies (Full Sample)										
	Panel A.1: Short Selling over the Period from September 18, 2006 to September 17, 2007									
	Financial Companies			Non-Financial Companies			Financial – Non-Financial			
	N	Mean	Median	N	Mean	Median	N	Mean-diff		t-test
1-Year Cum. Size/Shrout (%)	727	23.5472	9.9934	6,534	64.7307	28.7288	7,261	-41.1835	***	-11.34
1-Year Cum_Ab. Size/Shrout1(%)	727	7.0818	-2.8777	6,534	45.7001	10.8719	7,261	-38.6183	***	-10.74
	Panel A.2: Short Selling over the Period from September 18, 2007 to September 17, 2008									
1-Year Cum. Size/Shrout (%)	684	27.5271	4.6673	6,137	54.0449	12.2064	6,821	-26.5178	***	-7.14
1-Year Cum_Ab. Size/Shrout1 (%)	684	14.1724	-0.2241	6,137	36.1102	2.0950	6,821	-21.9378	***	-6.15

Panel A.3: Short Selling over periods immediately prior to the Short Selling Ban

	N	Mean	Median	N	Mean	Median	N	Mean-diff		t-test
2-Week Cum. Size/Shrout (%)	534	2.0019	0.3636	5,047	2.5038	0.5836	5,581	-0.5019		-1.29
2-Week Cum_Ab. Size/Shrout1 (%)	534	1.3001	0.031	5,047	1.6395	0.0342	5,581	-0.3394		-0.88
1-Month Cum. Size/Shrout (%)	575	3.0708	0.5512	5,285	4.1926	0.9942	5,860	-1.1218	**	-2.07
1-Month Cum_Ab. Size/Shrout1 (%)	575	1.8955	0.0407	5,285	2.7207	0.0498	5,860	-0.8252		-1.55
3-Month Cum. Size/Shrout (%)	683	8.2004	1.3536	5,699	13.4594	2.8526	6,382	-5.2590	***	-3.97
3-Month Cum_Ab. Size/Shrout1 (%)	683	4.7803	-0.0304	5,699	8.8429	0.1891	6,382	-4.0626	***	-3.13

Panel B: Comparison between Financial Companies and Matching Non-Financial Companies (after Matching on Size and CDS Spreads)

	Financial Companies			Matching Non-Financial Companies			Financial – Non-Financial		
	N	Mean	Median	N	Mean	Median	N	Mean-diff	Paired t-test
Panel B.1: Over the Period from September 18, 2006 to September 17, 2007									
Total Assets	79	259,758.47	59,805	79	173,830.75	59,998.00	79	85,927.72	3.44***
Log Assets	79	11.1378	10.9988	79	10.9473	11.0021	79	0.1905	4.16***
Spread 5Y (%)	79	0.4135	0.2426	79	0.4138	0.2512	79	-0.0003	-0.07
1-Year Cum. Size/Shrout (%)	79	43.2261	33.7872	79	58.3280	46.8745	79	-15.1019	-2.53**
1-Year Cum_Ab. Size/Shrout (%)	79	12.8960	2.3997	79	29.1997	15.5910	79	-16.3037	-2.73***
Panel B.2: Over the Period from September 18, 2007 to September 17, 2008									
Total Assets	75	315,149.36	57,762.26	75	122,738.54	40,661.00	75	192,410.82	3.79***
Log Assets	75	11.2120	10.9641	75	10.6217	10.6130	75	0.5903	5.47***
Spread 5Y (%)	75	1.6592	0.9132	75	1.6404	0.9419	75	0.0188	0.79
1-Year Cum. Size/Shrout (%)	75	78.1600	50.9972	75	73.9972	43.0501	75	4.1628	0.37
1-Year Cum_Ab. Size/Shrout (%)	75	42.5884	14.9681	75	40.3416	9.6737	75	2.2468	0.20
Panel B.3: Short Selling over periods immediately prior to the Short Selling Ban									
2-Week Cum. Size/Shrout (%)	72	4.5698	2.9832	72	3.3997	1.9363	72	1.1701	1.56
2-Week Cum_Ab. Size/Shrout1 (%)	72	3.0014	1.4154	72	1.9129	0.4596	72	1.0885	1.47
1-Month Cum. Size/Shrout (%)	72	7.2453	4.6030	72	5.6023	2.8194	72	1.6430	1.51
1-Month Cum_Ab. Size/Shrout1 (%)	72	4.5150	1.9523	72	3.0125	0.6804	72	1.5025	1.40
3-Month Cum. Size/Shrout (%)	72	21.5680	14.9236	72	17.4838	12.8256	72	4.0842	1.50
3-Month Cum_Ab. Size/Shrout1 (%)	72	12.5180	5.8994	72	8.9032	3.6457	72	3.6148	1.35

