2008 SEC short selling ban: impacts on the credit default swap market

Courtney, Samuel

19 May 2010

2008 SEC SHORT SELLING BAN: IMPACTS ON THE CREDIT DEFAULT SWAP MARKET

May 19, 2010

Sam Courtney
Stanford University

Under the direction of
Prof. John Shoven

ABSTRACT

On September 17, 2008, the Securities and Exchange Commission (SEC) issued an emergency order banning the shorting of 797 financial stocks. This paper studies the impact of the short selling ban on the credit derivatives market by investigating credit default swap (CDS) prices during the period that the ban was in effect. The hypothesis is proposed that the short selling ban on 797 financial stocks led market participants to enter CDS contracts to reflect positions that the participants had formerly entered through short sales, thus driving up CDS rates. Analysis compares the CDS prices of firms protected by the ban to the CDS prices of similar firms in the S&P 500 not covered by the ban. Tests are also conducted using metrics from the bond and equities markets to determine if the results from the CDS market are unique to the CDS space. A linear regression technique is used to test the significance of the ban on CDS prices. The study results indicate that the CDS prices of firms covered by the short selling restrictions experienced significant dislocations during the period of the ban.

Keywords: SEC short selling ban, credit default swaps, credit derivatives

Acknowledgements: I would like to sincerely thank Professor John Shoven for his continuous advice and guidance over the course of this project. I also thank Professor Geoffrey Rothwell for his help in the early stages of the paper. Finally, I thank Professor Orly Ashenfelter for his advice in running discontinuity testing procedures.

Sam Courtney

Introduction

On September 17, 2008, the Securities and Exchange Commission (SEC) issued an emergency order (release no. 34-58592) immediately banning the shorting of 797 financial stocks.[1] In a public release announcement, the SEC argued that the measure was designed in response to the crisis of confidence that was plaguing financial markets and contributing to steep declines in the prices of securities related to the financial and housing sectors. Financial regulators feared that the practice of short selling placed excessive pressures on firms and caused artificial fluctuations in the securities markets. Regulators had been given ample reason to worry about the health of the financial industry as only two days prior the historic investment bank Lehman Brothers was forced to file for Chapter 11 bankruptcy protection. Repercussions from Lehman's failure were widely and immediately felt as the Reserve Primary Fund, a multibillion dollar money market fund, "broke the buck" on September 16 and the net value of shares in the fund fell below the standard one dollar mark. Adding to the worsening financial dilemma was a request to the New York Federal Reserve by American International Group (AIG) for a $65 billion dollar bailout to pay off prior obligations. To protect public interests and prevent severe disruptions in the securities markets, the SEC declared that the short selling ban would remain in effect until 11:59 PM EST on October 2, 2008, with the possibility of a 30-day extension. Market-makers that sold short to hedge positions and engage in market-making activity were excluded from the ban.

[1] The practice of short selling involves the selling of a security that the seller does not own. This can be done by borrowing a security and immediately selling it, with the assumption that the security can be purchased at a later date for delivery to the lender.

Within a week of the restrictions being instituted, additional financial stocks were added to the banned list. This included 32 stocks on September 22 and 44 stocks on September 23. It appears that the addition of these firms to the banned list came as a result of quick lobbying on the part of the firms involved, along with the speed and manner at which the original list was compiled. Critics complained that the original list was so haphazardly compiled that the SEC emergency order document listed multiple firms twice and several stock ticker symbols were outdated. When the ban formally expired on October 2, 2008, the SEC declared that the ban would be extended to the earlier of two dates: October 17, 2008, or three business days following the enactment of the Emergency Economic Stabilization Act of 2008 (Boehmer, Jones, and Zhang 2008). After President George W. Bush signed the bill into law on October 3, the SEC announced that the ban would expire at 11:59 PM EST on October 8, 2008.

Due to the recentness of the short selling ban, literature on its effects has thus far been limited. Work by Boehmer, Jones, and Zhang (2008) suggests that the ban was linked to an initial sharp increase in share prices for those securities covered by the ban. However, studies have not yet been published concerning the effects of the ban on CDS premiums. Anecdotal evidence suggests that market participants, including speculators, entered into new CDS contracts to hedge positions formally covered by short sales, but detailed analysis has not yet been completed.

As defined by Claes and De Ceuster (2008), a credit default swap is a bilateral contract in which the notional amount of a bond is insured against specified credit events by a protection seller in exchange for a fixed fee (the CDS premium) that is paid periodically by a protection buyer. Credit default swaps are considered derivative financial instruments and are thus traded

through over-the-counter transactions instead of central exchanges. In an interview with Charlie Rose on April 12, 2010, famed short seller and hedge fund manager Jim Chanos asserted that the primary buyers in the CDS markets during the Fall of 2008 were large banking organizations. However, hedge funds were also widely expected to be active participants in the single name CDS markets. When negotiating contracts, the buyer and seller of a CDS contract individually agree on the legal details of each transaction and relatively standard agreements often take one or two days to complete. Payments by the protection buyer are usually made quarterly and are thus in the amount of one-fourth of the total CDS premium. In the case of a credit event, the protection buyer delivers the underlying bond to the protection seller who must then pay the protection buyer either the notional amount of the bond or the difference between the current bond price and notional value. According to Claes and De Cuester (2008), the most common credit events that trigger settlement of a CDS contract include bankruptcy of the underlying bond issuer, failure to pay interest payments by the issuer, or the restructuring of debt contracts by the issuer. Contracts can often be settled at an earlier time for an amount equal to the difference between the current market CDS price and the price at which the contract was originally entered. Through this process, a party can potentially enter into a speculative agreement with the purpose of settling the contract if the market price of the CDS agreement reaches a certain threshold.

Given that market participants often hedge their positions through the execution of short sales, a ban on the practice of short selling for all non market-makers could lead market participants to pursue other methods of entering short positions against a firm. Purchasing credit default protection is one method of either hedging existing positions or placing speculative bets since CDS premia are highly inversely correlated to stock prices. Thus, market participants may

have pushed up CDS premiums by driving up demand for new agreements as a substitute for shorting equities.

This paper attempts to study the impact of the short selling ban on the credit derivatives market by investigating CDS prices during the period that the ban was in effect. The Literature Review section outlines existing literature on CDS price modeling and the effects of the SEC ban on the equities market. The Study Design section outlines the methodologies used to test for disturbances in the CDS market during the period that the ban was in place. Potential disturbances in the CDS market are then compared to potential dislocations in other fluid security markets.

Studying the effects of the short sale ban on the credit derivatives market provides valuable insight to any policy maker considering a future ban of the practice. Although some initial work has been released analyzing the effects of the short selling ban on securities markets, little research has been done on the impacts to derivatives markets. The International Swaps and Derivatives Association, the largest global trade association in the derivates industry, estimates the size of the credit default swap market on single bond references to have been $38.6 trillion at the end of 2008. Given the extensive volume of the credit default swap market and the current absence of a central exchange for the derivatives, it is important to consider the possible effects that the policy could induce in the credit derivatives market prior to undertaking such a policy.

Literature Review

Due to the relative recency of the SEC short selling ban, academic literature concerning the impacts of the ban on the CDS market has not yet been published. However, research has been conducted concerning the impact of the ban on stock prices, the rate of stock short sales, and equity market liquidity. Boehmer, Jones, and Zhang (2008) discover that the shorting ban is linked with a large increase in share prices for the covered stocks, and shorting activity fell by about 85% while the ban was in effect. Stocks affected by the ban also suffered from higher spreads and intraday volatility.

