Investigating Insider Trading in Credit Default Swap Markets

William Reilly

Presented to the Department of Economics
in partial fulfillment of the requirements
for a Bachelor of Arts degree with Honors

Advisor: Professor Saleha Jilani

Haverford College
Haverford, PA

April 28, 2011

NEITHER MARKIT GROUP LIMITED ("MARKIT") ITS AFFILIATES NOR ANY DATA PROVIDER MAKES ANY WARRANTY
EXPRESS OR IMPLIED AS TO THE ACCURACY OF THE DATA OR SERVICES OR AS TO RESULTS TO BE ATTAINED BY
RECIPIENT OR OTHERS FROM THE USE OF THE DATA OR SERVICES NEITHER MARKIT. ITS AFFILIATES NOR ANY OF THEIR
DATA PROVIDER SHALL IN ANY WAY BE LIABLE TO ANY RECIPIENT OF THE MARKIT DATA OR FOR ANY INACCURACIES,
ERRORS OR OMISSIONS REGARDLESS OF CAUSE, IN THE MARKIT DATA OR SERVICES PROVIDED HEREUNDER OR FOR ANY
DAMAGES (WHETHER DIRECT OR INDIRECT) RESULTING THEREFROM. THE DATA IS ONLY FOR INFORMATIONAL
PURPOSES ONLY AND MAY NOT BE USED OR REDISTRIBUTED BY THE RECIPIENT FOR ANY PURPOSE WITHOUT THE
APPROPRIATE LICENSE FROM MARKIT.
Abstract:

Insider trading in credit default swap markets made possible by poor “Chinese walls” can be very detrimental to the efficient functioning of markets. This paper investigates the existence of insider trading leading up to, during, and following the 2008 financial crisis. Employing methods used by Acharya and Johnson (2007), we find evidence of insider trading in the nine months immediately following the start of the financial crisis for firms that have experienced credit deterioration or are expected to experience credit deterioration. However, we fail to find evidence of insider trading leading up to the financial crisis or once the fear and panic had subsided after the middle of 2009.
Table of Contents

Table of Contents ........................................................................................................................................... 3

Introduction .................................................................................................................................................... 4

Literature Review ......................................................................................................................................... 9

Data .............................................................................................................................................................. 12

Key Independent Variables .......................................................................................................................... 14

Methods and Models .................................................................................................................................. 17

Results ......................................................................................................................................................... 21

Conclusion .................................................................................................................................................... 25

Appendix ....................................................................................................................................................... 27

Bibliography ................................................................................................................................................ 29
I. Introduction

In 1998 the size of the global credit default swap market was $180 billion dollars, ranking it as the 23rd largest country by GDP behind Turkey. “At the end of June 2008, the total notional size of the global market [was] $57 trillion.” In ten years the CDS market had increased 300-fold, and it had far surpassed the size of any individual economy. Credit default swaps are financial derivatives. They provide protection, more commonly known as insurance, on an underlying debt instrument called a reference entity. In other words, they derive their value from a secondary asset. The CDS buyer is exchanging a stream of payments for reimbursement upon a credit event. The buyer is said to be long the credit default swap. The CDS seller takes the opposite position, or is short the CDS. He receives a stream of payments in exchange for the responsibility of reimbursing the buyer up to the par value of the debt instrument should it experience a credit event. A CDS contract can be written on any type of debt: corporate, commercial real estate, residential real estate, or a bank loan. A credit event is an adverse change in the nature of the underlying debt instrument. These events include, but are not limited to, bankruptcy, restructuring, or covenant violation. Because of the complexity of CDS, they are traded by large financial institutions. The goal of this paper is to explore the existence of insider trading in CDS markets leading up to, during, and immediately following the 2008 financial crisis.

Insider trading refers to the situation where individuals or entities trade on information that is not generally available to the public. Historically, there were two types of banks: commercial and investment banks. A commercial bank makes loans to companies and thus has

---

1 Stulz (2009), 13
3 Stulz (2009), 13
4 For a more extensive explanation of a CDS, see Stulz 2009, Blanco, Brennan, Marsh 2005, or the ISDA, which draws up standardized contracts for credit default swaps
access to nonpublic information concerning the future of these companies and their debt. An investment bank underwrites and trades financial securities. Additionally, it usually has a proprietary trading account in which traders can use the investment bank’s capital to speculate on market movements. In 1933 the Glass-Steagall Act separated investment banks and commercial banks. In doing so, it prevented insider information available to loan officers from being used by traders for the benefit of a bank’s proprietary account. However, in 1999 the Gramm-Leach-Bliley Act ended the separation of commercial and investment banks, which had existed for the previous 66 years.\(^5\)