Table III: Univariate Analysis of Cumulative Abnormal Returns

Table III summarizes the univariate analysis of cumulative abnormal returns (CAR) over different windows. Abnormal return (AR_{it}) of a given firm i on day t is defined as the difference between the daily return of firm i on day t and the contemporaneous return on CRSP equal weighted index (EWRETD). Day 0 is defined as the filing date of annual reports, or the next trading day if the filing date is not a trading day, for fiscal year end of 2005, 2006 and 2007 during the period from September 2005 to 8 September 2008 (ten days before the short sale ban by the SEC). In Panel A, the observations are sorted into three groups according to the subprime-to-assets ratio (Subprime) in each fiscal year. Group 1 and group 3 contain the observations with lowest and highest subprime-to-assets ratios, respectively. In Panel B, we conduct similar analysis but instead we sort the returns by the daily average 5-year CDS spreads over 90 days post the filing date of financial reports. We report the t-tests of CARS within each group and mean difference t-tests between group 1 and 3.

Panel A: Sorted by Subprime-to-assets Ratios

Fiscal Year	Subprime			CAR(-1, +1)		CAR(-1, +2)		CAR(-1, +5)		CAR(-1,+10)	
	Group	N	Mean	Mean	t-test	Mean	t-test	Mean	t-test	Mean	t-test
2005	1(lowest)	17	1.00E-06	0.0018	0.46	0.0065	1.38	0.0019	0.28	0.0055	0.82
	2	17	0.0051	-0.0065	-1.59	-0.0036	-0.79	-0.0048	-0.68	-0.0066	-0.86
	3(highest)	17	0.0809	0.0096	1.38	0.0032	0.56	0.0052	0.81	0.0056	0.52
	(1-3)		-0.0809	-0.0078	-0.98	0.0033	0.45	-0.0033	-0.35	-0.0001	-0.01
2006	1(lowest)	25	7.20E-05	-0.0016	-0.46	0.0004	0.11	-0.0008	-0.13	-0.0090	-1.28
	2	25	0.0065	-0.0017	-0.41	-0.0057	-1.11	-0.0082	-1.53	-0.0147	-1.15
	3(highest)	25	0.1257	-0.0002	-0.04	0.0002	0.02	-0.0058	-1.08	-0.0172 ***	-2.83
	(1-3)		-0.1256	-0.0014	-0.21	0.0003	0.03	0.0050	0.61	0.0082	0.88
2007	1(lowest)	192	0	-0.0067 *	-1.67	-0.0022	-0.44	-0.0024	-0.43	0.0076	1.18
	2	19	0.0003	-0.0257 **	-2.49	-0.0304 ***	-2.88	-0.0498 ***	-3.48	-0.0357 *	-2.10
	3(highest)	105	0.0274	-0.0192 ***	-3.13	-0.0173 ***	-2.77	-0.0207 **	-2.20	-0.0232 **	-2.00
	(1-3)		-0.0274	0.0125 *	1.71	0.0151 *	1.89	0.0183 *	1.66	0.0307 **	2.32

Panel B: Sorted by Change in 90-day Average 5-year CDS Spread (%) before and after Filing Dates

Fiscal Year	Change in CDS Spread (%)			CAR(-1, +1)			CAR(-1, +2)			CAR(-1, +5)			CAR(-1,+10)		
	Group	N	Mean	Mean		t-test	Mean		t-test	Mean		t-test	Mean		t-test
2005	1(lowest)	15	-0.2508	0.0026		0.59	0.0057		0.90	0.0085		1.01	-0.0065		-0.66
	2	15	-0.1553	-0.0033		-0.76	-0.0026		-0.75	-0.0007		-0.15	0.0041		0.69
	3(highest)	15	-0.1127	-0.0027		-0.67	-0.0053		-0.97	-0.0078	**	-2.05	-0.0162	*	-1.91
	(1-3)		-0.1381	0.0053		0.89	0.0110		1.32	0.0163	*	1.77	0.0097		0.75
2006	1(lowest)	19	-0.2015	0.0071		1.34	0.0100		1.68	0.0097		1.33	0.0031		0.31
	2	19	-0.0712	0.0010		0.31	0.0046		1.24	0.0022		0.57	-0.0059		-1.17
	3(highest)	19	0.0211	-0.0002		-0.03	0.0002		0.03	-0.0063		-0.93	-0.0243	***	-2.67
	(1-3)		-0.2226	0.0073		0.92	0.0098		1.09	0.0160		1.61	0.0274	*	2.01
2007	1(lowest)	16	-0.0708	-0.0235	**	-2.55	-0.0225	**	-2.41	-0.0348	**	-2.04	-0.0221		-0.97
	2	17	0.2875	-0.0262	***	-3.36	-0.0287	***	-3.32	-0.0437	***	-3.48	-0.0344	**	-2.30
	3(highest)	17	1.1332	-0.0477	***	-2.92	-0.0434	***	-2.77	-0.0669	***	-2.60	-0.1305	***	-4.30
	(1-3)		-1.2040	0.0242		1.29	0.0209		1.14	0.0321		1.04	0.1084	***	2.86

