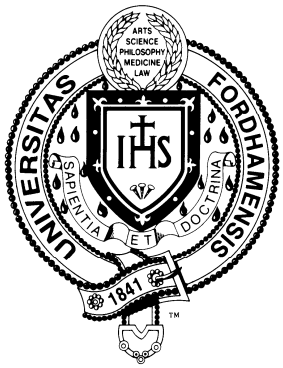

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Government Intervention and the CDS Market: A Look at the Market's Response to Policy Announcements During the 2007-2009 Financial Crisis

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Abstract

This paper adds to the literature on the financial markets' reaction to government interventions during the 2007-2009 financial crisis by analyzing the response of US firms' credit default swap spreads to key government actions. We find that the government measures taken to stabilize both the financial sector and the overall economy were generally well-received by CDS market participants, reducing perceived credit risk across a broad cross-section of firms. Financial firms responded most favorably to financial sector policies and interest rate cuts, with announcement date abnormal CDS spread changes of -5 and -2 percent, respectively. Non-financial firms responded most favorably to conventional fiscal and monetary policy tools with spread reductions of approximately one percent upon announcement of these measures. In a cross-sectional regression analysis, we find that size, recent performance, profitability, and stock returns are key factors in explaining the financial sectors response to government actions.

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I. Introduction

The credit crisis of 2007 – 2009 marks a period of extraordinary financial instability. The crisis initially stemmed from an unexpected fall in housing prices which in turn increased delinquencies on subprime mortgages negatively impacting the securities tied to those mortgages.[3] However, the turmoil soon spread throughout the financial system and to the broader global economy. US credit default swap (CDS) markets were among the first to feel the severity of the crisis with the CDX investment grade index doubling between the beginning of June and the end of July of 2007. As the crisis unfolded, CDS spreads continued to rise while stock market indices started their decline in the fall of 2007 (see figure 1). What was initially a dislocation in the US subprime market culminated into a global financial crisis by September 2008 with the collapse of Lehman Brothers.

The scope of the financial turmoil is widely seen to be the worst since that of the Great Depression.[4] As financial markets became increasingly distressed, confidence was lost and many markets froze up.[5] In an effort to keep the financial stress from spiraling into a global depression, central governments responded with a wide variety of policy initiatives. In the United States – the country in which the turmoil began – central bankers and policymakers were particularly aggressive in their monetary and fiscal policy efforts. Following a discount rate cut in August, 2007, the Federal Reserve initiated a series of ten Federal Funds rate cuts beginning with a fifty basis point cut (from 5.25% to 4.75%) on September 18, 2007 and ending with the Federal Funds rate reaching an effective floor of zero to 25 basis points on December 16, 2008. The United States Congress passed the $150 billion Economic Stimulus Act in February, 2008 only to be followed by the $787 billion American Recovery and Reinvestment Act of 2009.

In addition to conventional monetary and fiscal tools, several unprecedented policies and programs were enacted in an effort to "improve the functioning of credit markets, ease financial conditions, and support economic activity."[6] Many of these programs were aimed at restoring liquidity to financial markets such as the Term Auction Facility (TAF) introduced in December, 2007 and the Term Asset Backed Securities Loan Facility (TALF) of November, 2008.[7] Others sought to provide stability to the financial sector by purchasing troubled assets, guaranteeing liabilities, or injecting capital into financial institutions. The Troubled Asset Relief Program (TARP), introduced on September 19, 2008 and enacted October 3, 2008, authorized the US treasury to purchase up to $700 billion in troubled assets from financial institutions. The Temporary Guarantee Program,

[3] For more on the causes of the financial crisis, see Acharya et al. (2009) and Taylor (2008).
[4] Federal Reserve Chairman Bernanke refers to the financial crisis as "the worst since the Great Depression" in a speech on April 14, 2009, http://www.federalreserve.gov/newsevents/speech/bernanke20090414a.htm.
[5] See Acharya et al. (2009) for an overall discussion of short-term market dislocations and Krishnamurthy (2010) for a discussion of repo market activity during the crisis.
[6] Chairman Ben S. Bernanke, "Federal Reserve programs to strengthen credit markets and the economy," February 10, 2009, http://www.federalreserve.gov/newsevents/testimony/bernanke20090210a.htm.
[7] Additional liquidity measures include the Term Securities Lending Facility (TSLF) introduced in March, 2008 and the Money Market Investor Funding Facility (MMIFF) and the Commercial Paper Funding Facility (CPFF) both introduced in October, 2008.

also announced on September, 19, 2008, provided up to $50 billion to the money market mutual fund industry. On October 14, 2008, TARP was modified to allocate $250 billion to recapitalizing banks under the Capital Purchase Program (CPP).[8]

Aside from these systemic programs, the Federal Reserve, Federal Deposit Insurance Corporation (FDIC), and U.S. Treasury took standalone actions aimed at individual institutions including Bear Stearns, AIG, Citigroup, and Bank of America.[9] As of March, 2009, the Federal Reserve, US treasury, and FDIC combined had committed an estimated $12.8 trillion[10] to various rescue packages and programs.

Several authors have been quick to explore the impact of these types of government interventions on financial markets. King (2009) conducts an event study of 52 banks internationally and finds evidence that the government rescue packages benefited creditors at the expense of shareholders. While bank CDS spreads narrowed around the announcement of government interventions, bank stock prices fell implying that the negative effects of diluting existing shareholders and restricting dividends outweighed the positive effect of reducing financial distress for bank stocks. The US was a notable exception to this finding, most likely due to the attractive terms of its packages. Panetta et al. (2009) conduct a similar analysis in which they, too, find evidence of reductions in default premia associated with government intervention and a redistribution of resources from shareholders to creditors. Furthermore, Ait-Sahalia et al. (2009) find that several of the governments' efforts were effective in reducing interbank risk premia as measured by the Libor-OIS spread.

In a study of Japan's banking crisis, Miyajima and Yafeh (2007) explore the sensitivity of non-financial firms to Japan's banking crisis of the 1990's and find that not all firms were equally sensitive to the financial sectors' distress. In particular, by analyzing the cross-sectional response of abnormal stock returns around key dates throughout Japan's crisis, they find that firms with limited access to financial markets (e.g. small, leveraged, low-tech, low credit quality firms) were more severely impacted by Japan's credit crunch.

Our study extends the work of these authors by comparing and contrasting the reaction of CDS prices for financial and non-financial firms to government interventions during the 2007-2009 financial crisis. As the goal of our paper is to explore the effects of government interventions on the credit markets, we believe that the CDS market is an obvious candidate for such a study due to its sheer magnitude,[11] relative liquidity, and

[8] A full timeline and description of events during the 2007-2009 financial crisis can be found at http://www.imf.org/external/pubs/cat/longres.cfm?sk=23293.0.

[9] $29 billion in term financing was provided to facilitate the takeover of Bear Stearns by JP Morgan in March, 2008. An $85 billion credit extension was provided to AIG on September 16, 2008. The purchase of $40 billion of preferred AIG shares was announced on November 10, 2008 (restructuring the terms of the original agreement). The Treasury and FDIC provided protection to Citigroup against losses on an asset pool of $306 billion on November 23, 2008 and $118 billion of protection was provided to Bank of America on January 16, 2009.

[10] Source: http://www.bloomberg.com/apps/news?pid=20601087&sid=armOzfkwtCA4

[11] ISDA reports the total notional amount outstanding of credit default swaps is $26.3 trillion as of mid-year 2010. Source: http://www.isda.org/statistics/recent.html#2010mid.

increasingly available pricing data. Specifically, we analyze the CDS price reaction of 348 US firms to 23 government-initiated events including 8 liquidity support announcements, 4 fiscal policy announcements, 4 financial sector policy announcements, and 7 interest rate cuts.[12] We believe this is the first study to examine the CDS market's reaction to government interventions using a large cross-section of CDS spreads (as opposed to focusing on CDS premia for financial institutions). We find that the government measures taken to stabilize both the financial sector and the overall economy were generally well-received by CDS market participants, reducing perceived credit risk across a broad cross-section of firms. Financial firms responded most favorably to financial sector policies and interest rate cuts, with announcement date abnormal CDS spread reductions of approximately 5 and 2 percent, respectively. Non-financial firms responded most favorably to conventional fiscal and monetary policy tools with spread reductions of approximately one percent upon announcement of these measures.

In a cross-sectional regression analysis of abnormal spread changes, we find that size, recent performance, and profitability are key factors in describing the financial sectors response to government actions. In support of the notion of "too big to fail," we find that the coefficient on size is negative for financial firms, implying that the larger financial institutions benefited more from government support. Moreover, we find that financial firms whose credit default swap spreads had underperformed recently relative to their peers outperformed upon announcements of government support while more profitable firms were less sensitive to government interventions. Neither credit quality nor leverage were significant factors explaining abnormal spread changes.

For non-financial firms, our findings are similar with two notable exceptions. First, size was statistically significant only when isolating financial sector policies and then the coefficient on size is positive suggesting that there may be spillover effects for smaller non-financial firms who are most likely more dependent on bank financing. Second, the overall explanatory power of the model is much weaker for non-financial firms than for financial firms. While our regression analysis is able to explain up to 26 percent of the variation in abnormal spread changes of financial institutions, for non-financial firms it explains 4.6 percent, at best. Including the corresponding abnormal stock returns in our regression analysis indicates that both shareholders and creditors benefited from the government efforts as the coefficient on abnormal stock returns was negative and statistically significant overall.

The rest of the paper is organized as follows. Section II describes the data and event study methodology and presents the results of the event study. Section III then provides a parsimonious cross-sectional regression model that attempts to explain the abnormal spread changes obtained in Section II. In Section III, we discuss both the variables included in the regression model and the results of our analysis. We summarize our findings in Section IV.

[12] As stated in the methodology section, we focus on this narrow subsection of 23 events to minimize contamination issues that are associated with overlapping events in an event study context.