Boehmer, Jones, and Zhang (2008) analyze impacts on share prices through the computation of cumulative raw returns for the S&P 500 index, the stocks on the SEC's original shorting ban list, and the 1,066 NYSE stocks that were not covered by the ban. Abnormal daily returns of the securities covered by ban are determined by subtracting the return on the S&P 500 index. This same methodology of analyzing raw returns can be used to compute price increases in the CDS market during the period of the ban. Such a test serves as a preliminary indicator of CDS price disruptions due to short selling restrictions.

Literature on the determinants of credit default swap prices attempts to explain the spreads using a wide variety of pricing variables. Generally, pricing models take into account sources of price determinants that can be separated into two distinct categories: credit pricing factors and macroeconomic factors. The effects of the equity shorting ban can be analyzed in the CDS space by comparing credit-pricing factors to CDS premiums and by transforming the short selling ban into a dummy variable that is subsequently inserted into macroeconomic pricing regressions.

Works by Amato (2005) find that CDS spreads are influenced by risk aversion factors that can be measured from macroeconomic and technical market measures. Amato's findings drive research by Sougné, Heuchenne, and Hübner (2008) that address the relationship between CDS spreads and a set of macroeconomic factors during the period 2002-2005.

In order to test Amato's findings, Sougné, Heuchenne, and Hübner analyze the influence of macroeconomic variables on a cross-section of CDS spreads with the prediction that variables reflecting market uncertainty will be correlated with higher CDS prices. The time-varying exposures of CDS spreads are modeled to macroeconomic factors using a Kalman filter procedure. The procedure involves starting with a completely restricted model containing only an intercept, and adding variables one by one, including any uncorrelated variables that increased r-squared in an important way. Factors considered in the test include credit ratings, interest rates, time to maturity, stock prices, leverage, and index returns. Many of these same factors can be used in a similar process to model CDS prices before and during the SEC ban. If a dummy variable that represents the days that the SEC ban was in effect were to be significant in the pricing equation, this would indicate that the ban effected CDS prices.

Abid and Naifar (2006) conduct similar studies in an attempt to explain the determinants of CDS spreads using a variety of credit pricing variables. A regression technique is used by Abid and Naifar to show the relationship between factors influencing default risk and CDS prices. All equations are estimated as simple linear regressions. The White test is used to correct for heteroskedasticity. After analyzing multiple factors, Abut and Naifar conclude that credit rating is the most important variable in determining credit default swap spreads. Factors such as maturity, riskless interest rate, slope of the yield curve, and volatility of equity are also

statistically significant in determining spreads. Market conditions were extremely volatile during the period of the SEC ban and equity volatility levels may also explain a sizeable portion of CDS price increases. A negative correlation is found between the risk-free interest rate and CDS premiums, implying that the probability of default increases when the risk-free interest rate increases.

Byström (2008) moves away from the debt market to explain CDS price determinants and instead focuses on the correlation between CDS spreads and the equities market. Earlier works by Longstaff, Norden, and Weber (2003) also focus on the link between the single name CDS spread changes and stock returns. Byström's tests frame a portion of this paper's study in comparing the relationship between CDS prices and equity prices during the period that the ban was enforced. Byström also finds highly significant correlations between CDS spread levels and stock volatilities. These conclusions agree with those by Abid and Naifar (2006) arguing of the significance of volatility levels in determining CDS prices and reinforce the importance of including volatility in any CDS pricing equation. Tests to determine the speed at which firm-specific information is incorporated in different markets show that information flows fastest to the CDS market. Stock returns lagged by one day are almost as significantly correlated with current CDS spreads as current stock returns. This finding is important to studies focusing on the SEC ban since the ban was instituted on a specific day with little advanced notice. Thus, data at the beginning of the SEC ban should also reflect a situation where information is incorporated in the CDS market at the same time, or prior to, the equities market.

Study Design

Data on CDS, equity prices, and bond prices are gathered from Bloomberg LP. Microeconomic data including CPI, stock market indexes, and the risk-free rate are also all gathered from Bloomberg. Equity short interest data and short percent of float data are taken from Short Squeeze, a financial data provider that supplies historic biweekly short interest metrics. Daily CDS prices on underlying five-year bonds are collected from March 3, 2008, to October 24, 2008. This timeframe provides a range of data before, during, and after the short selling ban. Data are collected on 30 CDS entities whose corresponding equities were covered by the shorting ban, as well as 60 entities with corresponding equities in the S&P 500 that were not covered by the ban.[2] To be included in the sample, the CDS entities must have listed daily prices on Bloomberg during at least 80 percent of the sample period. Daily CDS prices are generated by Bloomberg from submissions by partner banks and represent end-of-day composite prices. If the CDS prices supplied by the partner banks exhibit a high degree of variance on a specific day, Bloomberg does not publish a composite price for that day. Thirty firms on the SEC banned list had available CDS prices on 80 percent of the days, while 60 firms in the S&P 500 not included on the banned list had available prices. CDS price indices in this study are created by taking the weighted average end-of-day prices for the two groups of CDS contracts: contracts whose corresponding equities were covered by the shorting ban (labeled "Banned CDS Index") and contracts whose corresponding equities were not covered (labeled "S&P 60 CDS Index"). Taking the differences between the "Banned CDS Index" and "S&P 60 CDS Index" generates a final index, labeled "Abnormal CDS Spread". Such an index indicates the presence

[2] See Appendices I and II for a listing of firms included in the study.

of pricing abnormalities that impact the CDS prices of firms included in the SEC ban. The "Abnormal CDS Spread" is used on the left side of the regression equation and pricing factors such as the three-month libor rate are regressed against it.

Corresponding equity and bond indices are created using the same methodology as applied to the CDS indices. An equity index, labeled "Banned Equity Index" is composed of the equity prices of the same 30 firms covered by the ban, while an index labeled "S&P 60 Equity Index" is composed of the equity prices of the same 60 firms composing the "S&P 60 CDS Index". An index titled "Abnormal Equity Spread" measures the differences between the two indices. Similarly, indices labeled "Banned Bond Index", "S&P 60 Bond Index", and "Abnormal Bond Spread" are also created using bond price data of bonds with like maturities. This process ensures consistency when comparing CDS to equity and bond prices and allows for comparisons across the three markets.

Daily prices are only included in the CDS, equity, and bond indices if at least two thirds of the entities that make up the index report prices for that day. For example, if the CDS prices of only 15 of the 30 entities covered by the ban were available on a given day, the CDS index would not include a price for that day.