Table IV: Univariate Analysis of Short Selling Activities Based on Annual Exposures to the Subprime Market

Table IV summarizes the univariate analysis of cumulative abnormal short selling activities over different event. Our results are robust for different window specifications. The results reported here are based on (-10, +10) window. The event is defined as the filing date of the annual reports of the financial firms for fiscal year end of 2005 2006 and 2007. We define abnormal short-selling by adjusting short-selling activities around the filing dates of financial reports by normal short-selling activities and then scale that measure by the number of shares outstanding, abnormal Short/SHROUT, or the average daily trading volume over the window (-120, -61), adjusted to change in number of shares outstanding, abnormal Short/Avol. We use three alternative measures for abnormal short selling. In the first definition, abnormal Short/SHROUT1, we define "normal" short selling benchmark as the contemporaneous median short selling activities ratio on the stock exchange of the financial firm. In the second definition, abnormal Short/SHROUT2, we define "normal" short selling benchmark as the mean short selling ratio of the financial firm over a 6-month period before and after the filing date but excluding event periods (-30,+30). In the third definition, abnormal Short/Avol, we define "normal" as the average short selling ratio over the period within 6 months before and after the filing date but excluding event period. The observations are sorted into three groups according to the subprime-to-assets ratios (Subprime) in each fiscal year. Group 1 and group 3 contain the observations with the lowest and the highest subprime-to-assets ratios, respectively. In addition to our three alternative measures of abnormal short selling we also include the cumulative contemporary raw short selling scaled by the outstanding shares. t-tests of short selling activities within each group and mean difference t-tests between group 1 and 3 are reported. * **, and *** indicate significance at 10%, 5%, and 1%, respectively. All variables in Table III are winsorized at 2 and 98 percentile.

Fiscal Year		Subprime		Cum. Short/SHROUT (%)			Cum. Abnormal Short/SHROUT1 (%)			Cum. Abnormal Short/SHROUT2 (%)			Cum. Abnormal Short/Avol (%)		
		N	Mean	Mean		t-test	Mean		t-test	Mean		t-test	Mean		t-test
2005	1 (lowest)	17	1.00E-06	0.7589			-0.2317		-1.19	-0.2036	***	-3.32	-158.3181	***	-2.98
	2	17	0.0051	1.1740			-0.1928		-0.90	-0.3918	***	-3.80	-185.4458	***	-2.77
	3 (highest)	17	0.0809	1.1537			-0.0882		-0.31	-0.2776		-1.54	-47.1725		-0.83
	(1-3)		-0.0809	-0.3948		-0.93	-0.1435		-0.42	0.0740		0.39	-111.1457		-1.43
2006	1 (lowest)	25	7.20E-05	1.2420			-0.1727		-0.91	-0.1343		-0.48	177.9418		1.50
	2	25	0.0065	2.1855			0.3826		0.67	0.1710		0.80	154.5137		1.19
	3 (highest)	25	0.1257	2.0328			0.4814		0.83	0.0583		0.27	40.5958		0.32
	(1-3)		-0.1256	-0.7908		-1.13	-0.6540		-1.07	-0.1926		-0.54	137.3460		0.79
2007	1 (lowest)	192	0	1.3419			0.5551	***	4.38	0.2342	***	4.23	31.4798	*	1.66
	2	19	0.0003	4.3828			2.2823	**	2.45	0.5358		1.32	34.0631		1.00
	3 (highest)	105	0.0274	3.5842			1.6780	***	4.62	0.4840	***	4.24	62.5519	***	3.12
	(1-3)		-0.0274	-2.2423	***	-4.45	-1.1229	***	-2.92	-0.2498	**	-1.97	-31.0722		-1.13