Since the passing of the Gramm-Leach-Bliley Act, the large financial institutions that trade and speculate in the CDS market are usually multinational financial conglomerates which combine aspects of both commercial and investment banks. This combination is ripe for illegal activity as there is a hefty profit to be made, or lost, in a $57 trillion market. In an attempt to prevent this unlawful information flow, “Chinese walls” have been put in place to prevent the transfer of nonpublic information from the commercial bank side of the business to the investment bank side. A Chinese wall is a barrier between the investment and commercial sides of a bank. It typically consists of a set of procedures and sometimes even physical walls implemented internally that prevent the conflict of interest that can arise when information from the commercial side of the bank makes its way to the investment side of the bank.

Since the 2008 financial crisis, there has been widespread speculation that financial institutions have shirked their fiduciary responsibilities. One such responsibility is maintaining the “Chinese wall” and the confidentiality of nonpublic information that clients provide to loan officers. These claims have been made, in part, because of the strong, perverse incentives for

banks to speculate on or hedge the loans of their clients. Speculating on clients’ loans using CDS can have a huge upside and hedging the downside risks associated with clients’ deteriorating loans can prevent a large loss.

One might ask why traders choose to exploit this nonpublic information in the CDS market as opposed to equity and/or debt markets. The answer is three-fold. First, CDS are traded in over-the-counter markets that are lightly regulated. This market structure makes detection highly unlikely.⁶ Second, CDS contracts are designed to be hedging instruments for debt-like exposures.⁷ Third, the CDS market is very liquid, which makes it easier and cheaper to buy CDS for protection than short a position of corporate bonds for the same reason.⁸ The CDS market is ideal for quietly speculating or hedging using insider information.

Detecting insider trading in CDS markets is relevant for three reasons. First, it is important to know if the institutions to which we entrust our wealth are breaking the law. Second, insider trading can reduce liquidity and increase transaction costs. Insider trading is a problem of asymmetric information. The existence of traders with better information prevents the uninformed traders from wanting to participate in the market, which then leads to a lack of depth in the market. As Acharya and Johnson (2007) point out, “insider trading has been the focus of a large body of research in equity markets which has found that insider trading lowers liquidity and increases trading costs […], raises the cost of equity capital […], and increases volatility.”⁹ Furthermore, “it is well known theoretically that in economies with information asymmetries, financial innovations that would otherwise improve risk-sharing can in fact be

---

6 Acharya and Johnson (2007), 116
7 Ibid. 116
8 Ibid. 116
9 Ibid. 114
welfare-reducing.” Third, the existence of insider trading may also serve as evidence of the deficiencies of “Chinese walls” in financial institutions. With the blame laid on banks for their “immoral” activities leading up to and during the recent financial crisis, it is important to determine the serious shortcoming of government regulation. Determining if there are or have been cracks in the “Chinese walls” over the course of the 2008 financial crisis would provide evidence enabling government regulators or banks’ internal regulators to crack down on illegal information sharing between the commercial and investment arms of the institution.

Additionally, as mentioned above, the notional value of the CDS market in 2008 was $57 trillion. Although $57 trillion does not represent the total exposure, which was approximately $2.6 trillion in March 2009, it still provides a sense of the scale and depth of this market, and its importance, to the financial system and the global economy as a whole. After the recent financial crisis, gaining insight into this relatively new area of finance is important in understanding the systematic risks in our financial markets. This is critical in determining what the best measures are to prevent such a financial meltdown in the future.

In this thesis I will explore insider trading in credit default swap markets based on the methodology presented in Acharya and Johnson (2007), using updated data, over the period January 1st, 2008 to December 31st, 2010. I hope to analyze the flow of information from CDS markets to stock markets throughout the recent financial crisis in order to determine the effect of the financial crisis on information transmission from the CDS markets to the stock markets. Furthermore, I would like to explore the possibility that the flow of information is greater when the credit of a firm is deteriorating or expected to deteriorate. In other words, I have three main research questions: 1) Is there evidence of insider trading over the whole three year period? 2) Is

---

10 Acharya and Johnson (2007), 114
11 Phillips (2010)
information transmission stronger pre-financial crisis or post-financial crisis? 3) Does the strength of the credit of a firm increase or decrease the likelihood of insider trading in their CDS?