II. The Reaction of CDS Spreads to Government Interventions

Daily CDS spread levels were provided by a large CDS market participant for approximately 500 US corporate entities.[13] The spreads are mid-market quotes based on end-of-day dealer runs that have been scrubbed for accuracy. The 5-year maturity contract price was provided as it is the most commonly traded maturity. For each individual spread, either the modified restructuring clause (MR) or the no restructuring clause (XR) was used as per industry standard.[14] The data ranges from July 17, 2006 through December 31, 2009 for a total of 865 trading days; 410 firms have the full 865 observations and 348 firms have matching CRSP stock market data for the full series. It is these 348 firms that are used in the analysis. The firms span a variety of industries and credit ratings. The industry classifications were supplied by the data provider and further mapped to Markit's industry codings and the credit ratings are Standard and Poor's long-term domestic issuer credit rating obtained from COMPUSTAT. Financial statement and accounting figures were also obtained from COMPUSTAT. As a proxy for the overall market, both the CDX North American Investment Grade (CDX IG) and the CDX North American High-Yield (CDX HY) index levels were provided by the market participant. The CDX IG is an equally-weighted index of the 125 investment grade entities. The CDX HY is comprised of 100 equally-weighted non-investment grade entities.[15]

Figure 1 plots daily CDX IG, CDX HY, and sample mean spread levels in Panel A and log differences in Panel B. Mean market capitalization and S&P index levels are plotted in Panel C, while daily sample mean stock returns and S&P500 index returns are displayed in panels C and D. The time series plots indicate that the sample data is representative of the overall market over the period. Even so, descriptive statistics presented in table 1 highlight the skewed nature of CDS spreads as the mean spread is 255 basis points compared to the median level of 95 bps. The data is influenced not only by very high spread levels for extremely distressed firms with high probabilities of imminent default, but also by the varying regimes that characterize the data.

As a rough approximation of these regimes, we break out sample means, medians, and standard deviations into four phases. Phase I consists of roughly the first year of the data set and ranges from July 17, 2006 through June 4, 2007. This is a period of relatively low and stable spreads. Phase II, the subprime phase, ranges from June 5, 2007 until the collapse of Lehman Brothers on September 14, 2008 at which point we enter the global phase (Phase III) of the financial crisis. The identification of the start of the crisis is based on a Markov-switching model used in Nowak et al. (2009) and the start of the global phase is consistent with Ait-Sahalia et al (2009). Phase IV begins in March 2009,

[13] The market participant wishes to remain anonymous.

[14] Specifically, if the firm was part of the CDX IG index, the MR clause was used up until the implementation of the Big Bang on April 8, 2009 at which point the XR curve became industry standard. If the firm was part of the CDX HY index, the XR curve was used throughout. If the firm was a constituent of neither index, S&P ratings were obtained from Compustat and investment grade firms followed the IG procedure while the XR curve was used for high-yield firms. The Big Bang was an industry-wide effort to promote standardization. For more on the Big Bang, see http://www.markit.com/assets/en/docs/markit-magazine/issue-4/60-cds-big-bang.pdf.

[15] For more on the CDX indices including their construction and constituents, see www.markit.com.

continues through year-end, and is considered the "recovery phase" in which spreads begin to tighten. The start of this last phase is identified based on casual examination of the data itself.

As we move from relatively stable markets into the subprime phase of the crisis, average spreads rise from 79 to 189 basis points and then to 552 basis points during the global phase of the crisis. Median spreads show a similar pattern of rising from 37 to 85 to 272 bps as we progress from Phase I through Phase III and standard deviations increase more than eightfold from 104 to 860 bps. Not only did the price and volatility of credit risk increase remarkably over this time period, but as we move from the subprime to the global phase of the crisis we see a drastic reduction in the market capitalization of firms with average market cap decreasing by one-third from $26.3 billion to $16.7 billion. It is this decrease in the value of equity that is driving the increase in leverage from an average of 33% during the subprime phase to a height of 45% during the global phase of the financial crisis. Profitability, as measured by Tobin's Q, decreases over the four phases from a mean (median) of 1.64 (1.46) in Phase I to a mean (median) of 1.30 (1.17) in Phase IV. Ratings are on a 17-point scale in which AAA equals 1 and defaulted or no rating is 17. An average rating of 9 corresponds to BBB and a standard deviation of three notches indicates a range from A to BB. The rating variable increases modestly over the sample period from a low of 8.88 in phase I to a high of 9.61 in phase IV. The relatively modest movement in credit rating is not surprising as rating agencies have made it clear that they value stability in the ratings process. While credit ratings continue to rise in period IV, CDS spreads have decreased; this observation is consistent with the notion that credit ratings often lag market indicators.

A. Identifying Key Government-Initiated Actions

First we identify abnormal performance around major government-initiated interventions related to the US financial crisis. The time period under study is one of the most fascinating in recent history, characterized by a succession of highly unprecedented, high-impact events all occurring in a relatively short time span. This is problematic for an event study as overlapping events can cause contamination issues and confound results. To account for this issue, our study relies on a unique database prepared by the IMF that focuses on key dates pertaining to the financial crisis. The IMF database spans from June 1, 2007 through March 31, 2009 and includes 196 global announcements ranging from fiscal policy to monetary policy actions, liquidity support, and financial sector policies. The database was created based on official press releases, major newspapers, and news search engines and cross-referenced with an extensive list of alternative sources. Special care was taken and a series of filtering criteria was applied to exclude overlapping announcements while ensuring the most newsworthy of announcements were identified.[16] Of the 196 global announcements, 84 (43 percent) are US-related.

[16] Readers are referred to Ait-Sahalia et al (2009), especially section IIC for more information on its construction. The database itself can be accessed at http://www.imf.org/external/pubs/cat/longres.cfm?sk=23293.0. We are thankful to the IMF for providing access to this data.

For our purposes, we further isolate US events in the IMF data that are coded as both non-overlapping and key events, resulting in 49 events selected for the analysis. We focus our attention on the markets' response to system-wide government-initiated interventions in the form of financial sector policies, fiscal policies, interest rate cuts, and liquidity support programs. There are 23 such government-initiated events that do not coincide with other major events including 4 financial sector policies, 4 fiscal policy announcements, 7 interest rate cuts, and 8 liquidity support measures. The financial sector policy measures include the enactment of the Emergency Economic Stabilization Act (TARP) on October 3, 2008 which authorized the Treasury to purchase up to $700 billion in troubled assets from financial institutions. Fiscal policy events include the introduction of the 2008 and 2009 stimulus packages. The seven interest rate cuts span September 2007 through April 2008 and comprise Federal funds rate reductions ranging from 25 to 75 bps.[17] Liquidity measures vary from early announcements of central bank support in the summer of 2007 such as providing necessary reserves and increasing the length of term financing to the introduction of new programs in the fall of 2008 such as the Money Market Investor Funding Facility (MMIFF) and the Term Asset Backed Securities Loan Facility (TALF). Table 2 details the 23 events included in the analysis.

B. Calculating Abnormal Performance

We use an event study approach to isolate the impact of government intervention on CDS spreads. Because the government actions affect all firms simultaneously there is an issue total clustering which means that the covariances of abnormal spread changes will not equal zero. One method to deal with this is to use a use a multivariate regression model with dummy variables for the event dates. However, MacKinlay notes that test statistics using this method often have "poor finite sample properties" and "little power against economically reasonable alternatives" (MacKinlay, 1997, p. 27). In light of this quandary, we proceed by estimating abnormal spread changes using both the dummy variable approach as well as a standard market model. We apply a variety of parametric and non-parametric tests to the abnormal spread changes and warn the reader to interpret test statistics with caution. If the results are consistent across the various models and test statistics, one can be somewhat confident in their robustness.

First we estimate the multivariate regression:

$$\%\Delta CDS_{it} = \alpha + \beta_1 \%\Delta CDX_t + \beta_2 D_t + \varepsilon_{it} \qquad (1)$$

where $\%\Delta CDS_{it}$ is calculated by taking log differences in CDS spread levels for firm *i* between day *t* and day *t-1*. As in Acharya and Johnson (2007), in using log differences, we are calculating percentages of percentages and we refer to these $\%\Delta CDS_{it}$ as spread changes. $\%\Delta CDX_t$ is the log difference in the corresponding CDX index between day *t* and day *t-1* and D_t is a dummy variable set to 1 if the date is associated with a government action and zero otherwise. The model is then modified to differentiate

[17] The federal funds rate was further reduced on 10/8/2008 by 50bps to 1.50% and on 10/29/2008 by another 50bps to 1.00% and finally on 12/16/2008 by 75 – 100 bps to 0 – 0.25% but these rate reductions overlap other key events tied to the financial crisis and hence are excluded from the initial analysis.

between the various types of events with dummy variables for financial policies (FIN), fiscal policies (FIS), interest rate cuts (IRCUT), and liquidity support programs (LIQ) each respectively set to 1 if the date in question corresponds to the announcement of one of these tools and zero otherwise as in equation (2) below:

$$\%\Delta CDS_{it} = \alpha + \beta_1 \%\Delta CDX_t + \beta_2 FIN_t + \beta_3 FIS_t + \beta_4 IRCUT + \beta_5 LIQ +_t \varepsilon_{it} \quad (2)$$

Additionally, we use a standard market model to calculate abnormal performance for CDS spread changes. The market model is calculated over a [-60,-21] estimation window as:

$$\%\Delta CDS_{it} = \alpha_i + \beta_i \%\Delta CDX_t + \varepsilon_{it}. \quad (3)$$

Abnormal spread changes are calculated as the actual $\%\Delta CDS_{it}$ minus the model's prediction for day *t* where *t=0* corresponds to the event date. As in Miyajima and Yafeh, the short estimation window is used due to "the large number and high frequency of events" (p. 2871) over the period, however, a 120-day estimation window is also used to ensure results are not sensitive to this specification.