In addition to the aforementioned indices, all tests are also conducted using similar indices composed of firms whose prices meet all of the criteria listed above but are adjusted to reflect the pricing irregularities during the time of Lehman Brothers failure. Correlation tests are run comparing CDS prices of the specific firms included in the "Banned CDS Index" and "S&P 60 CDS Index" to the CDS prices of Bear Stearns from March 3, 2008 to March 14, 2008. The period used in the correlation tests is important due to the Federal Reserve's decision to approve

a financing agreement on March 14, 2008 that facilitated the purchase of Bear Stearns by JPMorgan Chase. During the two weeks prior to the purchase of Bear Stearns, market uncertainty surrounding Bear Stearns' financial health and the unknown repercussions that would follow the failure of a major financial institution drove up CDS prices across market sectors. A similar situation occurred during the weeks leading up to September 15, 2008 when Lehman Brothers Holdings Incorporated filed for Chapter 11 bankruptcy protection. Unfortunately, the bankruptcy of Lehman Brothers only two days prior to the start of the SEC short selling ban likely had an important impact on CDS prices during the sample period and should be taken into account when analyzing the impact of the ban on CDS prices. By conducting correlation tests comparing CDS prices during the two weeks prior to the acquisition of Bear Stearns, new indices can be created composed of firms whose CDS prices were nearly equally effected by the potential failure of Bear Stearns. Such indices would more likely be similarly affected by the actual failure of Lehman Brothers since both Lehman Brothers and Bear Stearns were large investment banks with financial deals interconnected with other Wall Street firms. Thus, the new abnormal delta of the indices correlated to the CDS prices of Bear Stearns should be lower than the original "Abnormal CDS Spread". The new indices reflecting firms whose CDS prices were similarly correlated to the CDS prices of Bear Stearns are labeled "Banned CDS Index Correlated" and "S&P 60 CDS Index Correlated".[3] Twenty firms are included in each of the two indices. The index labeled "Abnormal CDS Spread Correlated" measures the differences between the two indices. Firms included in the "Banned CDS Index Correlated" group have an average correlation of 0.85 to the CDS prices of Bear Stearns, while

[3] See Appendices I and II for lists of the firms included in the indices.

the firms included in the "S&P 60 CDS Index Correlated" group have an average correlation of 0.80 to the CDS prices of Bear Stearns.

Testing procedures for this paper involve determining the average percentage change, or delta, in CDS premiums during the period that the ban was in place. Higher CDS price increases for firms covered by the ban compared to firms not covered could suggest pricing irregularities. This same procedure is conducted using equity and bond prices in an attempt to replicate the results of Boehmer, Jones, and Zhang (2008). Studying the effects of the ban on CDS prices, equity prices, and bond prices allows for a comparison of pricing differentials across three markets. If the price spreads between banned and non-banned entities are small in the equities and bond markets it is expected that the price spreads should also be small in the CDS market.

In addition to comparing the spreads between the Banned CDS indices and S&P CDS indices, testing procedures also seek to discover pricing discontinuity between specific firms within the Banned CDS indices. Equity short interest data are used to establish two indices composed of firms in the "Banned CDS Index Correlated" universe. The first index is composed of firms whose equity shares were shorted in the top 50 percentile of volume during the two weeks prior to the SEC ban. The second index is composed of firms whose equity shares were shorted in the bottom 50 percentile of volume. These indices are labeled "Top 50 Percentile Shorted by Volume" and "Bottom 50 Percentile Shorted by Volume" respectively. Similarly, two other indices are constructed to compare discontinuity within the "Banned CDS Index Correlated" universe. The indices are ordered by firms' short percent of float data and organized in the same fashion as the short volume indices. Short percent of float metrics represent the portion of a firm's shares sold short in comparison to the trading volume of the firm's shares that

took place during the time period. Firms whose equity shares were sold short in higher ratios during the two weeks prior to the SEC ban would be more likely to have higher dislocations in their corresponding CDS prices following the ban. Through the process of ordering banned firms by their number and ratio of shares sold short prior to the SEC ban it is possible to determine if discontinuity existed within the banned control group.

Data are also directly compared between corresponding equity, bond, and CDS prices in the same method used by Byström (2008). Correlation tests are run to determine the strength of the relationship between equity, bond, and CDS prices during the period of the ban. Substantial defections from the inverse relationship between corresponding equity and CDS prices or corresponding bond and CDS prices during the period of the ban would suggest the existence of market disturbances.

A linear regression technique based on the approach taken by Abid and Naifar (2006) is used to show the relationship between CDS prices and external factors such as the short selling ban. Equations are estimated as simple linear regressions and the White test is used to correct for heteroskedasticity. A dummy variable representing the days that the ban was in effect is used to test if the ban was a significant variable in CDS prices. Other variables including the three-month libor rate, the VIX volatility index, the S&P 500 index, and the price of gold, are all regressed against CDS price spreads to compare significance levels. The three-month libor rate is representative of the risk-free interest rate and any increase in CDS prices could be explained by a corresponding increase in the overall rate of risk. Gold is another barometer of risk due to its tendency to rise in value during periods of financial turmoil. The S&P 500 index is a proxy for stock prices and should act in an inverse manner to CDS prices. Finally, the VIX volatility

index should be negatively related to CDS prices due to the theory that insurance costs increase in times of financial uncertainty. Unfortunately, it is not possible to include credit ratings as a variable in the regression due to the fact that rating agencies did not issue an important number of new credit ratings to the firms during the period of the ban.

Results

Analysis of the CDS price indices indicates that the CDS prices of entities covered by the SEC ban rose at a higher rate during the period of the ban than entities not covered.[4] Prior to the ban, the CDS prices of covered entities tracked the prices of the S&P 60 Index with less then a seven percent daily differential from August 19, 2008 to September 8, 2008. The "Abnormal CDS Spread" reveals that the sharp increases in price of banned entities began to appear several days before the implementation of the ban.[5] It is likely that the initial rise in CDS prices of banned entities was a result of Lehman Brother's bankruptcy filing on September 15, as investors feared that other financial firms would also be vulnerable to the stresses that faced Lehman. In addition to the failure of Lehman Brothers, money market funds were experiencing huge outflows after the inventor of money market funds revealed that the net value of shares in his flagship fund, the Reserve Primary Fund, had fallen below one dollar. Despite these historic moments of financial distress, the "Abnormal CDS Spread" continued to rise another 50 percentage points a week following Lehman's bankruptcy, suggesting that other factors influenced the rise in CDS prices for firms protected by the SEC ban.

[4] See Appendix IV for a chart comparing the "Banned CDS Index" and "S&P 60 CDS Index".
[5] See Appendix V for a chart depicting the "Abnormal CDS Spread".

The effect of Lehman Brother's bankruptcy on CDS prices can be partly determined through the analysis of the "Abnormal CDS Correlated Spread". As previously described, the CDS correlated indices are composed of firms that were similarly affected by the potential failure of Bear Stearns in March 2008. A chart of the "Abnormal CDS Correlated Spread" demonstrates a pricing pattern nearly identical to the "Abnormal CDS Spread" chart suggesting that CDS pricing irregularities still existed in the CDS market even when accounting for such shocks as Lehman Brothers' failure.[6] However, a comparison between the "Abnormal CDS Spread" and "Abnormal CDS Correlated Spread" demonstrate that spreads were indeed less extreme during market shocks for firms that were price correlated during Bear Stearns' bailout.