The structure of this paper is as follows. Section two provides a review of the relevant literature; section three describes the data. Section four identifies and explains key independent variables. Section five is a description of methods and models. Section six presents results, and section seven concludes.
II. Literature Review

The most closely related work for this project is the article by Viral Acharya and Timothy Johnson (2007), entitled “Insider Trading in Credit Derivatives.” The authors investigate insider trading in CDS markets, using “daily closing CDS quotes for the most widely traded, North American reference entities from January 1, 2001 through October 20, 2004.” Methodologically, their research is sound, and they do find evidence of insider trading in CDS markets, but their data is 7-10 years old. It is important to reevaluate their findings with more recent data in light of the recent financial crisis, for the several reasons mentioned in the preceding section.

In order to test for insider trading in the context of CDS, Acharya and Johnson (2007) posit two main hypotheses. Their first hypothesis states that if insider trading exists, there should be information transmission from the CDS market to the stock market and that the transmission should be greater for firms with weakened credit. Their second hypothesis states that if insider trading exists, there should be more information transmission when there are a large number of informed insiders. One key aspect of the authors’ process is defining and isolating “CDS innovations” as a measure of information flows from the CDS market to the stock market. These “innovations” are calculated as the residuals of regressions for each firm, meant “to absorb any lagged information transmission within the credit market.” These CDS innovations are successfully isolated regressing changes in the CDS prices on current stock returns and the five lags of both CDS returns and stock returns (a full explanation of CDS innovations is presented in

12 Acharya and Johnson (2007), 116
13 Ibid. 116
14 Ibid. 116
15 CDS innovation is the term Acharya and Johnson use in their paper
16 Acharya and Johnson (2007), 120
section four). In other words, a CDS innovation is interpreted as news being incorporated into CDS prices that is not appreciated by the stock market at the time. Acharya and Johnson (2007) use these residuals as explanatory variables in this model specification to test the direction of information flows.

The authors find supporting evidence for both their hypotheses and conclude that there are statistically significant information flows from the CDS market to the stock market. Furthermore, they find that the flows persist and that they are stronger for companies with more banking relationships and on days when there is negative credit news. However, despite finding evidence of persistent insider trading by examining the bid-ask for their sample of CDS, Acharya and Johnson (2007) do not find evidence that insider trading decreases liquidity in the credit default swap markets.

In other related work, Roberto Blanco, Simon Brennan, and Ian Marsh (2005) analyze the relationship between investment-grade bonds and credit default swaps. Much of their paper is concerned with empirically testing a theoretical arbitrage relationship between CDS prices and credit spreads. The authors do find temporary deviations from the theoretically implied relationship, which indicates that CDS prices lead credit spreads in price discovery. This research provides an interesting juxtaposition with Acharya and Johnson’s work in that it seems CDS prices can lead both credit spreads and equity returns. Additionally, Blanco, Brennan, and

17 Acharya and Johnson (2007), 120
18 Ibid. 121
19 Ibid. 138
20 Ibid. 138
21 Ibid. 138
22 Blanco, Brennan, and Marsh (2005), 2256
23 Ibid. 2256
Marsh (2005) use vector error-correction models (VECM) of market prices to examine price discovery in the CDS market.\textsuperscript{24}

Much research has been done along the lines of Blanco, Brennan, and Marsh’s (2005) price discovery work. Lars Norden and Martin Weber (2004) concur with Blanco, Brennan, and Marsh’s (2005) findings; however, their research points to stock returns leading CDS price changes.\textsuperscript{25} Haibin Zhu (2006) conducts a similar analysis to that of Blanco, Brennan, and Marsh (2005), and finds that a theoretical parity relationship holds in the long-run. Furthermore, Zhu (2006) concludes, using VECM analysis, that there exist some temporary deviations from parity “due to the higher responsiveness of the CDS premia to changes in credit conditions.”\textsuperscript{26} This thesis attempts to build on these aforementioned authors’ research, employing their methodologies to analyze price discovery and test for insider trading in CDS markets, using more recent data that incorporates the three year period of the 2008-2010 financial crisis.