Acknowledging the fact that the government interventions were clearly responses to a series of events is to acknowledge an endogeneity issue in which the assumption that the error term is orthogonal to the dependent variable is violated. Bernanke and Kuttner (2005, p. 1230) remark that a contemporaneous response of monetary policy to financial markets or if both policy and markets respond jointly to new information violates the orthogonality condition resulting in a downward bias of the size of the policy's estimated impact. Solutions cited in their paper include narrowing the event window by using intraday data.[18] Unfortunately, intraday data is not currently available for CDS prices. In lieu of intraday data, we focus on the most narrow event window possible with our data limitations, one trading day. However, in doing so, we potentially understate the impact of policy because it may take time for a policy action to be fully digested by markets, especially if that policy is unprecedented or announced at the close of business. Therefore, we also allow for a two-day window which includes the announcement date and the following business day and is denoted as the [0,1] event window. Results for longer three- and five-day event windows, represented as [-1,1], and [-1,3] respectively, are available upon request. For multi-day windows, cumulative abnormal spread changes, denoted as CASCs, are calculated by summing average abnormal spread changes over the multi-day event window.

C. Interpretation of Results

Results using equations (1) and (2) are presented in Panel A of Table 3. The first observation is that the estimated coefficient on the market, $\hat{\beta}_1$=0.625, is highly significant and consistent across both specifications. Hence individual spreads are positively correlated with the overall market movements and there is evidence of a systemic

[18] The other solution involves a statistical procedure, however, Bernanke and Kuttner remark that results found using this method are similar to those obtained using the standard approach.

component to CDS pricing. Not surprisingly, over this sample, the estimated coefficient on the market for financial firms is somewhat greater than that of non-financial firms (0.705 versus 0.609). Second, the estimated coefficient on the event dummy variable is -0.557 (t=-7.18) indicating that the government actions were interpreted as "good news" by credit markets with spreads decreasing an average of -0.557% upon announcement. With average spreads of 255 bps over the sample period, this equates to a modest spread reduction of 1.42 bps which translates to $1,420 on a notional contract of $10,000,000. The reaction of financial firms is greater in magnitude than those of non-financial firms (-1.395% versus -0.407%). The explanatory power of the model is also greater for financial firms (R^2=17.5%) than for non-financial firms (R^2=13.6%). Overall, equations (1) and (2) explain approximately 14 percent of the variation in daily CDS spread changes (log differences).

Responses differ by the type of government action. Financial sector polices directly targeted at financial institutions, such as TARP, are associated with a strong announcement day reaction by financial firms in which spreads narrow by more than five percent. In contrast, fiscal stimulus packages, aimed at improving the broader economy, had a stronger effect on non-financial firms (coefficient estimate=-1.157%, t=-8.03) than on financial ones (for whom the response was insignificant).

Interest rate cuts were effective across the board as CDS spreads on financial and non-financial firms decreased by -1.924% and -1.047% respectively. In an earlier study, Bernanke and Kuttner (2005) use an event study approach to examine the response of stock market indices to monetary policy actions. They find that the stock market responds positively to unexpected Federal funds rate cuts: specifically, an unanticipated 25 basis point reduction elicits a one percent increase in stock indices. Our findings suggest that the CDS market has a similar reaction to Federal funds rate reductions. Indeed, across the spectrum of corporate credit, it appears that interest rate cuts were one of the most effective policy tools used during the crisis to calm credit markets.

Finally, liquidity support programs were the least effective at restoring market confidence. When estimated using equation (1), announcements regarding liquidity support were associated with a small increase in spreads of 0.26%. These programs, which include the TAF, MMIF, TALF, and TSLF, were new tools introduced by the Federal Reserve to provide liquidity to the short-term money markets. The most likely explanations for the lack of a positive market reaction (i.e., a reduction in spreads) to the liquidity support provided by the Federal Reserve is either (1) the CDS market interpreted the introduction of these facilities as negative signals as to the state of financial conditions or (2) the market could not fully digest and interpret these new programs in such a short time span as one day, or a combination of both.

While we recognize a one-day window is a somewhat limited view of the market reaction to government policy, based on the nature of the crisis and especially the frequency and proximity of high-impact announcements, we believe that this narrow window makes the most sense. Nonetheless, we provide results using a two-day event window that includes

both the announcement day and the following business day in Panel B of Table 3.[19] Overall, the results are similar in that there is a reduction in CDS spreads of -0.513% that is statistically significant at the 1% level. The reaction is stronger for financial firms (-1.117%) than for non-financial firms (-0.405%), interest rate cuts still elicit a statistically significant reduction in spreads for both financial and non-financial firms, and the explanatory power of the model is virtually unchanged going from a one- to two-day window. However, there are differences when the event window is expanded. Liquidity support program are now associated with a modest but statistically significant spread reduction of -0.387% suggesting that the programs' originally muted and contrarian response may have been due to slow processing of these new programs. The market's reaction to financial sector policies changes noticeably as well. First, the financial firms' reaction, although still negative and significant, is muted. More importantly, the non-financial firms experience a statistically significant increase in abnormal spread changes of 1.620%. It is important to note that two of the four events analyzed in this category occurred in October, 2008, which is when the credit crisis was at its peak and events were unfolding by the hour. Although care was taken to isolate events in the IMF database that did not have other high-profile US announcements on the same day, when the event window is widened, the potential for contamination increases with it. Hence, we cannot be sure that this reversal is not due to confounding announcements.

Next, we report abnormal spread changes (ASCs) estimated using the market model in Table 4 and compare them with the dummy variable coefficient estimates reported in Table 3. Although we provide a variety of parametric and non-parametric tests of the ASCs in Table 4, once again, based on the high frequency and clustering of events, we caution the reader to interpret these test statistics with caution and weigh them carefully in conjunction with the results found in Table 3. Overall, the results are consistent across the two methodologies. Whereas the dummy variables approach reports an abnormal response of all firms to government actions of -0.557%, the market model abnormal spread changes are estimated to be -0.660%. Using the market model to measure normal performance, again, we find the market reaction is negative and significant for all but the liquidity support announcements and that the strongest reaction, by far, is found in the response of financial firms to financial sector policies. Again, fiscal stimulus announcements elicit the strongest response for non-financial firms and interest rate cuts reduce CDS spreads significantly for both financial and non-financial firms, although the response is stronger for financial firms and weaker for non-financial firms using this methodology.

Expanding the event window to include the next trading day, we report two-day cumulative abnormal spread changes (CASCs) in Panel B. Increasing the event window leads to an increase in magnitude of CASCs from -0.660 (for time, t=0) to -0.979% (for the [0,1] window). Although the CASCs are larger in magnitude than the coefficient estimates reported in Panel B of table 3, qualitatively the results are similar. Again, interest rate cuts continue to elicit a statistically significant negative reduction in spreads and liquidity support programs seem more effective using a two-day window. Consistent

[19] Results using a three- and five-day window, available upon request, are qualitatively similar to those reported in Panel B.

with the results found in Table 3, we see a muted response of financial firms to financial sector policies and a significant increase in CDS spreads of non-financial firms to financial sector policies when the event window is expanded.

D. Robustness

To ensure our findings are not unduly influenced by outliers, we next account for outliers using various criteria. For equations (1) and (2), we identify outliers based on the influence criteria of Belsley, Kuh, and Welsch (1980). We assign a value of one to the variable D^{OUT} for those observations whose regression influence statistics exceed the cutoffs recommended by Belsley et al. and proceed to re-estimate our models with this additional variable included.[20] CDS multivariate regression results using this method are reported in table A1 of the appendix. The results show that while the size of the coefficients and the explanatory power of the model are stronger, the overall conclusions are unchanged. In table A2, we identify outliers as those observations with $\%\Delta CDS_{it}$ more than three standard deviations from the mean and, again, our findings are quite similar. For the market model estimated in equation (3), we identify abnormal spread changes that are more than three standard deviations from the mean and exclude those outliers from the event study. Again, our findings (reported in Appendix A2) are similar. Likewise, when the estimation window is expanded to include the [-140,-21] trading day period, findings (reported in Appendix A3) are comparable to those reported in table 4.[21]

E. Summary of Event Study Findings

In summary, we find that the government actions to stabilize the financial sector and the overall economy were generally well-received by CDS market participants and had the positive effect of reducing credit risk across a broad cross-section of firms with financial firms, not surprisingly, experiencing the greatest reduction in spreads. Using a narrow, one-day event window, the results suggest that the announcement of conventional monetary and fiscal policy tools reduce CDS spreads for all firms by approximately one percent. Interest rate cuts elicit a significant and consistent response across both financial and non-financial firms. Non-financial firms respond more strongly to fiscal policy announcements than financial firms. Although liquidity support programs appear to have the least impact on credit markets, when the event window is expanded, the market's reaction to these programs increases in significance, potentially indicating that these new programs took longer for the market to digest. Using the one-day window, we find that financial firms responded quite positively to financial sector policies such as TARP. When the event window is expanded to two days, we find an increase in CDS spreads of non-financial firms. However this negative reaction may be contaminated due to the high frequency of events during this time period.

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[20] Specifically, we examine the studentized residual, the covariance ratio, the ith element of the hat matrix, and the DFFits statistics. If the studentized residual is greather than two, the absolute value of the covariance ratio minus one is greater than 3p/n (where p is equal to the number of parameters and n is the number of observations), the ith diagonal of the hat matrix is greater than 2p/n, and the DFfits statistic is greater than $2\sqrt{p/n}$ then D^{OUT} is set equal to one, otherwise it is set equal to zero.

[21] One exception is that the non-financial firms exhibit small but significant positive mean abnormal spread changes upon announcement of financial sector policies.

III. Cross-Sectional Regression Analysis

Having established that the CDS market reacted in a meaningful way to policy announcements during the 2007-2009 financial crisis, we next seek to differentiate this response by firm characteristics. To explore the impact of size on the CDS response to government interventions, the market value of equity was obtained from CRSP by multiplying the share price by the number of shares outstanding. The natural log of this value was used as a proxy for firm size. If smaller firms are more dependent on bank financing, these firms should benefit more from government intervention in the financial sector. Hence, a positive relationship is hypothesized between firm size and abnormal spread changes for non-financial firms. However, for financial institutions, under the notion of "too big to fail," larger firms may benefit more from recent government interventions. That is, CDS spreads for larger financial firms may decrease more relative to those of their peers and an inverse relationship is expected for this sector.