At the peak of the price differentials the "Abnormal CDS Spread" reached nearly 130 percent, indicating that entities covered by the securities ban had corresponding CDS prices 130 percent higher than those of entities not covered by the ban. In comparison, the price differentials of the "Abnormal CDS Correlated Spread" reached 112 percent, a difference that potentially accounts for some of the impact of Lehman Brothers' bankruptcy. Particularly interesting is the fact that the "Abnormal CDS Spread" fell more then 40 percent within three days of the ban's end. Due to the over-the-counter nature of the CDS market, CDS trades are not performed over an exchange and instead often take multiple days to complete. It is likely that the CDS market experienced a large sell-off that lasted up to a week after the removal of the ban. The drive towards pricing normalcy was so sudden that by October 13, the CDS prices of covered entities actually reached levels below the average price of non-covered entities. Of equal interest is the 60 percent decline in the "Abnormal CDS Spread" over the course of the

[6] See Appendix VI for a chart depicting the "Abnormal CDS Correlated Spread".

three days leading up to October 2. The initial announcement of the SEC ban stipulated that the ban would last until October 2 with the possibility of an extension. Due to the fact that the Emergency Economic Stabilization Act of 2008 was not passed and signed until October 3, it seems that the best explanations for the significant drop in the "Abnormal CDS Spread" were market expectations that the ban would be lifted. The increase in the "Abnormal CDS Spread" after the implementation of the ban, coupled with the maintenance of this spread during its enforcement, both indicate that the equity ban had some influence on the CDS market. Further evidence showing that the "Abnormal CDS Spread" rapidly diminished upon the potential and then actual removal of the ban offers even greater support for this hypothesis.

Discontinuity tests organized by equity short sales data indicate that firms whose shares were sold short in higher concentrations prior to the SEC ban incurred greater increases in their CDS prices during the period of the ban. In a sample consisting of the firms in the "Ban CDS Index Correlated", firms that were previously sold short in higher concentrations had average CDS price increases nearly 100 percent higher than firms not sold short prior to the ban. Similar results are produced when either conducting the tests based on short sales volume data or using short sales percent of float data. Creating distinct CDS indices based on short sales percent of float data may be a more useful approach due to the high variance in the shares outstanding of the different firms. For example, the firm JPMorgan Chase may have experienced a high volume of short sales due to the large number of shares outstanding in the company. However, this same firm could have exhibited a relatively low short sales percent of float metric for the very same reason of having a high number of shares outstanding. Despite the differences between the short

sales volume and short sales percent of float metrics, the use of either metric in creating CDS indices generates output with similar trends.

Five days prior to the enactment of the SEC ban, CDS prices of firms that would later be covered by the ban with high short sales volumes began to rise drastically higher than those of firms with low short sales volumes.[7] Although this initially appears intuitive, the scale of the CDS pricing spreads marks the period as an important one. During the one month timeframe prior to September 10, 2008, CDS price deltas between firms that were sold short in high proportion to their trading flow, compared to those that were not, fluctuated within a five percent band.[8] By September 18, 2008, the spread in deltas between the two groups reached over 90 percent. Thus, heavily shorted firms covered by the SEC ban experienced CDS price increases over 90 percent higher than firms covered by the ban with low short sale ratios. Although the spread in deltas between the two groups fluctuated considerably during the period of the SEC ban, the most telling impact of the ban on CDS prices can be seen in the three days following the lifting of the ban. Only three days after the passing of the ban, the spread in deltas of the two indices fell over 70 percent from highs reached on September 30, 2008. The timing of such a steep decline strongly suggests that the delta spreads were influenced by the enforcement of the short selling ban. With the withdrawal of the short selling ban market participants were free to once again enter equity short selling positions and the demand for alternative derivative investments to achieve the same financial positions fell.

[7] See Appendix VII for a chart depicting the "Discontinuity Test Spread by Shorting Volume".
[8] See Appendix VIII for a chart depicting the "Discontinuity Test Spread by Shorting Ratio of Total Trading Float".

The high price spread existent in the CDS market between the "Ban CDS Index" and "S&P 60 Index", or between the subgroups of the banned entities, is not found in the corresponding equities market. The "Abnormal Equities Spread" indicates that the equity prices of firms covered by the ban track within five percentage points of the equity prices of the "S&P 60 Index" firms during the entirety of the ban.[9] An absence of the major pricing spreads existent in the CDS market suggests that arbitrage strategies were utilized in the CDS market in order to bypass the short selling ban in the securities market.

During the period of the SEC short selling ban, the bond market also experienced sharp dislocations similar to the CDS market. Average bond prices for firms included in the "Ban Bond Correlated Index" fell over ten percent more than bond prices in the "S&P Bond Correlated Index" within two days of Lehman Brothers' bankruptcy filing.[10] These differences soon converged after the curtailing of the SEC short selling ban and within three days of the ban's dismissal the "Abnormal Bond Correlated Spread" fell below five percent. Overall, the bond price market behaved in a very similar manner to the CDS market following the SEC ban and such behavior suggests that the CDS market may not have been the only method for financial market participants to enter short positions that achieved ends similar to the practice of shorting equities.

Correlation analysis testing the relationship between equity prices and CDS prices tentatively suggests that the shorting ban had some effect in causing a disconnect between the two markets. Earlier work by Byström (2008) demonstrates that CDS prices and their corresponding equity prices are nearly perfectly negatively correlated. In the period from August

[9] See Appendix III for a chart depicting the "Banned Equity Index" and "S&P 60 Equity Index".
[10] See Appendix IX for a chart depicting the "Abnormal Bond Spread Correlated".

18, 2008 to October 24, 2008, the equity and CDS price indices of firms in the "S&P 60 Index" have a clearly significant negative correlation of -0.97. The same correlation test is also significant at the 95 percent level when the firms covered by the SEC ban are substituted and data is used from August 18, 2008 to October 24, 2008. Although both correlations are statistically significant, the correlation between the equity and CDS prices of the firms in the "S&P 60 Index" is stronger than the relationship between the corresponding equity and CDS prices of the firms in the "Ban CDS Index".[11] When similar correlation tests are applied that only include the period when the ban was in affect, the equity and CDS price correlation of the covered firms is even weaker. However, the correlation is still significant at the 95 percent level.

Regressing pricing variables against the "Abnormal CDS Spread" offers further support for the theory that the SEC short selling ban caused dislocations in the CDS market. The dummy variable BAN, representing the period that the ban was enforced, is significant at the 95 percent level when used to explain the "Abnormal CDS Spread". Other variables significant at the 95 percent level include the S&P 500 Index and the price of gold.[12] The final pricing formula is represented by the equation:

$$\text{Abnormal CDS Spread} = BAN(x) + SP(x) + GOLD(x) + e$$

The statistical significance of the BAN dummy variable is an important indication that the SEC ban played a role in the increase of CDS prices during its enforcement. Furthermore, the

[11] See Appendix X for a table containing correlation values.
[12] See Appendix XI for a table listing the regression values. Appendix XII contains the variable descriptive statistics.

coefficient of the BAN dummy variable is over 29, meaning that the SEC ban forced the CDS prices of the covered entities 29 percent higher than their counterparts not included in the ban group. The S&P 500 Index has a negative coefficient of -0.085, indicating that CDS prices decrease almost 0.1 percent for every point increase in the S&P 500. Gold has a coefficient of 0.18, indicating CDS prices increase nearly 0.2 percent for every dollar increase in the price of an ounce of gold. A volatility measure represented by the VIX index was not significant, nor was the riskless rate represented by the three-month libor rate.