\textsuperscript{24} Blanco, Brennan, and Marsh (2005), 2270
\textsuperscript{25} Norden and Weber (2004), 27-28
\textsuperscript{26} Zhu (2006), 221
III. Data

The first component of the data for this research is provided by Markit ICE, a clearinghouse for CDS contracts. The data covers CDS from January 1st, 2008 through December 31st, 2010 and provides a multitude of variables describing the individual contracts. The reference entities in the Markit ICE dataset are determined by the CDX CDS index. Any firm that was part of the CDX index during the three year sample window is included in the original data set provided. The total number of firms for which data was available was approximately 1200; however, after cleaning the data, the final sample size was narrowed to 230 US firms. The cleaning of the data involved narrowing the sample firms to publicly traded firms to ensure the availability of stock data. Furthermore, lagged, interaction, and percent return variables were generated. The 230 firms in the sample span eleven different sectors (See Figure 1 in the Appendix) including two government-sponsored entities: the Federal National Mortgage Association (Fannie Mae) and the Federal Home Loan Mortgage Corporation (Freddie Mac). The CDS contracts are all written on senior debt denominated in US dollars. Furthermore, the CDS contracts examined in this study have a maturity of five years. The five year CDS contract is considered to be the most liquid of all CDS contracts. CDS contracts are also characterized by the type of restructuring clause that is written into the definition of credit events. Prior to April 8th, 2009 all of the contracts included in the dataset have a modified restructuring clause which was standard practice in the CDS market. On April 8th, 2009, a major shift occurred in the CDS market. The standard contract was changed from one that included a modified restructuring clause to one with no restructuring clause.27 Therefore, for the period after April 7th, 2009 the CDS contracts included in the data set have no restructuring clause. This change midway through

27 Price and Casey (2010), 18
the sample window is to make sure that the only most liquid CDS contracts are tested for insider trading.

The main variables of interest in the CDS dataset are the price (or credit spread, particularly the 5-year spread) and average rating of each individual reference entity. The spread is measured in basis points (hundredths of a percent). It is measured at the end of each business day, so it can be considered the “closing price.” If a particular CDS contract does not trade during that day, then the daily closing price is determined by a consensus of major CDS brokers. The average rating variable is an average of the rating on the debt rounded to the nearest whole letter (i.e. both an A- and A+ would round to an A). As defined by Markit ICE, the ratings used for this study are “the average of the Moodys and S&P ratings adjusted to the seniority of the instrument and rounded to not include the '+' and '-' levels.”

Examining changes in average rating across time reveals a lack of variation in this variable (See figure 2 in the Appendix). This consistency is disconcerting as one would expect an economy-wide downgrade of firms in response to the financial crisis, but this does not appear to be the case. The lack of variation over time may be an indication of credit ratings’ weaknesses. The ratings may not be a good indicator of the expectation of credit deterioration, because it may be difficult for ratings to quickly incorporate new information as it becomes available. Finding another proxy to measure credit-deterioration, in order to corroborate any evidence found using credit ratings, will be important to ensure robustness of the results.

The second component of the data is the stock price data from which stock returns can be calculated. This data is readily available since all 230 companies are publicly traded on major US exchanges such as the NYSE and Nasdaq or over-the-counter. The relevant variable for this study is the daily closing price, which is used to calculate daily return.

---

28 Bashaw (2011)
IV. Key Independent Variables

With the combination of the CDS and stock components of the dataset, the two key independent variables can be generated. The first main independent variable of interest is CDS innovation. CDS Innovations, as they are referred to in Acharya and Johnson (2007) and as they will be called in this paper, are the residuals of time-series regressions for each firm meant to control for lagged information transmission in CDS markets.\(^{29}\) The following equation is the specification for the firm-specific time-series regressions, yielding CDS returns (or innovations) for each individual firm in the data set.

Equation (1):

\[
(CDS\text{ return})_{i,t} = \alpha_i + \sum_{k=0}^{5} \beta_{i,t-k} + \frac{\gamma_{i,t-k}}{(CDS\ Level)_{i,t}} \times (Stock\ return)_{i,t-k} + \delta_{i,t-k} (CDS\ return)_{i,t-k} + u_{i,t}
\]

The variables used in this model are defined as follows:

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDS return</td>
<td>This variable is calculated as the difference in the logs of the credit spreads, so it is a percentage change.</td>
</tr>
<tr>
<td>CDS Level</td>
<td>This variable is simply the credit spread as reported at close each day.</td>
</tr>
<tr>
<td>Stock Return</td>
<td>This variable is calculated as a simple percent return for each daily closing stock price.</td>
</tr>
</tbody>
</table>

As Acharya and Johnson (2007) describe, the CDS innovations (or residuals) can be interpreted as news arriving in CDS markets that is not relevant or not appreciated by the stock market at

\(^{29}\) Acharya and Johnson (2007), 120
that particular time.\textsuperscript{30} These CDS innovations will later be used in the main model (equation (2)) to identify information flows from the CDS market to the stock market, which in turn will be interpreted as evidence of illegal trading on material nonpublic information in CDS markets.