Credit quality should also be a differentiating factor. The price of a credit default swap is determined by two things: the probability of default and the loss given default. Both those determinants rise in a deteriorating market environment increasing the price of credit risk across the board. However, considering the non-linearity of the structural models of credit risk, we'd expect firms with an initial closer distance-to-default to be more impacted by a systemic event than their peers. Therefore, we assume firms with lower credit ratings would be more affected by the turmoil in the credit markets than those with higher credit quality and to test this hypothesis a dummy variable is included to account for firms whose S&P credit rating is below investment grade.

Furthermore, leverage is included as a potential explanatory variable. Firms with more debt relative to total assets should be more affected by the credit crunch, hence we expect to find an inverse relationship between the leverage ratio and abnormal spread changes signifying that firms with higher leverage ratios benefit more from government support. As noted in Miyajima and Yafeh, "high leverage and low credit rating (can be interpreted) as indicators of bank dependence and limited access to financial markets" (p. 2875). Obtaining data from COMPUSTAT, we measure leverage as the book value of debt divided by the total assets of the firm. Book value of debt is defined as debt in current liabilities plus long-term debt.

In addition to these measures of credit worthiness, we include measures of recent performance of individual firms under the hypothesis that firms which have underperformed relative to their peers up to this point should react more favorably to government intervention in the financial markets. To measure recent performance, we calculate the percentage change in CDS spreads over a three-month interval ending one week prior to the event. We expect to find a negative relationship between the three-month change in spreads and abnormal spread changes.

We include Tobin's Q as a measure of the firm's profitability. We expect more profitable firms to be less sensitive to the financial crisis and thus less responsive to the resulting government intervention.

Generally CDS spreads and stock prices move in an inverse direction, for if information increases the value of the firm, CDS spreads would decrease and the value of the equity would rise. However, there are instances where that relationship would not hold. If news were good for creditors and bad for shareholders, both CDS spreads and equity prices would decrease. As mentioned earlier, both King (2009) and Panetta et al. (2009) find evidence that the government rescue packages benefited creditors at the expense of shareholders. However, King finds that the US is an exception to this finding. Most likely due to the favorable terms of the US packages, bank stocks cumulative average abnormal returns were 21 percent over the [0,1] announcement period. We include same-day market model abnormal stock returns in our model to further test the relationship between CDS and stock prices around these events. The abnormal stock return for firm *i* on day *t*, AR_{it}, is calculated using a market model of the form $R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon$ in which R_{mt} is the return on the S&P500 index for day *t*. AR_{it} is then equal to $R_{it} - \hat{\alpha}_i - \hat{\beta}_i R_{mt}$. As in the CDS event study, a 40 day estimation period spanning the [-60,-21] pre-event window is used to obtain the market-model parameter estimates. In this broader market context, we expect an inverse relationship between the two markets would surface suggesting that the government interventions provided stability to financial markets as a whole and not just to credit markets.

To summarize, the factors explored in the regression are size, credit quality, leverage, recent CDS performance, profitability, and abnormal stock returns. Data sources and definitions of these variables are provided in Table 5 and the regression equation is:

$$ASC_{it} = \alpha_0 + \beta_1 SIZE_{it} + \beta_2 NIG_{it} + \beta_3 LEV_{it} + \beta_4 CDSPERF_{it} + \beta_5 TQ_{it} + \beta_6 AR_{it} + \varepsilon_{it} \quad (4)$$

where ASC_{it} are the abnormal spread changes for firm *i* on day *t*, $SIZE_{it}$ is the natural log of market capitalization, NIG_{it} is the indicator variable for non-investment grade firms, LEV_{it} is the leverage ratio, $CDSPERF_{it}$ is the percentage change in CDS spreads over the three-months ending one week prior to the event, and TQ_{it} stands for Tobin's Q.

We regress the CDS abnormal spread changes obtained from the CDS market model estimation on the independent variables identified above to explore the overarching hypothesis that firms with different characteristics responded differently to government policies and programs announced throughout the crisis. We analyze financial firms separately from non-financial firms and present our results in Table 6.

A. Cross-sectional Regression Results

Panel A provides results for financial firms. Consistent with the hypothesis that large financial institutions benefited more from government support, the results indicate that size is inversely related to abnormal spread changes with statistically significant negative size coefficients for all actions, financial sector policies, and interest rate cuts. While credit quality and leverage prove to be insignificant, recent CDS price performance is negative and statistically significant at the one percent level for three of the five categories. This finding is consistent with our hypothesis that those financial firms

whose CDS had underperformed recently relative to their peers would outperform upon reaction of government support. Tobin's Q is positive and significant when all government actions are taken together and marginally significant for financial sector policies and interest rate cuts. Thus there is some evidence that more profitable financial firms benefited less from government actions.

The coefficient on abnormal stock returns is negative and significant for all but fiscal policies. This finding is inconsistent with those of Panetta et al. (2009) who find that bank CDS and stock prices both decrease upon announcement of government rescue packages. However, while King (2009) corroborates Panetta et al. finding's internationally, he further concludes that US bank CDS and stock prices move in inverse directions. Hence, our findings are consistent with those of King. It should be noted that, unlike these studies, our study does not focus solely on banks. Our data consists of 53 financial firms including 5 banks, 16 financial firms, 16 insurance firms, and 16 REITs. Panel A of Table 7 provides mean abnormal spread changes and stock returns broken out by these finer industry classifications. Across all these various subcategories, while the CDS market's reaction is stronger than the stock market's, the inverse relationship between these two markets is consistently observed. To further investigate the relationship between these markets, figure 2A provides a scatter plot of mean abnormal spread changes and mean abnormal stock returns for the 53 financial firms. Again, figure 2 largely confirms the regression results with the majority of the firms residing in the fourth quadrant. The firms with the largest negative mean ASCs are the 5 banking firms in the study (JP Morgan, Goldman Sachs, Wells Fargo, Bank of America, Citigroup). Not surprisingly, AIG and Citi stand out as outliers as AIG experiences increases in both ASCs and ARs while Citi experiences declines in both these measures.

The results for non-financial firms are reported in Panel B. Overall, the explanatory power of the regression model is much weaker for non-financial firm than financial ones. Specifically, r-squared values range from 3.5% to 26% for financial firms depending on the event classification. In contrast, the explanatory power for non-financial firms ranges from 0.8% to 4.6%. As in the financial firm regression results, the explanatory power is highest for non-financial firms when focusing on the impact of financial sector policies on these firms. Interestingly, for this classification, the coefficient on size is significant and positive (t=3.26) suggesting that smaller firms benefited more from government intervention in the financial sector.[22] This finding is consistent with those of Miyajima and Yafeh (2007) and the hypothesis that smaller firms who are more dependent on bank financing benefit more from government intervention in the banking sector than their larger peers. Furthermore, the coefficient on credit quality is negative and significant, indicating that non-investment grade firms benefited more from financial sector policies than higher credit quality ones. The coefficient on recent CDS performance is also negative and significant, indicating that those firms whose CDS price has underperformed prior to the government action, outperformed upon announcement of government support. The significance of this coefficient is high, not just for this event type, but across all event categorizations and across financial and non-financial firms[23]

[22] A decrease in the CDS spread indicates a decrease in the perceived credit risk of the underlying firm.
[23] The sole exception being the financial firms' reaction to fiscal policy announcements.

suggesting that it is the single most important indicator of a non-financial firm's CDS price response to government intervention during the financial crisis. Tobin's Q is negative and significant for financial sector policies and fiscal policies, but positive and significant for interest rate cuts indicating that CDS spreads for non-financial firms with higher market-to-book values responded more favorably to financial sector and fiscal policies and less favorably to interest rate cuts. Same day abnormal stock returns are negative and significant on the whole and specifically for interest rate cuts and liquidity support programs. This finding is important because it suggests that, in general, the CDS and stock market responded similarly to the government's efforts. That is to say, a decrease in abnormal spreads upon government announcement of rescue efforts is associated with an increase in stock returns. To further explore this relationship, Panel B of table 7 reports mean ASCs and ARs by industry classification for non-financial firms. Rather than confirming the regression results (as in Panel A for financial firms), the table highlights the fact that the CDS and stock markets' responses to these events differed by industry sector with ASCs being statistically significant and negative for (1) Consumer Products, (2) Media, Broadcasting, and Cable, (3) Rails, Trucking, and Air Freight, (4) Retail and Restaurants, (5) Technology, and (6) Utilities. There is not one industry for which mean ASCs were significantly positive. In contrast, mean ARs are significantly positive only for (1) Automobiles, (2) Chemicals, and (3) Oil and Gas, and mean ARs are significantly negative for (1) Aerospace and Defense, (2) Consumer Products, (3) Healthcare, and (4) Utilities. In short, based on this limited analysis, there does not appear to be a clear and consistent inverse relationship between the CDS and stock price reaction to government interventions across these industries. Figure 2B plots mean abnormal spread changes and mean abnormal stock returns for the 295 non-financial firms. Similar to the results in Panel B of Table 7, there is no clear pattern between ASCs and AR for non-financial firms.

Conclusions

This paper examines the effects of government intervention during the 2007 – 2009 financial crisis on CDS prices using a cross-section of 348 firms from both the financial and non-financial sector. We find evidence that CDS spreads responded favorably to government intervention as abnormal spread changes were negative and statistically significant for both financial and non-financial firms. The reaction to government actions was stronger for financial firms than for non-financial ones. Not surprisingly, the financial sector responded most favorably to financial sector policies, for which announcement day abnormal spread reductions were approximately 5 percent. Announcements of interest rate cuts reduced financial firms ASCs by approximately 2 percent. Non-financial firms responded most favorably to traditional fiscal and monetary policy measures with abnormal spread reductions of approximately one percent for both fiscal policies and interest rate cuts. These findings are important because, to the best of our knowledge, this is the first study to look at the effects of monetary and fiscal policy on the CDS prices of non-financial firms.