The r-squared value of the explanatory equation is 0.482, suggesting that the equation only weakly describes the "Abnormal CDS Spread". This test is limited by the weak explanatory power of the "Abnormal CDS Spread" equation, which may partly be attributed to the multitude of events that occurred during the two-week period that the ban was enforced. Further limiting the explanatory power is the fact that the "Abnormal CDS Spread" is generated by taking the difference between the "Ban CDS Index" and the "S&P 60 CDS Index". Therefore, variables in the "Abnormal CDS Spread" regression are used to explain a delta in two CDS indices, rather than simply the prices of one index. It is interesting to note that neither a volatility index nor a risk index were significant variables in increasing the pricing spreads. This could indicate that both volatility and a rise in the risk-free rate had equal or similar impacts on the prices of both the banned entities and S&P entities.

A major problem facing this study remains in determining what pricing irregularities can be isolated to the SEC ban and what irregularities should be attributed to other independent market events. In particular, the bankruptcy of Lehman Brothers only days before the enactment of the short selling ban likely had a substantial effect on the CDS prices of financial institutions.

It remains unclear how long this catalyst impacted the CDS market of financial firms. Future research should attempt to further quantify the impact of Lehman's bankruptcy on the CDS market of financial institutions.

Policy Implications

Statistical tests demonstrate that the CDS prices of firms covered by the SEC short selling ban experienced significant pressures during the period that the ban was enforced. Moreover, the ban had a greater effect on the CDS prices of protected firms that were previously sold short in high volumes than on protected firms that were not previously sold short in high volumes. The existence of this discontinuity within the group of firms protected by the ban strengthens the study results and suggests that such a short selling ban could be particularly detrimental to the CDS prices of firms that the SEC was most concerned in protecting. Although these results may be partially influenced by other market events that occurred during the same time frame, the clear differences in behavior between the equities and CDS markets, and bond and CDS markets indicate that participants likely engaged in active arbitrage within the CDS market. Compounding the disturbing nature of this claim is the assertion by Chanos that the main buyers of such CDS contracts at the time were the same firms whose equity shares were specifically protected by the ban. The results of the study are also strengthened by the inclusion of firms in the price indices that were nearly equally effected by an earlier market shock similar to the collapse of Lehman Brothers. While the share prices of equities covered by the ban maintained a

close relationship to the prices of other similar S&P firms, the CDS prices of firms covered by the ban varied wildly from their counterparts.

As the CDS prices of entities covered by the ban varied from their counterparts, so too did the bond prices of entities covered by the ban vary with respect to their counterparts. This evidence suggests that the CDS market was not alone in experiencing dislocations during the period of the SEC ban. Due to the short time frame that the ban was enforced, it is difficult to evaluate financial metrics of firms outside of the equity, bond, and CDS markets. Thus, it remains inconclusive if the inconsistencies between the equity, CDS, and bond markets are due only to the ban's positive effect of shielding the equities market from short sellers, or if the ban instead distorted the bond and CDS spaces by driving short sellers to these markets. The answer to this question of causality may be a combination of these forces but the data seem to overwhelming indicate that it was the bond and CDS spaces that were more intensely effected by the ban. Perhaps most telling is the fact that the CDS prices of firms covered by the ban returned to levels similar to those priced during the first week of September within only three days of the ban's repeal. The clear return to normalcy only days after the lifting of the ban, along with the sudden drop in the "Abnormal CDS Spread" on October 2 indicates that active arbitration occurred in the CDS markets. Even the passage and signing of the Emergency Economic Stabilization Act on October 3 failed to have an impact as significant on the "Abnormal CDS Spread" as did the potential lifting of the ban on October 2.

When making future decisions whether to implement such a ban, the SEC should not discount evidence that the short selling ban clearly caused disruptions to the CDS market. The CDS market represents nearly a $40 trillion market and substantial price swings can have

important impacts on bondholders, CDS underwriters, and other markets in general. Investors are increasingly viewing CDS prices as market indicators of a firm's financial health. Price swings indicate market uncertainty and can encourage so called "bank runs" that perpetuate crises. The opaque nature of the over-the-counter derivatives market should also be noted, as many of the CDS participants are likely to be closely interconnected. As exemplified by the multiple bailouts of AIG, the potential failure of a single large CDS counterparty could have a tremendous negative impact on the entire world economy. In order to evaluate the SEC short selling ban, it is also important to remember the climate of fear that gripped financial markets at the time. Financial regulators, including those at the Treasury Department and Federal Reserve, genuinely feared that short sellers could lead the equity prices of financial firms into a downward spiral, while profiting from the chaos. The short selling ban did indeed protect the equity share prices of firms, but at the cost of potentially driving up the cost of debt protection and the cost of debt itself on these same firms. Regulators must be cognizant of the potential for arbitrage across product spaces. If a trading ban is to be enacted, such a ban must be enforced across fixed income, derivatives, and equity product markets so as to limit the potential for dislocations. The SEC should also closely monitor other potential over-the-counter instruments of arbitrage to ensure that the same intended beneficiaries of protection do not actively attempting to abuse the protection through the pursuit of speculative strategies. However, as the evidence presented in this paper suggests, the SEC should be extremely hesitant to enact future short selling bans and should only do so in cases of extreme financial distress. Such hesitancy may already be existent within the regulatory community as demonstrated by former Securities and Exchange

Commission Chairman Christopher Cox's remark that "knowing what we know now, I believe on balance the commission would not do [a short selling ban] again" (Younglai 2008).

Appendix I

Firms included on the SEC short selling ban list that are used in the "Ban CDS Index":

Ticker	Firm	Ticker	Firm
ACE	ACE LTD	ING	ING GROUP
AEG	AEGON NV	JPM	JPMORGAN CHASE
AET	AETNA INC	L	LOEWS
AIB	ALLIED IRISH BANKS	MER	MERRILL LYNCH
AIG	AMERICAN INTERNATION GROUP	MS	MORGAN STANLEY
AOC	AON CORP	NMR	NOMURA HOLDINGS
AXA	AZA UAP	PRUU	PRUDENTIAL FINANCIAL
BAC	BANK OF AMERICA	PRUE	PRUDENTIAL PLC
BAR	BARCLAYS	RBS	ROYAL BANK SCOTLAND
BRK/A	BERKSHIRE HATHAWAY	SCH	CHARLES SCHWAB
C	CITIGROUP INC	UBS	UBS AG
CB	CHUBB CORP	UNM	UNUM GROUP
DB	DEUTSCHE BANK	WB	WACHOVIA
GS	GOLDMAN SACHS	WFC	WELLS FARGO
HUM	HUMANA INC	WLP	WELLPOINT

Firms included on the SEC short selling ban list that are used in the "Ban CDS Index Correlated":

Ticker	Firm	Ticker	Firm
AEG	AEGON NV	MER	MERRILL LYNCH
AET	AETNA INC	MS	MORGAN STANLEY
AIB	ALLIED IRISH BANKS	NMR	NOMURA HOLDINGS
AIG	AMERICAN INTERNATION GROUP	PRUE	PRUDENTIAL PLC
AXA	AZA UAP	SCH	CHARLES SCHWAB
BAC	BANK OF AMERICA	UBS	UBS AG
C	CITIGROUP INC	UNM	UNUM GROUP
GS	GOLDMAN SACHS	WB	WACHOVIA
ING	ING GROUP	WFC	WELLS FARGO
JPM	JPMORGAN CHASE	WLP	WELLPOINT

Appendix II

Firms listed on the S&P 500 not included on the SEC short selling ban list. These firms form the "S&P 60 Index" used in the study:

Ticker	Firm	Ticker	Firm
AA	ALCOA INC	IBM	INTL BUSINESS MACH
AEP	AMER ELECTRIC POWER CO	JNJ	JOHNSON AND JOHNS DC
ALL	ALLSTATE CP	KFT	KRAFT FOODS INC
AMGN	AMGEN INC	LMT	LOCKHEED-MARTIN
AVP	AVON PRODUCTS INC	MCD	MCDONALDS CP
BA	BOEING CO	MMM	3M COMPANY
BAX	BAXTER INTL INC	MO	ALTRIA GROUP INC
BHI	BAKER HUGHES	MON	MONSANTO COMPANY
BMY	BRISTOL-MYERS SQUIBB	MRK	MERK CO INC
BNI	BURLINGTON N SANTE FE	NSC	NORFOLK SO CP
CAT	CATERPILLAR INC	OXY	OCCIDENTAL PET
CL	COLGATE PALMOLIVE	PEP	PEPSICO INC
COP	CONOCOPHILLIPS	PFE	PFIZER INC
CPB	CAMPBELL SOUP CO	PG	PROCTOR GAMBLE CO
CSCO	CISCO SYSTEMS, INC	RTN	RAYTHEON CO
CVX	CHEVRON CORP	S	SPRINT NXTEL CP
DD	DU PONT	SGP	SCHERING-PLOUGH
DELL	DELL INC	SLE	SARA LEE CORP
DIS	WALT DISNEY	SO	SOUTHERN COMPANY
DOW	DOW CHEMICAL	T	AT&T INC
DVN	DEVRON ENERGY	TGT	TARGET CP
EXC	EXELON CORP	TWX	TIME WARNER INC
FDX	FEDEX	UNH	UNITED HEALTH GROUP
GD	GENERAL DYNAMICS	UPS	UNITED PARCEL SVC
GE	GEN ELECTRIC CO	UTX	UNITED TECH
HAL	HALLIBURTON CO	WMB	WILLIAMS COS
HD	GOME DEPOT INC	WMT	WAL MART STORES
HNZ	HEINZ HJ CO	WY	WEYERHAEUSER CO
HON	HONEYWELL INTL INC	WYE	WYETH
HPQ	HEWLETT PACKARD CO	XRX	XEROX CP

Appendix II (continued)

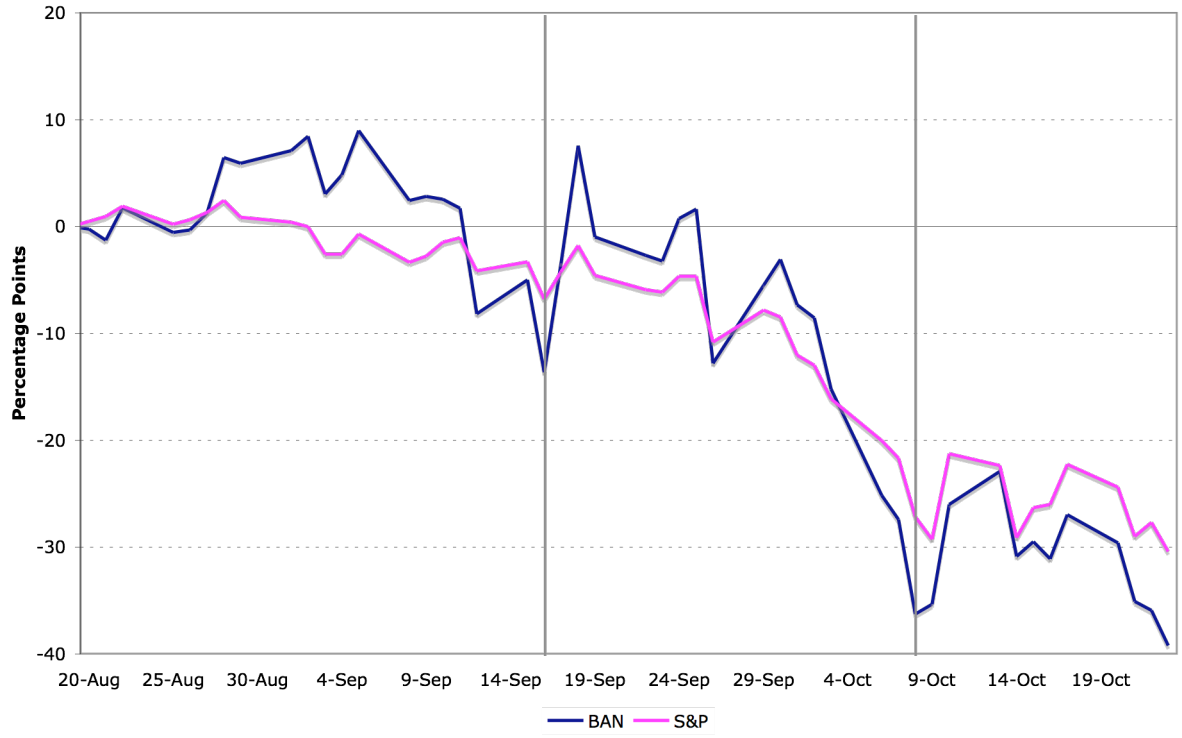
Firms included in the "S&P 60 Index Correlated" used in the study:

Ticker	Firm	Ticker	Firm
AEP	AMER ELECTRIC POWER CO	IBM	INTL BUSINESS MACH
BA	BOEING CO	KFT	KRAFT FOODS INC
BMY	BRISTOL-MYERS SQUIBB	MO	ALTRIA GROUP INC
CAT	CATERPILLAR INC	MON	MONSANTO COMPANY
DELL	DELL INC	SGP	SCHERING-PLOUGH
DIS	WALT DISNEY	T	AT&T INC
DOW	DOW CHEMICAL	TGT	TARGET CP
FDX	FEDEX	UTX	UNITED TECH
HNZ	HEINZ HJ CO	WMT	WAL MART STORES
HPQ	HEWLETT PACKARD CO	WY	WEYERHAEUSER CO