The second key independent variable used in equation (2), to detect insider trading, is the interaction term involving the credit-condition dummy. The credit-condition dummy is critical for testing the hypothesis that firms that have experienced or are expected to experience credit deterioration are more susceptible to insider trading. There are three credit-condition dummies that will be considered in the main model. The first of the three dummy variables, which will henceforth be referred to as the A-credit-condition dummy, is created using the average rating variable. The dummy is one if the firm’s average rating is below A at time $t$. The second credit-condition dummy, which is also ratings-based, takes the value one if the average rating is below BBB at time $t$ (henceforth BBB-credit-condition dummy). The reasoning behind the first two credit-condition dummies is that a credit rating is meant to signal strength of a firm’s credit now and in the future. Therefore, a firm with a lower credit rating has experienced or is expected to experience a deterioration of credit and thus there will be a greater incentive for trading on material nonpublic information that impacts the particular firm. The A-credit-condition dummy is very similar to the ratings-based dummy utilized by Acharya and Johnson (2007) in their analysis; however, the rounding of these ratings in our data set prevents the identical reproduction of Acharya and Johnson’s dummy (their dummy is one if the rating is below A-).

The addition of the BBB-credit-condition dummy is to differentiate between investment grade and speculative grade debt, and to further isolate firms with the greatest expectation of credit deterioration.

\textsuperscript{30} Acharya and Johnson (2007), 121
The third credit-condition dummy is generated from the CDS spread level. This dummy (henceforth 100bps-credit-condition dummy) is one if a firm’s CDS spread is greater than or equal to 100bps from time $t$ until the end of the sample period. Intuitively, a higher credit spread means one must pay a higher price to insure against a credit event; this indicates that a credit event is more likely. This will represent the fact that the firm has experienced deterioration in credit or is expected to experience deterioration in credit.
V. Methods and Models

In order to test for insider trading in the CDS market, we employ the model developed by Acharya and Johnson (2007). The presence of insider trading is indicated by information flows from the CDS market to the stock market, as represented by the sum of the five lagged coefficients on the interaction term between CDS innovations and the credit-condition dummy. The basic model is specified follows.

Equation (2):

\[
(stock \ return)_t = a + \sum_{k=1}^{5} [b_k \ast (CDS \ innovation)_{t-k}] + \sum_{k=1}^{5} [c_k \ast (Stock \ return)_{t-k}] + \sum_{k=1}^{5} [b_k^D \ast (Credit \ Condition \ Dummy)_t \ast (CDS \ innovation)_{t-k}] + \sum_{k=1}^{5} [c_k^D \ast (Credit \ Condition \ Dummy)_t \ast (Stock \ return)_{t-k}] + \epsilon_t
\]

Where the description of the variables are as follows:

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit Condition Dummy</td>
<td>This variable is one of the three credit-condition dummies identified in section four. It takes the value 1 if by some measure the firm has experienced or is expected to experience credit deterioration.</td>
</tr>
<tr>
<td>CDS Innovation</td>
<td>This variable is the residuals of the firm specific regression defined in section four. It captures news realized in the CDS market that is not appreciated by the stock market at the time.</td>
</tr>
<tr>
<td>Stock Return</td>
<td>This variable is calculated as a simple percent return for each daily closing stock price.</td>
</tr>
</tbody>
</table>

In short, the model identifies insider trading as the ability of lagged CDS innovations to predict stock returns. In other words, if in time \( t \) new information is incorporated into the price of a
CDS, but the information is not incorporated into the stock price until some time after \( t \), then there is evidence that credit default swaps have predictive power for stock returns. This predictive power constitutes insider trading because it represents information flows that were not captured by efficient markets. The information flows were not captured because the new information was proprietary and private. In essence, the efficient market hypothesis says that all relevant information is immediately incorporated into security prices. Therefore, the delayed response of stock prices to new information must be a result of insider trading because otherwise these opportunities would have been arbitraged away by profit-maximizing individuals/firms. We apply Acharya and Johnson’s (2007) model to the sample period covering the financial crisis (2008-2010) in order to identify periods of insider trading.