On the whole, we conclude the government efforts to restore confidence in credit markets were successful when evaluated in an event study context. By design, an event study is a

somewhat narrow approach in that it focuses on the immediate market reaction. A more thorough investigation of the long-term implications of these policies would be an important area for future research. We next attempt to explain the variation in abnormal spread changes using a cross-sectional regression of ASCs on key variables including size, credit quality, leverage, recent CDS performance, profitability, and corresponding abnormal stock returns. In so doing, we are able to explain 26 percent of the variation in financial firms' response to financial policy actions. Notably, we find that the coefficient on size for financial firms is negative and statistically significant suggesting that there was a "too big to fail" reaction to the government actions. Recent CDS performance was also a key determinant of the financial sector's reaction to government actions as those firms who had underperformed in the prior three months outperformed their peers upon announcement of government support. Overall, we find a negative relationship between the CDS and stock markets' reactions to government interventions suggesting that these interventions benefited both creditors and shareholders. However, upon further investigation, that relationship appears stronger for those firms most immediately affected by these actions: that is, the relationship is stronger for financial firms than for non-financial ones. Finally, our model accounts for less than five percent of the variation of non-financial firms' response to government intervention leaving the majority of the non-financial sector reaction to government actions unexplained.

While the credit crisis of 2007-2009 will be remembered as a period of great turmoil in financial markets, the effectiveness of the government's response will remain an area of considerable debate for many years to come. This study seeks to enrich that debate by providing an empirical examination of the CDS market's response to government interventions over this timeframe. While only time will tell of the full long-term consequences of these actions, this study finds that - in the short-term context of an event study - the government's efforts were at least somewhat effective at restoring confidence in credit markets.

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Table 1: Descriptive Statistics

Time Period	Variable	Mean	Median	σ	N
Full Sample	CDS level (mid-price in bps)	255	95	515	301,020
07/17/2006 – 12/31/2009	%ΔCDS (log differences * 100)	0.09	0.00	6.43	300,672
	Market cap (in millions)	23,019	9,272	44,052	301,020
	Stock returns (in percentages)	0.03	0.02	3.69	301,020
	S&P credit rating	9.13	9.00	3.29	288,900
	Leverage ratio	0.35	0.30	0.23	272,476
	Tobin's Q	1.52	1.35	0.58	277,828
Phase I: Stable Markets	CDS level (mid-price in bps)	79	37	104	76,560
07/17/2006 – 6/04/2007	%ΔCDS (log differences * 100)	-0.11	0.00	6.55	76,212
	Market cap (in millions)	26,538	11,726	48,255	76,560
	Stock returns (in percentages)	0.13	0.10	1.56	76,560
	S&P credit rating	8.88	9.00	3.20	73,386
	Leverage ratio	0.29	0.25	0.20	72,035
	Tobin's Q	1.64	1.46	0.60	72,160
Phase II: Subprime Crisis	CDS level (mid-price in bps)	189	85	289	111,708
06/05/2007 – 09/13/2008	%ΔCDS (log differences * 100)	0.42	0.00	6.43	111,708
	Market cap (in millions)	26,298	11,090	48,637	111,708
	Stock returns (in percentages)	-0.05	-0.06	2.84	111,708
	S&P credit rating	8.95	9.00	3.21	107,214
	Leverage ratio	0.32	0.27	0.22	105,683
	Tobin's Q	1.61	1.44	0.62	105,288
Phase III: Global Crisis	CDS level (mid-price in bps)	552	272	860	41,064
9/14/2008 – 03/08/2009	%ΔCDS (log differences * 100)	0.70	0.00	7.04	41,064
	Market cap (in millions)	16,739	5,565	35,443	41,064
	Stock returns (in percentages)	-0.66	-0.63	6.64	41,064
	S&P credit rating	9.23	9.00	3.27	39,412
	Leverage ratio	0.45	0.41	0.26	37,824
	Tobin's Q	1.38	1.20	0.52	38,704
Phase IV: Recovery	CDS level (mid-price in bps)	375	155	665	71,688
03/09/2009 – 12/31/2009	%ΔCDS (log differences * 100)	-0.54	-0.10	5.83	71,688
	Market cap (in millions)	17,751	6,592	34,291	71,688
	Stock returns (in percentages)	0.46	0.19	4.04	71,688
	S&P credit rating	9.61	9.00	3.45	68,888
	Leverage ratio	0.41	0.36	0.24	56,934
	Tobin's Q	1.30	1.17	0.44	61,676

Table 2: List of Key Government-Initiated System-wide Interventions

Date	Event	Type
8/10/2007	FRB announces it will provide reserves as necessary	Liquidity Support
8/17/2007	FRB reduces primary credit rate + FRB increases borrowing term + Term Discount Window Program (30day) + a conference call to urge banks to lend	Liquidity Support
9/18/2007	Federal funds rate reduced 50 bps from 5.25% to 4.75%	Interest Rate Cut
10/31/2007	Federal funds rate reduced 25 bps from 4.75% to 4.50%	Interest Rate Cut
12/11/2007	Federal funds rate reduced 25 bps from 4.50% to 4.25%	Interest Rate Cut
12/12/2007	Term Auction Facility (TAF)	Liquidity Support
12/19/2007	TAF: FRB to auction $20bn	Liquidity Support
1/18/2008	President Bush Asks Congress To Work With Him To Enact An Economic Growth Package That Bolsters Business Investment And Consumer Spending	Fiscal Policy
1/22/2008	Federal funds rate reduced 75 bps from 4.25% to 3.50%	Interest Rate Cut
1/30/2008	Federal funds rate reduced 50 bps from 3.50% to 3.00%	Interest Rate Cut
3/11/2008	Term Securities Lending Facility (TSLF)	Liquidity Support
3/18/2008	Federal funds rate reduced 75 bps from 3.00% to 2.25%	Interest Rate Cut
4/30/2008	Federal funds rate reduced 25 bps from 2.25% to 2.00%	Interest Rate Cut
10/3/2008	Emergency Economic Stabilization Act of 2008 (TARP)	Financial Sector Policy
10/14/2008	TARP Capital Purchase Program and Temporary Liquidity Guarantee Program	Financial Sector Policy
10/21/2008	Money Market Investor Funding Facility (MMIFF)	Liquidity Support
11/25/2008	Term Asset Backed Securities Loan Facility (TALF)	Liquidity Support
12/19/2008	Term Asset Backed Securities Loan Facility (TALF) Expanded	Liquidity Support
1/12/2009	TARP: Second round of funds available	Financial Sector Policy
1/15/2009	Stimulus Package	Fiscal Policy
2/9/2009	US Stimulus Plan passes Senate	Fiscal Policy
2/26/2009	Federal Budget Released	Fiscal Policy
3/23/2009	Public Private Investment Program	Financial Sector Policy

Source: Source: Ait-Sahalia, Y., J. Andritzky, A. Jobst, S. Nowak and N. Tamirisa, "How to Stop a Herd of Running Bears? Market Responses to Policy Initiatives during the Global Financial Crisis", IMF Working Paper, 2009.

Table 3: Abnormal spread changes upon announcement of key government-initiated interventions using multivariate regression model with dummy variables for the event date

Panel A: Multivariate Regression Results for announcement date (t=0)

	All Firms		Financial Firms		Non-Financial Firms	
	(1)	(2)	(1)	(2)	(1)	(2)
Intercept	0.065***	0.064***	0.186***	0.186***	0.043***	0.043***
	(5.91)	(5.89)	(6.38)	(6.38)	(3.63)	(3.61)
%ΔCDX	0.625***	0.627***	0.705***	0.704***	0.609***	0.611***
	(168.49)	(168.76)	(64.85)	(65.42)	(157.67)	(157.69)
D	-0.557***		-1.395***		-0.407***	
	(-7.18)		(-5.28)		(-5.23)	
FIN		-0.657***		-5.133***		0.148
		(-2.99)		(-5.18)		(0.85)
FIS		-0.985***		-0.010		-1.157***
		(-6.90)		(-0.02)		(-8.03)
IRCUT		-1.180***		-1.924***		-1.047***
		(-9.32)		(-4.77)		(-8.05)
LIQ		0.263*		0.240		0.263*
		(1.89)		(0.66)		(1.74)
R^2	0.142	0.142	0.175	0.177	0.136	0.136
No. of observations	300,671		45,791		254,879	

Panel B: Multivariate Regression Results for [0,1] event window

	All Firms		Financial Firms		Non-Financial Firms	
	(1)	(2)	(1)	(2)	(1)	(2)
Intercept	0.076***	0.068***	0.206***	0.196***	0.053***	0.045***
	(6.88)	(6.17)	(7.00)	(6.67)	(4.42)	(3.79)
%ΔCDX	0.627***	0.626***	0.708***	0.708***	0.610***	0.610***
	(168.86)	(168.32)	(64.67)	(64.32)	(158.33)	(158.19)
D	-0.513***		-1.117***		-0.405***	
	(-9.01)		(-6.25)		(-6.89)	
FIN		1.178***		-1.265**		1.620***
		(8.23)		(-2.20)		(12.43)
FIS		-0.845***		-0.336		-0.933***
		(-7.46)		(-0.99)		(-7.85)
IRCUT		-0.875***		-1.678***		-0.731***
		(-9.11)		(-5.65)		(-7.35)
LIQ		-0.387***		-0.279		-0.411***
		(-3.98)		(-1.04)		(-3.94)
R^2	0.142	0.143	0.175	0.175	0.136	0.137

Test statistics calculated using robust standard errors. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 4: Abnormal spread changes upon announcement of key government-initiated interventions using standard market model

Panel A: Market model results for announcement date (t=0)