Table V: Determinants of Cumulative Abnormal Short Selling Activities Using the Annual Subprime Asset Exposures

Table V includes the regression analysis of determinants of cumulative abnormal short selling activities during the period form September 2005 to 17 September 2008 (one day before the short sale ban by the SEC). We employ a year fixed effect regression and the error term is clustered at the firm level. The dependent variable is cumulative abnormal short/SHROUT1 over window (-10, +10). Option refers to the indicator variable which equals 1 if the firm has option trading within 3 months before and after the filing dates of annual reports and zero otherwise. Subprime refers to the subprime-to-asset ratio. Year_2006 and Year_2007 are two indicator variables of the fiscal year 2006 and 2007, respectively. Bank is an indicator variable that equals 1 if the financial firm is incorporated as a bank and 0 otherwise. CAPR1 refers to the Tier 1 Risk-Adjusted Capital Ratio.

Dependent Variable: Cumulative Abnormal Short Selling over Window (-10, +10)												
	Model I			Model II			Model III			Model IV		
	Coeff.		t-test	Coeff.		t-test	Coeff.		t	Coeff.		t-test
Size	0.3536	***	2.71	0.3564	***	2.60	0.3677	***	2.66	0.3476	**	2.59
Option	1.1353	**	2.09	1.4143	**	2.58	1.3449	**	2.46	1.0919	**	2.00
Subprime	3.7144		1.63	3.8753	*	1.93	---		---	---		---
Subprime ×Year_2007	---		---	35.769	**	2.26	17.0811	**	2.22	35.3058	**	2.27
Subprime ×Year_2006	---		---	-3.1566	*	1.70	0.5818		0.70	0.6939		0.82
Bank	---		---	0.9556	*	1.70	---		---	---		---
Bank×Capr1	---		---	-0.0209		0.50	0.0361		1.36	---		---
Bank×Capr1×Year_2007	---		---	0.0098		0.23	---		---	---		---
Subprime ×Bank1×CAPR1×Year_2007	---		---	-2.2003	**	2.05	---		---	-1.8263	*	1.76
Year_2007	1.1379	***	5.01	1.0095	**	2.17	1.0127	***	5.02	0.9604	***	4.91
Year_2006	0.1899		0.80	0.3833		1.38	0.2809		1.08	0.2794		1.10
Constant	-3.4584	***	3.63	-4.1704	***	3.36	-3.9009	***	3.58	-3.3545	***	3.57
Observations	414			404			404			404		
Adjusted R-square	0.235			0.27			0.253			0.261		

Table VI: Analysis of Short Selling Activities Based on Quarterly Call Report Information

In Table VI, we conduct analysis of cumulative abnormal short selling using quarterly variables from banks' call reports and bank holding companies' FRY-9 reports. MBS/Assets, ABS/Assets, Com. Paper Conduit/Assets, CDO/Assets refer to the ratios of mortgage-backed securities (held-to-maturity), asset-backed-securities (held-to-maturity), asset-backed commercial paper conduits and collateralized-debt obligations to total assets, respectively. In Panels A to D, we report the results of univariate analysis of abnormal short selling by sorting the call report variables into three groups and Panel E reports the results multivariate analysis. Dum. ABS, Dum. Com. Paper and Dum. CDO are indicators of whether a company has positive ABS, Commercial Paper Conduit or CDS, respectively. Dummy Combined is an indication if a company has any positive value on the following three variables: ABS, Com. Paper Conduit or CDO. t-tests of short selling activities within each group and mean difference t-tests between group 1 and 3 are reported. * **, and *** indicate significance at 10%, 5%, and 1%, respectively.

Panel A: Sorted by MBS/Asset Ratio

	MBS/Assets (%)			Cum. Short/SHROUT over window (-10, 10) (%)			Cum. Ab. Short/SHROUT over window (-10, 10) (%)		
Report Date	Group	Obs.	Mean	Mean		t-test	Mean		t-test
	1	202	0	0.6683			-0.4049	***	-8.30
3/31/2006	2	9	5.95E-04	1.1188			-0.0534		-0.12
	3	105	2.6545	0.8975			-0.2490	***	-3.14
	(1-3)		-2.6545	-0.2292	**	-2.15	-0.1559	*	-1.67
	1	203	0	1.0458			-0.0043		-0.06
6/30/2006	2	9	5.50E-04	1.2568			0.0879		0.17
	3	106	2.4610	1.2696			0.1052		1.04
	(1-3)		-2.4610	-0.2238		-1.57	-0.1095		-0.87
	1	204	0	0.7835			-0.1300	**	-2.14
9/30/2006	2	9	1.06E-03	1.1104			-0.2530		-0.99
	3	106	2.4397	0.9370			-0.0655		-0.76
	(1-3)		-2.4397	-0.1534		-1.22	-0.0646		-0.61
	1	202	0	0.8090			-0.3455	***	-5.67
12/31/2006	2	11	1.64E-03	0.9083			-0.4579	*	-1.68
	3	106	2.3821	0.9503			-0.3105	***	-4.23
	(1-3)		-2.3821	-0.1413		-1.23	-0.0350		-0.37