Sam Courtney

Appendix III

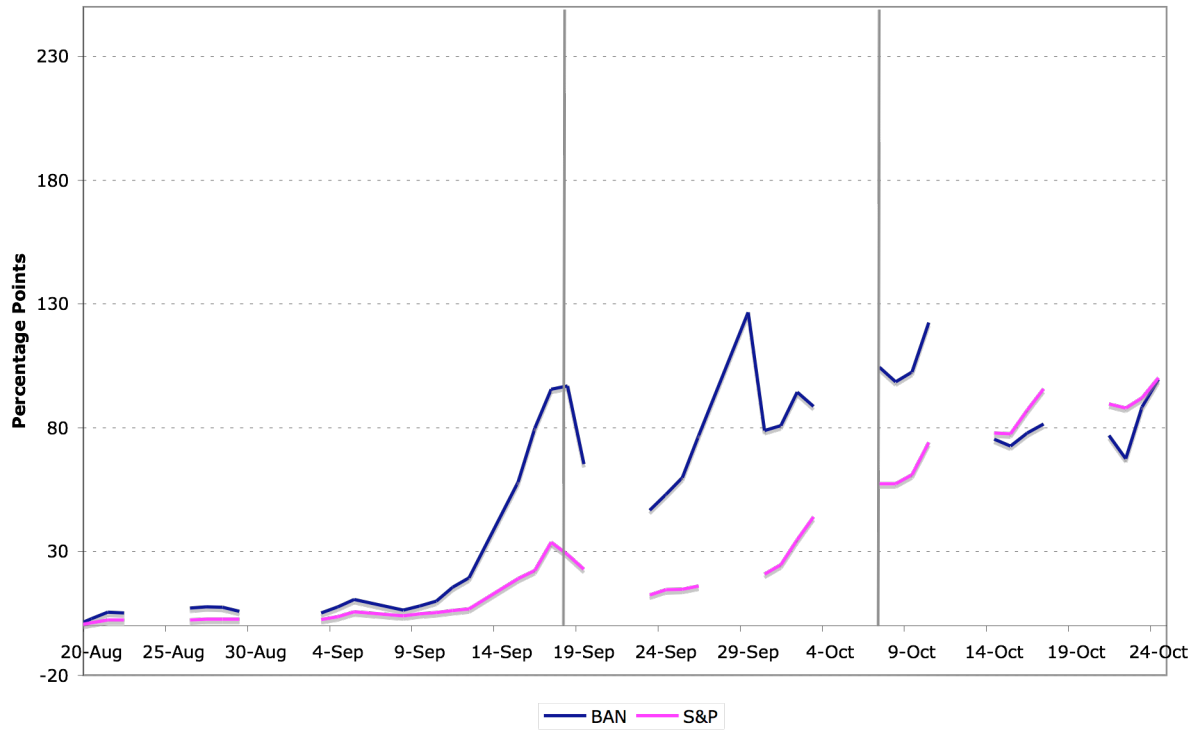
Chart depicts the equity price indices created in this study. The "Ban Equity Index" is a composite of the weighted average share prices of thirty entities included in the SEC ban. The "S&P 60 Equity Index" is a composite of the weighted average share prices of sixty entities in the S&P 500. The two vertical grey lines indicate the dates that the SEC short selling ban was implemented and removed. Values are indexed to August 20, 2008 levels. Source: Bloomberg LP.



Sam Courtney

Appendix IV

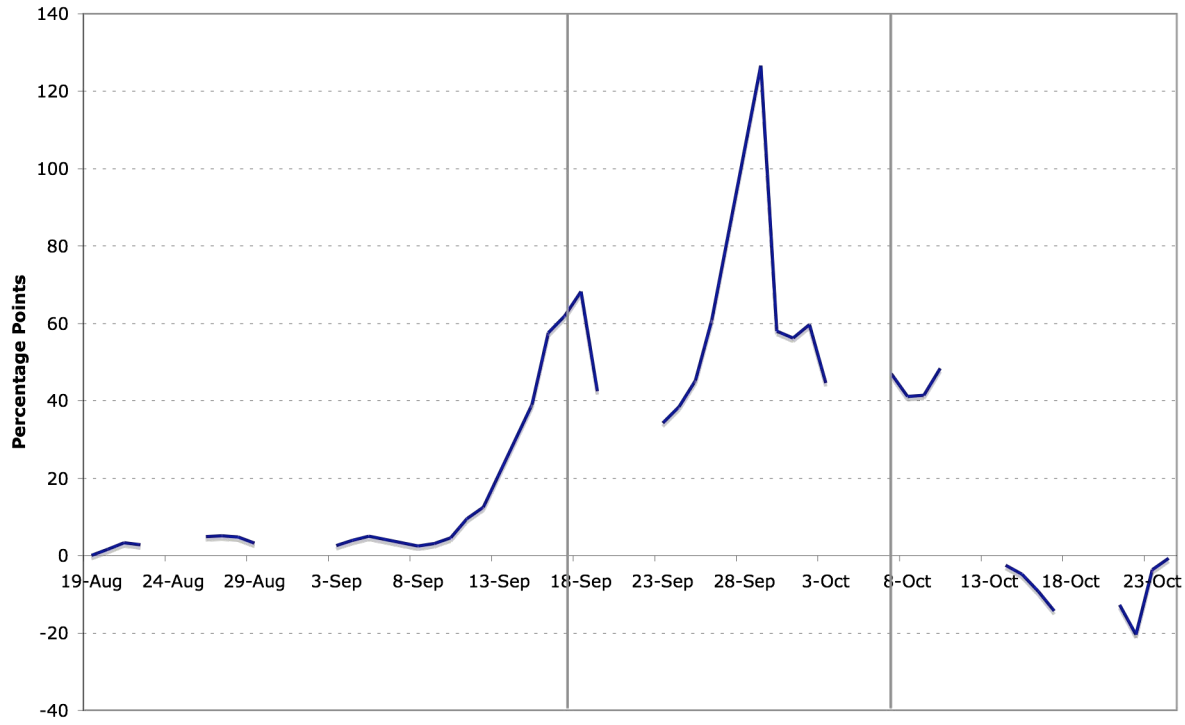
Chart depicts the "Ban CDS Index" and "S&P 60 CDS Index" created in this study. The "Ban CDS Index" is a composite of the weighted CDS prices of thirty entities included in the SEC ban. The "S&P 60 CDS Index" is a composite of the weighted average CDS prices of sixty entities in the S&P 500. The two vertical grey lines indicate the dates that the SEC short selling ban was implemented and removed. Values are indexed to August 20, 2008 levels. Source: Bloomberg LP.



Sam Courtney

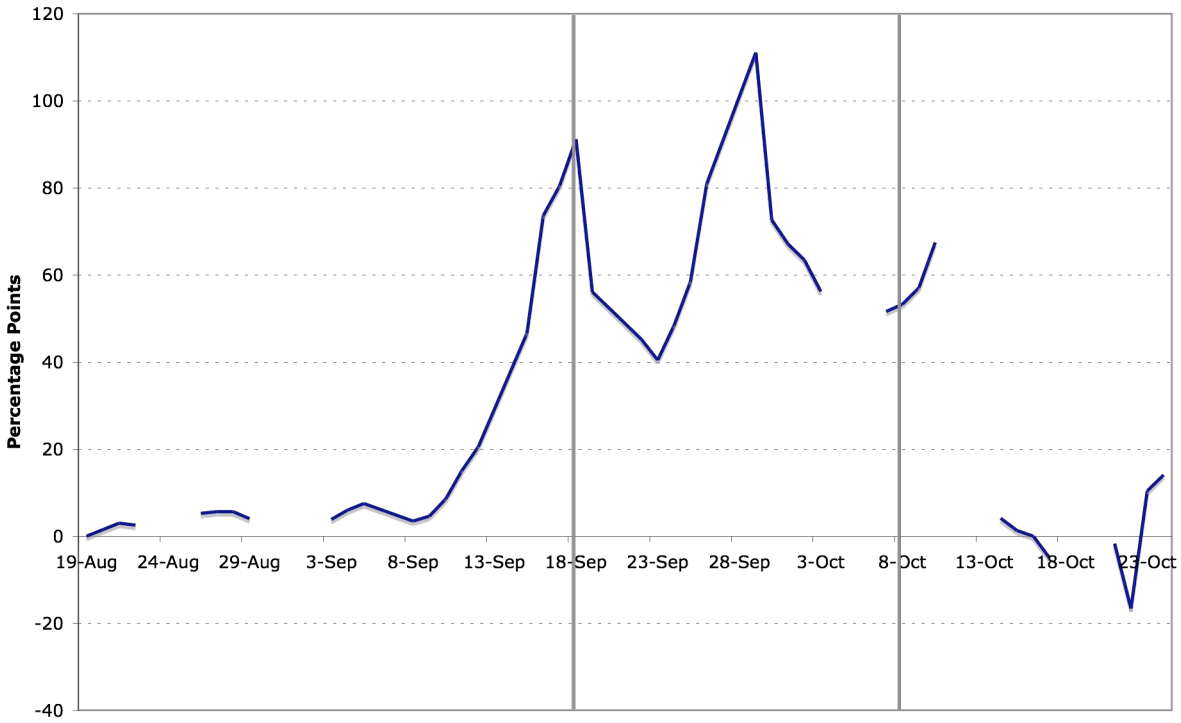
Appendix V

Chart depicting "Abnormal CDS Spread" represents spreads in the "Ban CDS Index" and "S&P 60 CDS Index". The two vertical grey lines indicate the dates that the SEC short selling ban was implemented and removed. Values are indexed to August 20, 2008 levels. Source: Bloomberg LP.