	Type of Action	No of obs.	ASC/ CASC	Cross-sectional t-test	Patell's (1976) Test	Boehmer's et al. (1991) t-statistic	% Positive	Sign Test Statistic
All	All Actions	8,004	-0.660	-8.47	-15.54	-8.66	0.46	-7.96
Firms	FIN	1,392	-0.936	-4.34	-9.8	-3.92	0.47	-2.25
	FIS	1,392	-1.154	-8.06	-9.96	-8.75	0.37	-9.86
	IRCUT	2,436	-0.918	-6.84	-11.76	-8.66	0.43	-7.29
	LIQ	2,784	-0.051	-0.36	-1.38	-0.70	0.52	1.90
Financial	All Actions	1219	-1.688	-6.49	-14.83	-6.36	0.41	-5.99
Firms	FIN	212	-4.881	-5.41	-18.59	-5.19	0.37	-3.71
	FIS	212	-0.059	-0.12	-0.51	-0.36	0.45	-1.51
	IRCUT	371	-2.792	-6.65	-10.72	-6.73	0.33	-6.49
	LIQ	424	0.06	0.16	-1.62	-0.69	0.49	-0.39
Non-	All Actions	6785	-0.476	-6.02	-10.6	-6.32	0.46	-6.11
Financial	FIN	1180	-0.227	-1.2	-2.77	-1.26	0.49	-0.87
Firms	FIS	1180	-1.350	-9.37	-10.6	-9.85	0.35	-10.07
	IRCUT	2065	-0.581	-4.22	-8.23	-6.31	0.44	-5.17
	LIQ	2,360	-0.070	-0.47	-0.82	-0.43	0.52	2.22

Panel B: Market Model Results for [0,1] event window

	Type of Action	No of obs.	ASC/ CASC	Cross-sectional t-test	Patell's (1976) Test	Boehmer's et al. (1991) t-statistic	% Positive	Sign Test Statistic
All Firms	All Actions	8004	-0.979	-9.55	-13.25	-7.86	0.44	-9.95
	FIN	1392	2.131	8.10	19.69	9.05	0.61	8.09
	FIS	1392	-2.136	-9.77	-13.18	-8.13	0.31	-13.18
	IRCUT	2436	-1.434	-7.69	-12.97	-9.43	0.43	-6.81
	LIQ	2784	-1.559	-9.18	-14.94	-9.32	0.44	-6.37
Financial	All Actions	1219	-2.296	-6.64	-12.55	-6.53	0.42	-5.59
Firms	FIN	212	-2.604	-2.62	-7.20	-2.74	0.48	-0.69
	FIS	212	-1.076	-1.41	-1.32	-0.91	0.39	-3.16
	IRCUT	371	-3.910	-6.07	-10.96	-7.16	0.35	-10.96
	LIQ	424	-1.339	-2.56	-5.00	-2.50	0.46	-1.46
Non-	All Actions	6785	-0.743	-7.18	-9.07	-5.54	0.45	-8.44
Financial	FIN	1180	2.982	12.12	24.44	12.04	0.63	9.08
Firms	FIS	1180	-2.327	-10.65	-13.76	-8.35	0.30	-13.80
	IRCUT	2065	-0.989	-5.33	-9.44	-7.06	0.45	-5.00
	LIQ	2360	-1.598	-9.03	-14.10	-9.28	0.44	-6.30

Table 5: Data Sources and Definitions of Independent Variables

Variable	Definition	Expected Sign	Data Source
Size	The natural log of market capitalization defined as stock prices times number of shares outstanding.	(-) for financial firms (+) for non-financial firms	CRSP
Credit Quality	A dummy variable, NIG, is set to 1 if rating is below investment grade or firm is not rated.	(-)	COMPUSTAT S&P's ratings
Leverage	The book value of debt (BVD) divided by total assets. BVD = long-term debt + debt in current liabilities as of prior quarter.	(-)	COMPUSTAT
CDS Performance	Three-month percent change in CDS ending one week prior to the event. %ΔCDS.	(-)	CDS Data
Tobin's Q	The ratio of market value of assets to book value of assets as of prior quarter. Market value of assets is calculated as total assets less the book value of equity plus the market value of equity.	(+)	COMPUSTAT
Abnormal Stock Return	Announcement day abnormal stock returns are calculated using the market model. The estimation window is the [-60,-21] pre-event period.	(-)	CDS data/ Markit industry classifications

Table 6: Cross-sectional regression analysis of abnormal spread changes

Panel A: Financial Firms

	All Government Actions	Financial Sector Policies	Fiscal Policies	Interest Rate Cuts	Liquidity Support Programs
Intercept	1.912	5.659	-0.563	2.769	3.179
	(1.19)	(0.97)	(-0.20)	(0.97)	(1.21)
Size	-0.457***	-1.572**	0.404	-0.712**	-0.238
	(-2.64)	(-2.08)	(1.23)	(-2.54)	(-1.07)
Credit Quality	0.937	-1.660	-1.618	0.703	2.115
	(0.78)	(-0.43)	(-0.97)	(0.31)	(1.28)
Leverage	0.522	5.858*	-2.745	1.004	-0.056
	(0.48)	(1.89)	(-1.10)	(0.69)	(-0.04)
%ΔCDS	-0.006***	-0.035***	-0.009***	-0.004	-0.004
	(-3.53)	(-4.20)	(-3.15)	(-1.48)	(-1.52)
Tobin's Q	0.960**	3.259*	-1.144	1.179*	-0.221
	(2.00)	(1.71)	(-1.07)	(1.83)	(-0.34)
AR	-0.333***	-0.315**	-0.381	-0.340***	-0.170*
	(-4.38)	(-2.18)	(-1.53)	(-4.03)	(-1.90)
R^2	0.087	0.261	0.138	0.086	0.035
No. of obs.	1116	192	193	342	389

Panel B: Non-financial firms

	All Government Actions	Financial Sector Policies	Fiscal Policies	Interest Rate Cuts	Liquidity Support Programs
Intercept	-0.848	-3.316**	0.132	-0.933	0.642
	(-1.18)	(-1.98)	(0.11)	(-0.67)	(0.46)
Size	0.035	0.650***	-0.008	-0.132	-0.082
	(0.45)	(3.26)	(-0.06)	(-0.85)	(-0.57)
Credit Quality	0.343*	-1.203**	0.274	0.495	0.867**
	(1.71)	(-2.23)	(0.86)	(1.43)	(2.25)
Leverage	-0.187	2.660*	0.681	-0.574	-1.004
	(-0.38)	(1.94)	(0.77)	(-0.62)	(-1.15)
%ΔCDS	-0.006***	-0.015***	-0.011***	-0.004*	-0.006***
	(-5.85)	(-4.70)	(-4.52)	(-1.83)	(-3.27)
Tobin's Q	0.257	-1.835***	-0.898***	1.075***	0.372
	(1.55)	(-2.94)	(-2.59)	(4.05)	(1.34)
AR	-0.070***	-0.046	-0.011	-0.206***	-0.070**
	(-3.08)	(-1.86)	(-0.26)	(-4.20)	(-1.99)
R^2	0.008	0.046	0.039	0.021	0.011
No. of obs.	6,394	1,112	1,112	1,946	2,224

Test statistics calculated using robust standard errors. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 7: Mean abnormal spread changes (ASCs) and mean abnormal stock returns (ARs)

Panel A: Financial Firms

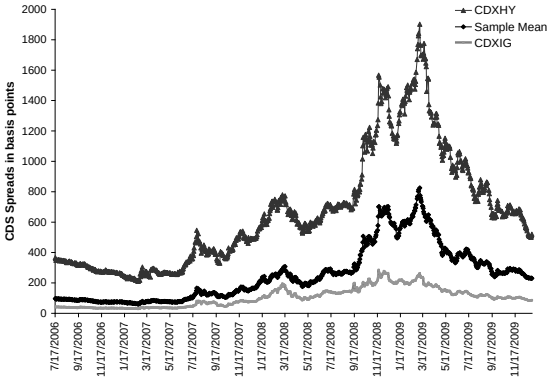
Industry Classification	# of firms	# of event/firm combinations	Mean ASC (in %'s)	Mean AR (in %'s)
All financial firms	53	1,219	-1.688***	0.589***
Banking	5	115	-5.639***	0.800
Finance	16	368	-1.605***	0.918**
Insurance	16	368	-1.531***	0.752**
REITs	16	368	-0.694*	0.027

Panel B: Non-Financial Firms

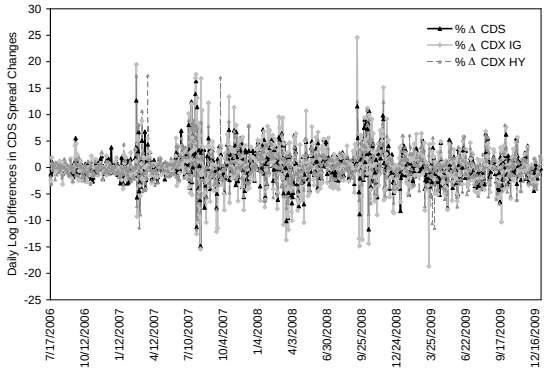
Industry Classification	# of firms	# of event/firm combinations	Mean ASC (in %'s)	Mean AR (in %'s)
All Non-Financial firms	295	6785	-0.476***	-0.083*
Aerospace and Defense	11	253	0.016	-0.224*
Airlines & Travel	5	115	0.388	-0.615
Automobile	9	207	-0.156	0.876**
Chemicals	17	391	-0.038	0.254*
Construction Materials & Housing	2	46	0.321	0.090
Consumer Products	26	598	-0.908***	-0.152*
Gaming, Lodging, & Leisure	7	161	-0.399	-0.257
Grocery & Drugstores	6	138	-0.776	-0.345
Healthcare	22	506	-0.173	-0.518***
Homebuilding	11	253	-0.275	-0.364
Industrials & Manufacturing	11	253	-0.491	0.149
Media, Broadcasting & Cable	15	345	-0.993***	-0.110
Metals & Mining	10	230	0.032	0.069
Oil and Gas	29	667	-0.292	0.369***
Paper & Packaging	10	230	0.396	0.070
Printing and Publishing	3	69	-0.302	-0.759
Rails, Trucking, Air Freight	7	161	-0.906*	0.080
Retail & Restaurants	26	598	-0.936***	0.021
Services (eco, edu, corp)	5	115	0.301	-0.014
Technology	23	529	-0.863***	-0.210
Telecommunications	11	253	-0.548	-0.229
Utilities	29	667	-0.782***	-0.403***

Figure 1: Time Series Plots of Sample Mean and Index values – July 17, 2006 - December 31, 2009