	MBS/Assets (%)			Cum. Short/SHROUT over window (-10, 10) (%)			Cum. Ab. Short/SHROUT over window (-10, 10) (%)		
	1	203	0	1.0140			-0.0821		-1.02
3/31/2007	2	12	1.03E-03	1.1204			-0.2789		-1.34
	3	108	2.3200	1.2547			0.0368		0.33
	(1-3)		-2.3200	-0.2407		-1.50	-0.1189		-0.87
	1	204	0	1.0511			-0.0371		-0.45
6/30/2007	2	11	1.12E-03	1.2329			-0.1489		-0.54
	3	108	2.1888	1.3658			0.1118		0.97
	(1-3)		-2.1888	-0.3147	*	-1.68	-0.1489		-1.05
	1	207	0	0.4692			0.0890	**	2.21
9/30/2007	2	10	1.05E-03	1.2020			0.3556		1.47
	3	108	2.1348	0.9385			0.3239	***	3.42
	(1-3)		-2.1348	-0.4693	***	-2.62	-0.2349	**	-2.28
	1	209	0	0.8920			0.3807	***	4.38
12/31/2007	2	8	7.33E-04	1.5839			0.6239		0.80
	3	109	2.1049	1.5448			0.7352	***	4.37
	(1-3)		-2.1049	-0.6528	**	-2.21	-0.3545	*	-1.87
	1	209	0	1.1114			0.6384	***	4.72
3/31/2008	2	10	1.29E-03	2.8406			1.8007		1.37
	3	109	2.3028	1.6842			0.9439	***	5.33
	(1-3)		-2.3028	-0.5728	*	-1.72	-0.3055		-1.37
	1	211	0	1.5502			0.9889	***	4.82
6/30/2008	2	8	1.11E-03	5.9686			4.0620	*	1.78
	3	110	2.4478	2.3047			1.4156	***	4.69
	(1-3)		-2.4478	-0.7545		-1.56	-0.4266		-1.17

Panel B: Sorted by ABS/Cash Ratio

	ABS/Assets (%)			Cum. Short/SHROUT over window (-10, 10) (%)			Cum. Ab. Short/SHROUT over window (-10, 10) (%)		
Report Date	Group	Obs	Mean	Mean		t-test	Mean		t-test
3/31/2006	1	310	0	0.7448			-0.3493	***	-8.05
	2	6	0.2212	1.5007			0.0553		0.16
		(1-2)	-0.2212	-0.7559	***	-3.04	-0.4046		-1.17
6/30/2006	1	312	0	1.1049			0.0216		0.36
	2	6	0.1930	2.2577			0.7256		1.11
		(1-2)	-0.1930	-1.1529	**	-2.28	-0.7040		-1.07
9/30/2006	1	314	0	0.8297			-0.1210	**	-2.50
	2	5	0.2300	1.7530			0.4460		0.67
		(1-2)	-0.2300	-0.9233	*	-1.86	-0.5669		-0.85
12/31/2006	1	314	0	0.8494			-0.3427	***	-7.34
	2	5	0.2590	1.4948			-0.0340		-0.08
		(1-2)	-0.2590	-0.6454	**	-2.11	-0.3087		-0.70
3/31/2007	1	318	0	1.0732			-0.0697		-1.11
	2	5	0.2525	2.7063			1.2122		1.57
		(1-2)	-0.2525	-1.6332	**	-2.20	-1.2819	*	-1.65
6/30/2007	1	318	0	1.1357			-0.0089		-0.14
	2	5	0.2323	2.8760			1.1330		1.35
		(1-2)	-0.2323	-1.7403	**	-2.13	-1.1419		-1.36
9/30/2007	1	320	0	0.6334			0.1710	***	4.10
	2	5	0.2728	1.5838			0.4610		0.99
		(1-2)	-0.2728	-0.9504		-1.29	-0.2900		-0.62
12/31/2007	1	320	0	1.0972			0.4953	***	6.05
	2	6	0.2006	2.8302			1.0911		1.29
		(1-2)	-0.2006	-1.7330		-1.62	-0.5958		-0.70
3/31/2008	1	320	0	1.2900			0.7364	***	6.63
	2	8	0.1522	4.0057			2.3771	**	2.22
		(1-2)	-0.1522	-2.71588	*	-1.90	-1.6407		-1.52
6/30/2008	1	318	0	1.8319			1.1724	***	6.63
	2	11	0.1958	3.4717			1.7392	**	1.99
		(1-2)	-0.1958	-1.6398		-1.33	-0.5668		-0.64