The coefficient values of interest are the sums of regression coefficients from the model specified above. The first value is the sum of coefficients on CDS innovations, also referred to as a measure of unconditional information flows from the CDS market to the stock market (the sum of the five \( b_k \)’s).\(^{31}\) This sum of the five coefficients on the lagged CDS innovation variables measures the amount of information transmission that occurs regardless of the credit condition of the firm. The second value, which is referred to as a measure of conditional information flows from the CDS market to the stock market, is the sum of the five \( b_k^D \)’s. These \( b_k^D \)’s are coefficients on the lagged CDS innovation variables when they are interacted with the credit-condition dummy variable. The sum of these five coefficients on the interaction terms measures the amount of information transmission that occurs conditional on there being deterioration or expected deterioration in the credit of the firm.

\(^{31}\) The distinction between conditional and unconditional information flows is introduced in Acharya and Johnson (2007) and will be used in the same context in this paper.
Generally, there are three possible outcomes for the unconditional and conditional measures of information flows. The first is an outcome of zero, or a value not statistically significantly different from zero. This result would mean that there is no evidence of insider trading in general over the period examined or for firms with weakened credit. The second possible outcome is a negative value which is statistically significant. In this case, there is evidence of insider trading as past, unanticipated moves in CDS spreads have predictive power for stock returns. The final possible outcome, a positive and statistically significantly value, is theoretically illogical. A positive value of the sum of the coefficients on the lagged variables means that when there is an unappreciated, by stock markets, increase (decrease) in a firm’s credit spread, it will be followed by a positive (negative) move in stock prices. In other words, when a firm’s credit situation weakens, the stock price would increase, or when a firm’s credit situation improves, the stock price would fall. This seems highly improbable and if it does occur, would be most likely the result of equity-relevant information incorporated into stock prices but not appreciated by CDS prices (one such example is a dividend announcement). The model does not control for such equity-only information. (Unfortunately, because this news is random, it is nearly impossible to control for it). Additionally, for the purpose of this research, the Delta Method for testing statistical significance will be used.32 Because the sum of the five coefficients is a linear combination, the Delta Method, which uses Taylor series expansion, can be applied to estimate the standard error of the combined coefficients. Once the standard errors are known, a simple t-test is employed.

In order to test for the presence of insider trading during the period covering the financial crisis, the “official date” of the financial crisis must be defined. For the purpose of this study,

---

32 The Delta Method was chosen at the recommendation of Dr. Viral Acharya. For further information, see Stata Reference Manual
September 15\textsuperscript{th}, 2008 will be used as the start of the financial crisis. This was the day that Lehman Brothers filed for bankruptcy which sparked the precipitous drop-off in financial markets. This was also the day before the Reserve Primary Fund “broke the buck,” which is a sign of true market instability.\textsuperscript{33} An argument could be made for other start dates to the 2008 financial crisis, particularly March 17\textsuperscript{th}, 2008, the day Bear Stearns was sold to JP Morgan Chase, but September 15\textsuperscript{th} was when the real panic set in evidenced by the approximately 4\% drop in all three major US market indices. Furthermore, it was the beginning of massive deleveraging and a liquidity squeeze, which strained even the most creditworthy firms.

VI. Results

The results of the regressions specified in the preceding section provide an interesting picture of insider trading throughout the recent financial crisis. Figure 3 in the Appendix presents a summary of the regression outputs for various specifications using different credit-condition dummies and time periods.

The unconditional flows for the whole sample—January 1\textsuperscript{st}, 2008 to December 31\textsuperscript{st}, 2010—are essentially zero in all three equations, each using a different credit-condition dummy. The conditional flows are negative for all three credit-condition dummies; however, they fail to be statistically significant. The signs on the summed coefficients are consistent with that of Acharya and Johnson (2007) although they found their conditional flows to be statistically significant. Hence, this study fails to find evidence of insider trading over the entire three year sample period; however, it is possible that there is evidence of insider trading within one or more subsamples of the entire sample period that are masked by the overall trend.

To examine whether insider trading is affected by the financial crisis and its aftermath, the model is run on different portions of the sample period. These results are also included in figure 3 in the Appendix. Pre-financial crisis, defined as January 1\textsuperscript{st}, 2008 to September 12\textsuperscript{th}, 2008, there is little evidence of insider trading. The measures of unconditional flows of information are not statistically significant for any of the three credit-condition dummies. The conditional information flows are positive over this pre-crisis period, but only statistically significant for the BBB-credit-condition dummy. However, as discussed earlier, a positive sign on the summed coefficients on CDS innovations interacted with the credit-condition dummy is most likely the effect of random news that only impacts stock prices. Based on the results of this regression (row 2 in figure 3 in the Appendix), we can reach the tentative conclusion that insider
trading in CDS markets was not rampant in the sample of firms examined in the period leading up to the crisis.