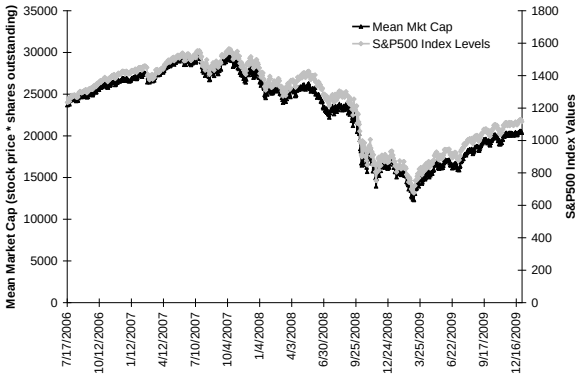
A. CDS sample mean and index spread levels



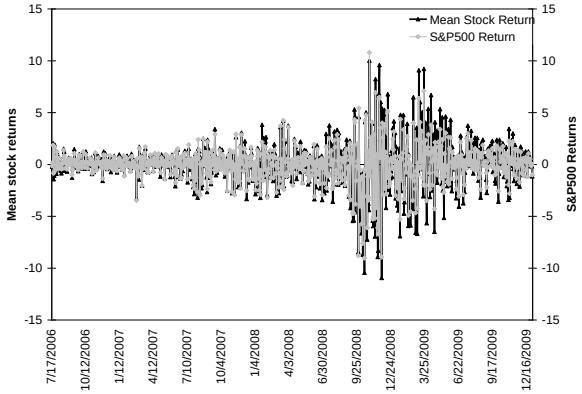
B. Log differences in CDS and CDX indices



C. Mean Market Cap and S&P500 Index Levels

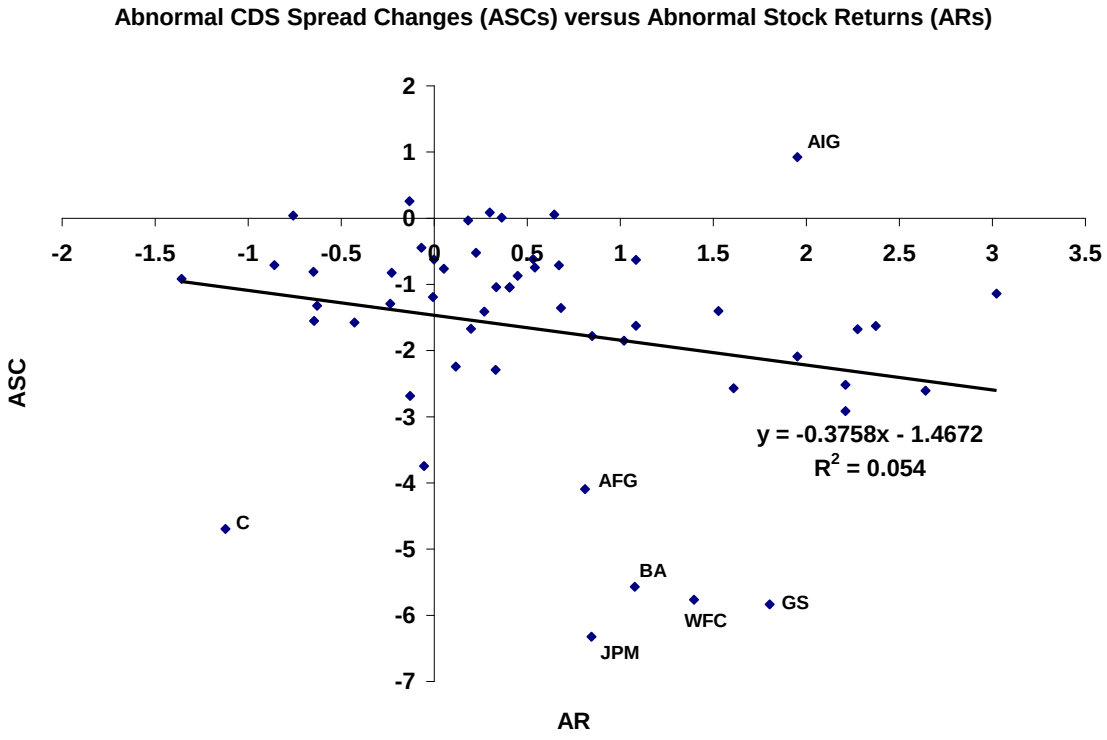


D.Mean stock returns and S&P500 returns

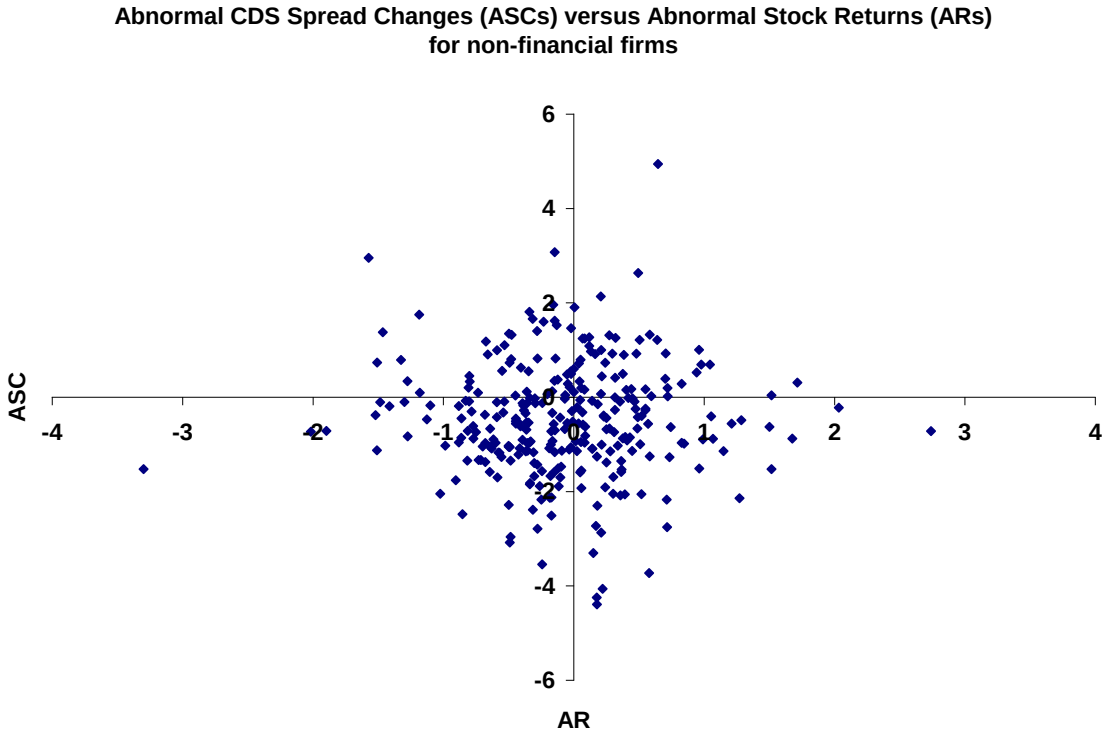


CDS data, provided by a market participant, constitutes mid-market quotes based on end-of-day dealer runs that have been scrubbed for accuracy.

Figure 2: Mean abnormal spread changes versus mean abnormal stock returns
Panel A: Financial Firms



Panel B: Non-Financial Firms



Appendix A1: Multivariate regression results excluding outliers based on various influence statistics

Panel A: Multivariate Regression Results for announcement date (t=0)

	All Firms		Financial Firms		Non-Financial Firms	
	(1)	(2)	(1)	(2)	(1)	(2)
Intercept	0.035***	0.035***	0.118***	0.118***	0.020*	0.020*
	(3.23)	(3.22)	(4.15)	(4.15)	(1.71)	(1.70)
%ΔCDX	0.620***	0.621***	0.689***	0.688***	0.606***	0.607***
	(181.12)	(181.35)	(73.19)	(74.08)	(166.81)	(166.71)
D^{EVENT}	-1.119***		-2.259***		-0.908***	
	(-15.87)		(-9.17)		(-13.00)	
FIN		-1.315***		-6.161***		-0.436***
		(-6.30)		(-6.50)		(-2.69)
FIS		-1.202***		-0.565		-1.315***
		(-9.25)		(-1.45)		(-9.71)
IRCUT		-1.667***		-2.749***		-1.469***
		(-14.62)		(-7.28)		(-12.68)
LIQ		-0.490***		-0.737**		-0.438***
		(-3.95)		(-2.24)		(-3.27)
D^{OUT}	20.241***	20.208***	21.863***	21.903***	19.545***	19.488***
	(60.58)	(60.46)	(32.77)	(32.88)	(51.90)	(51.67)
R^2	0.164	0.164	0.216	0.218	0.153	0.153
No. of observations	300,672		45,792		254,880	

Panel B: Multivariate Regression Results for [0,1] event window

	All Firms		Financial Firms		Non-Financial Firms	
	(1)	(2)	(1)	(2)	(1)	(2)
Intercept	0.049***	0.043***	0.143***	0.137***	0.032***	0.026**
	(4.47)	(3.95)	(4.98)	(4.78)	(2.70)	(2.22)
%ΔCDX	0.623***	0.623***	0.695***	0.694***	0.608***	0.608***
	(181.79)	(181.06)	(72.79)	(72.44)	(167.90)	(167.58)
D	-0.859***		-1.666***		-0.711***	
	(-15.99)		(-9.81)		(-12.86)	
FIN		0.610***		-2.084***		1.105***
		(4.52)		(-3.77)		(9.13)
FIS		-1.096***		-0.993***		-1.114***
		(-10.41)		(-3.41)		(-9.90)
IRCUT		-1.225***		-2.386***		-1.015***
		(-13.60)		(-8.63)		(-10.88)
LIQ		-0.734***		-0.676***		-0.741***
		(-8.03)		(-2.64)		(-7.62)
D^{OUT}	20.202***	20.146***	21.800***	21.924***	19.512***	19.403***
	(60.23)	(59.74)	(32.59)	(32.91)	(51.59)	(50.87)
R^2	0.164	0.164	0.216	0.217	0.153	0.154

Test statistics calculated using robust standard errors. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively. There are 668 observations whose influence statistics deem them to be outliers.