Panel C: Sorted by Com. Paper Conduit/Assets Ratio

	Com. Paper Conduit /Assets			Cum. Short/SHROUT over window (-10, 10) (%)			Cum. Ab. Short/SHROUT over window (-10, 10) (%)		
Report Date	Group	Obs	Mean	Mean		t-test	Mean		t-test
3/31/2006	1	308	0	0.7447			-0.3381	***	-7.67
	2	10	0.4681	1.2497			-0.5470	***	-4.22
	(1-2)		-0.4681	-0.5050	***	-5.57	0.2090		1.53
6/30/2006	1	310	0	1.1171			0.0480		0.78
	2	10	0.4797	1.4898			-0.4900	**	-2.20
	(1-2)		-0.4797	-0.3727	**	-2.58	0.5380	**	2.33
9/30/2006	1	311	0	0.8228			-0.1084	**	-2.17
	2	10	0.4908	1.6709			-0.2689		-1.22
	(1-2)		-0.4908	-0.8481	***	-4.99	0.1604		0.71
12/31/2006	1	310	0	0.8197			-0.3509	***	-7.51
	2	11	0.4653	2.0516			-0.0827		-0.27
	(1-2)		-0.4653	-1.2320	***	-4.25	-0.2681		-0.88
3/31/2007	1	314	0	1.0480			-0.0728		-1.14
	2	11	0.4616	2.5317			0.4095		1.24
	(1-2)		-0.4616	-1.4838	***	-4.37	-0.4823		-1.43
6/30/2007	1	314	0	1.1148			0.0018		0.03
	2	11	0.4556	2.8892			0.2868		0.70
	(1-2)		-0.4556	-1.7744	***	-4.10	-0.2850		-0.69
9/30/2007	1	315	0	0.5907			0.1759	***	4.18
	2	12	0.2926	2.5015			0.2458		0.89
	(1-2)		-0.2926	-1.9108	***	-6.14	-0.0700		-0.25
12/31/2007	1	316	0	0.9962			0.4454	***	5.74
	2	12	0.2689	4.8759			1.9607	**	2.50
	(1-2)		-0.2689	-3.8797	***	-4.60	-1.5153	*	-1.92
3/31/2008	1	320	0	1.2210			0.6951	***	6.28
	2	10	0.2881	6.2345			3.4852	***	7.35
	(1-2)		-0.2881	-5.0135	***	-7.96	-2.7901	***	-5.73
6/30/2008	1	321	0	1.6528			1.0195	***	6.29
	2	10	0.2594	9.7499			6.5642	***	4.51
	(1-2)		-0.2594	-8.0970	***	-5.45	-5.5447	***	-3.79

Panel D: CDO/Assets Ratio

	CDO/Assets(%)			Cum. Short/SHROUT over window (-10, 10) (%)			Cum. Ab. Short/SHROUT over window (-10, 10) (%)		
Report Date	Group	Obs	Mean	Mean		t-test	Mean		t-test
3/31/2008	1	142	0	1.3561			0.7807	***	4.30
	2	4	0.1196	6.2321			3.2095	***	3.24
	(1-2)		-0.1196	-4.8760	***	-4.77	-2.4289	**	-2.41
6/30/2008	1	147	0	2.2047			1.4349	***	4.85
	2	6	0.2053	8.9026			5.4125	***	3.03
	(1-2)		-0.2053	-6.6979	***	-3.67	-3.9776	**	-2.20