The model was also run for the post-financial crisis window, defined as September 15th, 2008 to December 31st, 2010 (results in row 3 of figure 3 in the Appendix). Again, the summations reflecting unconditional information transmission in the three regression equations are not statistically significant, but the conditional information flows following the collapse of the financial markets until the end of 2010 are negative for all three coefficient summation terms and statistically significant at the 10% level for the BBB-credit-condition dummy. The coefficient on the BBB dummy (in row 3, column 2 of figure 3 in the Appendix) represents a 3.1% flow of pricing information in CDS innovation to future stock market returns. In other words, there is evidence of insider trading on firms’ CDS contracts if the firm’s debt is rated below investment-grade. Overall, the results for the post-financial crisis timeframe are much stronger than for the whole sample. This leads to a narrowing of the window in order to find the period with the greatest amount of information transmission, or evidence of insider trading.

Examining the window covering the eight and a half months after the start of the financial crisis yields the greatest amount of information transmission (row 4 of figure 3 in the Appendix). As with all of the regressions run previously, the unconditional flows of information are not statistically significant for the three equations, each using a different credit-condition dummy meaning that in general there is no evidence of insider trading. However, all three measures of conditional flows of information are negative and are statistically significant for both the BBB-credit-condition dummy and the 100bps-credit-condition dummy. These results provide strong evidence for the existence of insider trading in the period immediately following the collapse of financial markets on September 15th, 2008. The BBB-credit-condition coefficient

34 Acharya and Johnson (2007)
represents an 8.9% flow of pricing information in CDS innovation to future stock market returns,\textsuperscript{35} and the 100bps-credit-condition coefficient represents a 6.5% flow of pricing information in CDS innovation to future stock market returns.\textsuperscript{36} These coefficients are negative and of the same magnitude of those found by Acharya and Johnson (2007); however, they find slightly less information transmission, more in the 4-5% range.

Although these coefficient values may not be evidence of rampant malfeasance in the CDS market, these values are large when one considers the scope and structure of the CDS market. Due to the high levels of leverage and the massive size of the trades made in the CDS market, even small price differentials can mean big profits or big losses. In other words, covering a short position at even a slightly lower price could be the difference between a profit and a loss for a CDS trader. Taken as a whole, the results of the time-contingent analysis provide an interesting picture of the CDS market immediately following the collapse of Lehman Brothers. As there was no evidence of insider trading in our selection of firms in the lead up to the bankruptcy of Lehman, or once the hysteria had subsided, (see row 5 of figure 3 in the Appendix), the greatest amount of insider trading appears to have occurred in the tumultuous months following the collapse of Lehman Brothers. This is consistent with the hypothesis that traders are more likely to trade on material nonpublic information when there are large losses at stake. Unfortunately, this is perhaps the worst time for traders to be doing so. The increased asymmetry can fuel fear and panic when markets need order and information symmetry to prevent a massive sell-off. It is possible that insider trading in CDS, one of the securities central to the financial crisis, may have fueled the downward spiral that occurred immediately following the bankruptcy of Lehman. As traders received insider information, they would have hedged or

\textsuperscript{35} Acharya and Johnson (2007)  
\textsuperscript{36} Ibid.
gotten out of their exposed positions as quickly as possible. This further depresses the prices of the firms’ stocks and bonds and lends credibility to any fears that the firm is insolvent. Quickly, the fears become self-fulfilling prophecies, and the firm is actually insolvent. Furthermore, traders without inside information may come to the realization that they are being duped by insiders and will stop trading altogether. This distrust leads to liquidity problems in the market, which further fuels fear and panic. Overall, insider trading can be particularly dangerous during times of financial distress, fueling sell-offs more rapidly than in the absence of such abuse of asymmetric and incomplete information. This highlights the question of the efficacy of the SEC and other regulatory agencies in monitoring and policing such irregularities in financial markets.
VII. Conclusion

The results presented in this paper provide little evidence of the occurrence of insider trading over the entire sample period 2008-2010 for a cross section of US firms; however, closer analysis reveals that insider trading is prevalent in the months immediately following the collapse of Lehman Brothers and the beginning of the financial crisis. Based on the estimates presented in figure 3, it appears that information flows between the CDS market and the stock market were statistically insignificant in the sub-sample periods preceding and post 2008-2010 financial crisis. However, the data show that in the first nine months following the start of the financial crisis, there was statistically significant information transmission from the CDS market to the stock market for credit-weak firms. This may be interpreted as evidence that new information was incorporated into CDS prices before it became known in stock markets. It seems that the benefit of avoiding losses outweighed the risk of trading on nonpublic information. This conclusion can be incredibly useful to regulatory agencies so that they can focus their search for insider trading where and when there is the potential for large losses.