Appendix A2: Multivariate regression results excluding %ΔCDX more than three standard deviations from the mean

Panel A: Multivariate Regression Results for announcement date (t=0)

	All Firms		Financial Firms		Non-Financial Firms	
	(1)	(2)	(1)	(2)	(1)	(2)
Intercept	0.029***	0.029***	0.105***	0.102***	0.016	0.016
	(3.15)	(3.12)	(4.27)	(4.17)	(1.60)	(1.58)
%ΔCDX	0.623***	0.624***	0.695***	0.694***	0.607***	0.609***
	(167.43)	(167.78)	(63.55)	(64.49)	(156.89)	(156.93)
D^{EVENT}	-0.579***		-1.562***		-0.414***	
	(-7.39)		(-5.76)		(-5.30)	
FIN		-0.731***		-5.784***		0.128
		(-3.25)		(-5.53)		(0.72)
FIS		-0.969***		-0.044		-1.140***
		(-6.83)		(-0.10)		(-7.91)
IRCUT		-1.200***		-2.054***		-1.055***
		(-9.39)		(-4.83)		(-8.10)
LIQ		0.245*		0.197		0.249
		(1.74)		(0.53)		(1.64)
D^{OUT}	2.185***	2.184***	3.953***	4.094***	1.730***	1.725***
	(5.82)	(5.82)	(4.89)	(5.10)	(4.09)	(4.08)
R^2	0.144	0.144	0.182	0.184	0.137	0.137
No. of observations	300,672		45,792		254,880	

Panel B: Multivariate Regression Results for [0,1] event window

	All Firms		Financial Firms		Non-Financial Firms	
	(1)	(2)	(1)	(2)	(1)	(2)
Intercept	0.041***	0.033***	0.127***	0.116***	0.026**	0.019*
	(4.35)	(3.56)	(5.09)	(4.67)	(2.57)	(1.86)
%ΔCDX	0.624***	0.624***	0.699***	0.698***	0.608***	0.608***
	(167.72)	(167.09)	(63.20)	(62.92)	(157.54)	(157.34)
D	-0.536***		-1.277***		-0.414***	
	(-9.40)		(-7.05)		(-7.05)	
FIN		1.107***		-1.611***		1.580***
		(7.73)		(-2.70)		(12.25)
FIS		-0.826***		-0.30		-0.918***
		(-7.32)		(-0.91)		(-7.75)
IRCUT		-0.906***		-1.929***		-0.740***
		(-9.32)		(-6.20)		(-7.40)
LIQ		-0.395***		-0.323		-0.415***
		(-4.05)		(-1.18)		(-3.98)
D^{OUT}	2.192***	2.166***	3.990***	4.024***	1.734***	1.706***
	(5.84)	(5.76)	(4.93)	(4.98)	(4.10)	(4.04)
R^2	0.144	0.145	0.182	0.182	0.137	0.138

Test statistics calculated using robust standard errors. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively. There are 5,387 individual observations with %ΔCDX more than three standard deviations from the mean.

Appendix A3: Market model abnormal spread changes (ASCs) upon announcement of key government-initiated interventions excluding ASCs more than 3 standard deviations from the mean

Panel A: Market model results for announcement date (t=0)

	Type of Action	No of obs.	ASC/ CASC	Cross-sectional t-test	Patell's (1976) Test	Boehmer's et al. (1991) t-statistic	% Positive	Sign Test Statistic
All Firms	All Actions	7889	-0.564	-8.67	-12.79	-9.33	0.46	-7.76
	FIN	1362	-0.439	-2.64	-4.48	-2.45	0.48	-1.79
	FIS	1380	-1.231	-9.92	-10.81	-11.03	0.37	-9.96
	IRCUT	2401	-0.906	-7.63	-11.79	-10.10	0.43	-7.29
	LIQ	2746	0.009	0.08	0.16	0.11	0.52	1.98
Financial Firms	All Actions	1200	-1.179	-5.68	-9.54	-6.33	0.42	-5.60
	FIN	203	-2.855	-4.87	-10.14	-4.90	0.39	-3.16
	FIS	211	-0.340	-0.86	-1.50	-1.49	0.45	-1.58
	IRCUT	365	-2.349	-6.10	-9.09	-6.20	0.34	-6.23
	LIQ	421	0.224	0.68	0.47	0.35	0.49	-0.34
Non-Financial Firms	All Actions	6690	-0.465	-6.90	-10.20	-7.56	0.46	-6.09
	FIN	1163	-0.101	-0.60	-1.56	-0.85	0.49	-0.73
	FIS	1173	-1.348	-10.12	-10.73	-10.73	0.35	-10.07
	IRCUT	2038	-0.669	-5.48	-9.10	-8.19	0.44	-5.32
	LIQ	2316	-0.020	-0.17	-0.06	-0.04	0.52	2.33

Panel B: Market Model Results for [0,1] event window

	Type of Action	No of obs.	ASC/ CASC	Cross-sectional t-test	Patell's (1976) Test	Boehmer's et al. (1991) t-statistic	% Positive	Sign Test Statistic
All Firms	All Actions	7873	-0.92	-10.43	-12.78	-9.52	0.44	-9.88
	FIN	1360	2.109	9.77	18.94	10.89	0.61	7.97
	FIS	1373	-2.092	-11.86	-12.93	-12.95	0.31	-13.95
	IRCUT	2398	-1.388	-8.41	-12.72	-10.65	0.43	-6.78
	LIQ	2742	-1.427	-9.62	-13.95	-10.80	0.44	-6.15
Financial Firms	All Actions	1200	-1.746	-5.85	-9.36	-6.51	0.42	-5.25
	FIN	206	-0.928	-1.25	-2.58	-1.40	0.49	-0.28
	FIS	209	-1.337	-2.04	-2.33	-1.99	0.39	-3.25
	IRCUT	367	-3.369	-5.73	-10.00	-6.84	0.36	-5.48
	LIQ	418	-0.927	-1.98	-3.03	-2.36	0.47	-1.27
Non-Financial Firms	All Actions	6691	-0.817	-8.96	-10.43	-7.82	0.45	-8.62
	FIN	1154	2.545	11.76	20.85	12.11	0.63	8.65
	FIS	1169	-2.348	-13.10	-13.29	-13.62	0.30	-13.89
	IRCUT	2041	-1.053	-6.27	-9.86	-8.58	0.44	-5.07
	LIQ	2327	-1.507	-9.69	-13.72	-10.60	0.44	-6.12

Appendix A4: Market model abnormal spread changes (ASCs) using a 120-day estimation window

Panel A: Market model results for announcement date (t=0)

	Type of Action	No of obs.	ASC/ CASC	Cross-sectional t-test	Patell's (1976) Test	Boehmer's et al. (1991) t-statistic	% Positive	Sign Test Statistic
All	All Actions	8,004	-0.708	-9.20	-13.97	-10.16	0.45	-9.48
Firms	FIN	1,392	-0.462	-2.14	-3.88	-2.04	0.51	0.54
	FIS	1,392	-1.317	-9.27	-9.39	-9.96	0.33	-12.44
	IRCUT	2,436	-1.369	-10.65	-13.44	-11.95	0.38	-11.71
	LIQ	2,784	0.051	0.37	-1.72	-1.21	0.53	3.30
Financial	All Actions	1219	-1.581	-6.10	-10.75	-6.51	0.41	-12.97
Firms	FIN	212	-5.056	-5.30	-14.65	-5.09	0.37	6.92
	FIS	212	-0.270	-0.57	-1.27	-1.48	0.41	-16.67
	IRCUT	371	-2.295	-5.89	-7.59	-5.89	0.35	-11.95
	LIQ	424	0.124	0.34	0.13	0.11	0.49	-3.9
Non-	All Actions	6785	-0.551	-7.09	-10.61	-8.06	0.45	-7.64
Financial	FIN	1180	0.364	2.04	1.99	1.23	0.53	2.15
Firms	FIS	1180	-1.505	-10.49	-9.66	-10.12	0.32	-12.40
	IRCUT	2065	-1.202	-8.96	-11.38	-10.42	0.39	-10.19
	LIQ	2,360	0.038	0.25	-1.93	-1.32	0.54	3.83

Panel B: Market Model Results for [0,1] event window

	Type of Action	No of obs.	ASC/ CASC	Cross-sectional t-test	Patell's (1976) Test	Boehmer's et al. (1991) t-statistic	% Positive	Sign Test Statistic
All Firms	All Actions	8004	-1.166	-11.60	-15.44	-11.65	0.43	-12.97
	FIN	1392	2.070	7.90	13.51	8.31	0.59	6.92
	FIS	1392	-2.500	-11.93	-13.54	-9.82	0.28	-16.67
	IRCUT	2436	-2.140	-11.90	-15.10	-13.51	0.38	-11.95
	LIQ	2784	-1.264	-7.55	-12.03	-9.80	0.46	-3.90
Financial	All Actions	1219	-2.351	-7.06	-10.01	-7.19	0.41	-6.56
Firms	FIN	212	-2.671	-2.66	-5.52	-2.63	0.48	-0.55
	FIS	212	-1.759	-2.42	-2.78	-2.92	0.33	-4.94
	IRCUT	371	-3.965	-6.56	-9.08	-7.13	0.32	-6.91
	LIQ	424	-1.073	-2.17	-2.61	-2.18	0.48	-0.78
Non-	All Actions	6785	-0.953	-9.33	-12.52	-9.55	0.43	-11.30
Financial	FIN	1180	2.921	12.02	17.01	11.45	0.61	7.74
Firms	FIS	1180	-2.633	-12.54	-13.53	-9.39	0.27	-16.01
	IRCUT	2065	-1.812	-9.99	-12.55	-11.57	0.39	-10.06
	LIQ	2360	-1.298	-7.36	-11.96	-9.71	0.46	-3.91