Panel E: Multivariate Analysis Using Call Report Variables

	Model I		Model II		Model III		Model IV	
	Coeff	t-test	Coeff	t-test	coeff	t-test	Coeff	t-test
Size	0.2640***	4.41	0.2552***	4.22	0.2875***	4.73	0.6564***	3.17
Option	0.9347***	4.55	0.9849***	4.79	0.9863***	4.78	2.0764***	3.24
CAPR1	-0.0182	1.26	-0.0099	0.67	-0.0144	0.99	-0.0244	0.48
MBS/Asset	0.0434**	2.34	---	---	---	---	---	---
ABS/Asset	---	---	1.4746**	2.35	---	---	---	---
Com. Paper Conduit	---	---	---	---	-1.1525**	2.05	---	---
CDO/Asset	---	---	---	---	---	---	110.8958	0.15
Year 2008	1.0509***	8.32	1.0517***	8.34	1.0353***	8.28	---	---
Year 2007	0.3109***	7.92	0.3087***	7.90	0.3014***	7.73	---	---
Constant	-2.1810***	4.53	-2.1843***	4.50	-2.3566***	4.80	-4.4341**	2.58
OBS	3124		3124		3124		282	
Adjust r-square	0.279		0.276		0.280		0.386	

Table VII: Univariate Analysis of Short Selling Activities Based on CDS Spreads

In Panel A, we summarize the univariate analysis of short selling activities over windows (-10, +10) using three alternative measures of cumulative abnormal short selling as well as the contemporary cumulative short selling ratio, Cum. Short/SHROUT. The observations are sorted into three groups according to changes in the average 5-year CDS spreads from the 90 days before the filing of financial reports to the 90 days after. Group 1 and group 3 contain the observations with the lowest and the highest change in CDS spreads, respectively. t-tests of short selling activities within each group and mean difference t-tests between group 1 and 3 are reported.

In Panel B, we report the univariate tests for the one-year change in CDS spread just prior to the 2008 short-sale ban by the SEC. To compute the ΔCDS, for every firm, we calculate the average daily CDS for two periods: *t* and *t-1,* where *t* is the period from18 September 2007 to September 17, 2008 (one day prior to the short-sale ban) and *t-1* is the period from September 18, 2006 to September 17, 2007. The difference between CD_t and CD_{t-1} is the one-year change in CDS spreads (ΔCDS). We include three measures of short selling activities, including Cumulative Short/SHROUT ratios and Cumulative Abnormal Short/SHROUT1 ratios over the year before the announcement of the short selling ban (18 September 2008), as well as the change in Cumulative Short/SHROUT ratios (ΔCumulative Short/SHROUT), where ΔCumulative Short/SHROUT is the difference between the Cumulative Short/SHROUT$_t$ and the Cumulative Short/SHROUT$_{t-1}$. We first identify observation(s) with zero or negative ΔSpread as group 0, and then sort the remaining observations with positive ΔSpread into three groups. Group1 and 3 contains the lowest and highest ΔCDS Spreads, respectively. We also conduct t-tests on the mean of Cumulative Abnormal Short/SHROUT1 and ΔCumulative Short/SHROUT within each group and calculate the mean-difference tests between group1 (lowest positive ΔCDS) and group3 (highest positive ΔCDS). * **, and *** indicate significance at 10%, 5%, and 1%, respectively.

Panel A: Sorted by Change in 5year-CDS Spread over 90 day post the annual filing of the financial reports

Fiscal Year		CDS Spread (%)		Cum. Short/SHROUT (%)		Cum. Abnormal Short/SHROUT1 (%)		Cum. Abnormal Short/SHROUT2 (%)		Cum. Abnormal Short/Avol (%)	
		N	Mean	Mean	t-test	Mean	t-test	Mean	t-test	Mean	t-test
2005	1 (lowest)	15	-0.2508	2.7127		0.8367 *	2.01	-1.00E-05	-4.80E-05	81.8429	0.81
	2	15	-0.1553	2.7784		0.8963 **	2.35	-0.3553 **	-2.14	-58.9883 **	-2.31
	3 (highest)	15	-0.1127	2.0330		0.1099	0.26	0.1358	0.41	4.4911	0.08
	(1-3)		-0.1381	0.6797	1.12	0.7268	1.21	-0.1358	-0.34	77.3518	0.66
2006	1 (lowest)	19	-0.2015	3.1643		0.6325	1.27	0.1290	0.55	-11.0920	-0.22
	2	19	-0.0712	1.8874		-0.6512 **	-2.40	-0.2349	-1.57	-69.8781	-1.47
	3 (highest)	19	0.0211	4.5845		1.9578 **	2.47	-0.0178	-0.06	21.5680	0.19
	(1-3)		-0.2226	-1.4202	-1.56	-1.3253	-1.42		0.39	-32.6600	-0.27
2007	1 (lowest)	16	-0.0708	4.0397		0.8346 *	1.88	0.7091 **	2.15	123.0349 **	2.27
	2	17	0.2875	4.2544		0.9333 **	2.68	0.1065	0.45	13.7197	0.33
	3 (highest)	17	1.1332	9.7765		6.1522 ***	4.37	0.9795	2.68 **	47.3546	1.14
	(1-3)		-1.2040	-5.7368 ***	-3.86	-5.3177 ***	-3.60	-0.2704	-0.55	75.6804	1.11