It is important to note the negative sign of the sum of the coefficients on the interaction terms (the lagged CDS innovation variable with the credit-condition dummy variables) could support an alternative explanation. It is possible that the results do not reflect insider trading, but may in fact be reflecting the insurance effect. The insurance effect is the result of fear and panic in financial markets. It is possible that following the collapse of Lehman Brothers, traders were so terrified that they bought insurance on anything they could at the first whisper of trouble. The insurance effect could manifest itself as insider trading in this model. However, it is unlikely that this was the case because liquidity and excess cash were scarce following the collapse of Lehman, and thus it would have been difficult to purchase CDS contracts solely as insurance.
It is also important to consider future directions that this research can be taken. Acharya and Johnson (2007) examine the effects of the number of banking relationships on the degree of insider trading. Unfortunately, the requisite data to complete that type of analysis, mainly the size of each firms’ loan syndicates, were not available. They also examine the effects of insider trading on the liquidity of the market. Bid-ask spreads and market depth data were not available so examining the effects of insider trading on the liquidity of the market during this period would be an important follow up to this paper.
VIII. Appendix

Figure 1:

<table>
<thead>
<tr>
<th>Sector</th>
<th>Freq.</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Materials</td>
<td>14</td>
<td>6.09</td>
</tr>
<tr>
<td>Consumer Goods</td>
<td>40</td>
<td>17.39</td>
</tr>
<tr>
<td>Consumer Services</td>
<td>56</td>
<td>24.35</td>
</tr>
<tr>
<td>Financials</td>
<td>23</td>
<td>10.00</td>
</tr>
<tr>
<td>Government</td>
<td>2</td>
<td>0.87</td>
</tr>
<tr>
<td>Health Care</td>
<td>13</td>
<td>5.65</td>
</tr>
<tr>
<td>Industrials</td>
<td>31</td>
<td>13.48</td>
</tr>
<tr>
<td>Oil &amp; Gas</td>
<td>15</td>
<td>6.52</td>
</tr>
<tr>
<td>Technology</td>
<td>13</td>
<td>5.65</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>6</td>
<td>2.61</td>
</tr>
<tr>
<td>Utilities</td>
<td>12</td>
<td>5.22</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>2.17</td>
</tr>
<tr>
<td>Total</td>
<td>230</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Figure 2:

![Ratings Changes](chart_image)
Figure 3:
\textit{t-statistics listed below coefficients}

<table>
<thead>
<tr>
<th></th>
<th>Rating Dummy (A)</th>
<th>Rating Dummy (BBB)</th>
<th>100bps Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole Sample</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unconditional</td>
<td>0.0042</td>
<td>0.0025</td>
</tr>
<tr>
<td></td>
<td>Condition</td>
<td>-0.0106</td>
<td>-0.0143</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.26</td>
<td>0.26</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.59</td>
<td>-0.97</td>
</tr>
<tr>
<td>Pre-Collapse</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unconditional</td>
<td>0.0073</td>
<td>0.0036</td>
</tr>
<tr>
<td></td>
<td>Condition</td>
<td>0.0264</td>
<td>0.0699</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.28</td>
<td>0.24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.90</td>
<td>2.59</td>
</tr>
<tr>
<td>Post-Collapse</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unconditional</td>
<td>0.0070</td>
<td>0.0055</td>
</tr>
<tr>
<td></td>
<td>Condition</td>
<td>-0.0212</td>
<td>-0.0311</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.37</td>
<td>0.47</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-1.01</td>
<td>-1.83</td>
</tr>
<tr>
<td>Collapse-5/29/2009</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unconditional</td>
<td>0.0136</td>
<td>0.0165</td>
</tr>
<tr>
<td></td>
<td>Condition</td>
<td>-0.0498</td>
<td>-0.0886</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.35</td>
<td>0.65</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-1.11</td>
<td>-2.36</td>
</tr>
<tr>
<td>5/30/2009-12/31/2010</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unconditional</td>
<td>0.0009</td>
<td>-0.0036</td>
</tr>
<tr>
<td></td>
<td>Condition</td>
<td>0.0111</td>
<td>0.0283</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.58</td>
<td>1.90</td>
</tr>
</tbody>
</table>
IX. Bibliography


Halligan, Liam. "Outrage at Bonuses Won't Solve the Mess We're In." Telegraph 14 FEB 2009.