Panel B: Sorted by one-year ΔCDS spreads from 18, 2007 to September 17, 2008

	ΔCDS		Cum. Short/SHROUT (%)			Cum. Abnormal Short/SHROUT1 (%)			ΔCumulative Short/SHROUT (%)		
	# of Obs	Mean	Mean		t-test	Mean		t	Mean		t-test
0	1	-0.0370	0.1360		---.	-0.2330		---	0.0402		---
1 (lowest)	19	0.2115	0.4988		---	0.1298	***	3.37	0.1648	***	4.14
2	20	0.6541	0.5638		---	0.1948	**	2.30	0.2188	***	6.11
3 (highest)	20	3.1734	1.4114		---	1.0774	***	4.46	0.7567	***	3.73
(1-3)		-2.9619	-0.9126	***	-3.73	-0.9475	***	-3.98	-0.5919	***	-2.97

Table VIII: The Relationship between Cumulative Abnormal Short Selling Activities and the 5-year CDS Spread

Table VIII shows the relationship between the short selling and change in CDS spread. In Panel A, we compute the one-year change in the 5-year CDS Spread from September 18, 2007 to September 18, 2008. Then we employ multivariate regression analysis using two alternative measures of short selling. In models I and II, the dependent variable is annual cumulative Abnormal Short/SHROUT1 from September 18, 2007 to September 17, 2008 and, in models III and IV, the dependent variable is the change in one-year cumulative Short-selling from September 18, 2007 to September 17, 2008 (Δ Cum. Short/SHROUT1). The other control variables are as defined in Table IV. In Panel B, we compute the changes in the average 5-year CDS spreads from the 90 days before the filing of financial reports in each fiscal year to the 90 days after. We employ year fixed effect regression and the error term is clustered at the firm level. The dependent variable is cumulative abnormal short/SHROUT1 over window (-10, +10). Our results are robust for different window specification, for example we obtain similar results for (-10, -2) window. The other control variables as defined in Table IV.

Panel A: One-year ΔCDS spreads from 18, 2007 to September 17, 2008 (Cross-Sectional Tests)												
Dependent Variable	**One-year Cum. Abnormal Short/SHROUT1(%)**						**One-year Δ Cum. Short/SHROUT(%)**					
	Model I			Model II			Model III			Model IV		
Independent Variables	Coeff.		t-test	Coeff.		t-test	Coeff.		t-test	Coeff.		t-test
Size	0.0333		0.98	0.0366		0.94	0.0630	*	1.91	0.0572		1.51
Option	-0.0472		0.24	-0.0519		0.25	-0.0173		0.09	-0.0103		0.05
ΔCDS	31.1330	***	10.39	31.1043	***	10.06	18.8634	***	6.48	18.7000	***	6.24
Bank				0.1113		0.09				0.3830		0.30
Bank× CAPR1				-0.0182		0.11				-0.0427		0.26
Constant	-0.2932		0.69	-0.3199		0.70	-0.5775		1.41	-0.5289		1.20
Observations	58			58			58			58		
Adjusted R^2	0.654			0.641			0.423			0.403		

Panel B: Changes in 90-day average 5-year CDS spread before and after filing of Annual Reports (2005 to 2007)						
Dependent Variable	**Cumulative Abnormal short/SHROUT1 over Window (-10,+10)**					
	Model V			Model VI		
Independent Variables	Coeff.		t-test	Coeff.		t-test
Size	-0.1984		-1.60	-0.1954		-1.42
Option	1.5304	*	1.86	1.5596	*	1.89
Changes in CDS Spread	3.7239	***	7.71	3.7245	***	7.61
Bank				8.2017		1.62
Bank× CAPR1				-1.0402	*	-1.74
Bank×Capr1×Year_2007				0.0827		0.55
Year_2007	-0.3172		-0.50	-0.5501		-0.79
Year_2006	-0.2083		-0.39	-0.1057		-0.20
Constant	2.1026		1.30	2.1166		1.24
Observations	**145**			**144**		
Adjusted R^2	**0.363**			**0.367**		