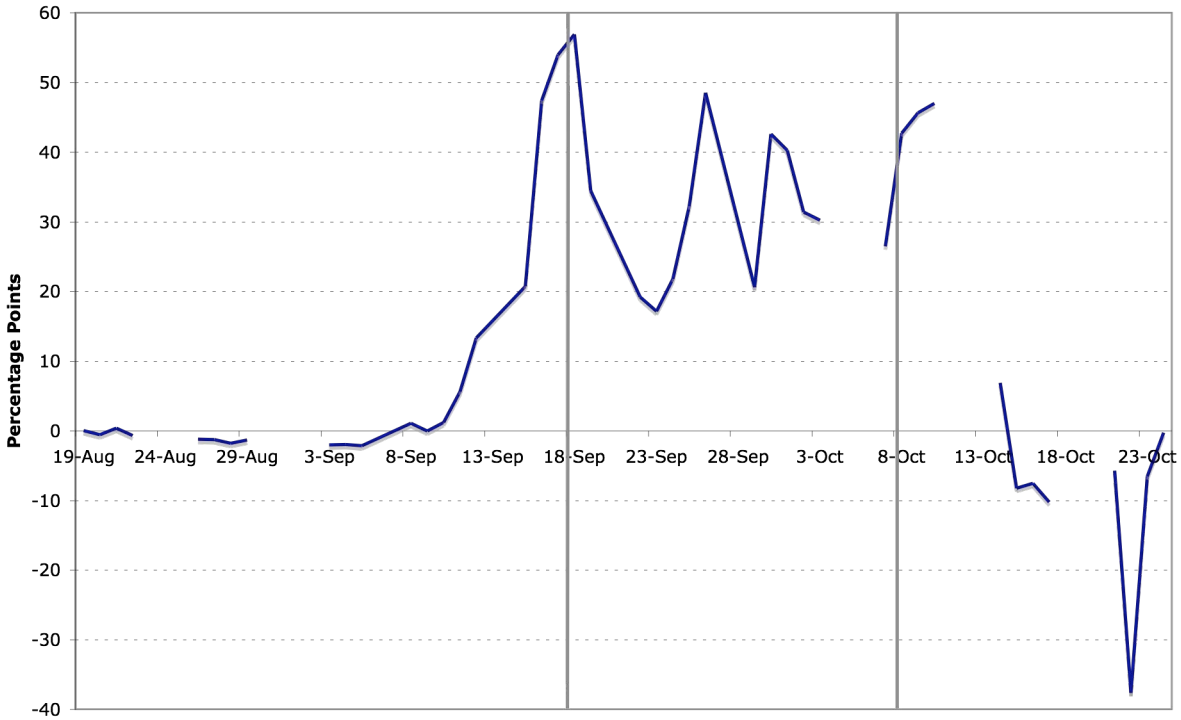
Appendix VI

Chart depicting "Abnormal CDS Spread Correlated" represents spreads in the "Ban CDS Index Correlated" and "S&P 60 Index Correlated". The two vertical grey lines indicate the dates that the SEC short selling ban was implemented and removed. Values are indexed to August 20, 2008 levels. Source: Bloomberg LP.



Appendix VII

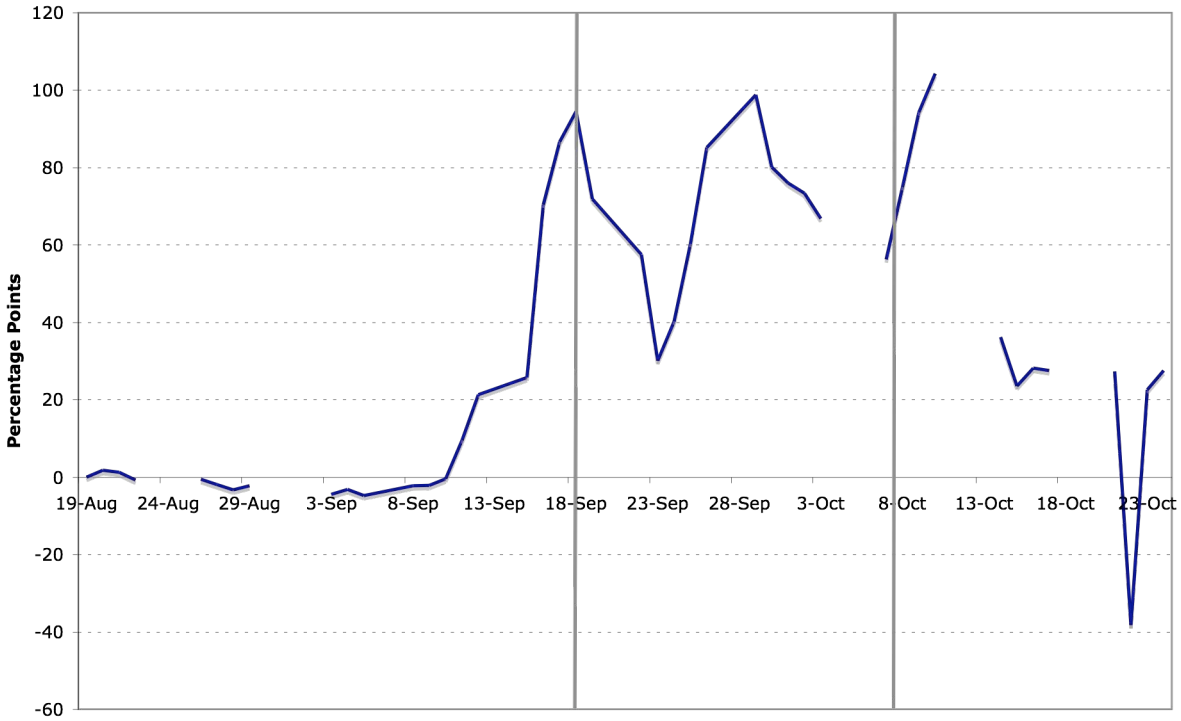
Chart depicting "Volume Discontinuity Spread" represents real average price spreads in the "Top 50 Percentile Shorted by Volume" and "Bottom 50 Percentile Shorted by Volume" groups. The two vertical grey lines indicate the dates that the SEC short selling ban was implemented and removed. Values are indexed to August 20, 2008 levels. Sources: Bloomberg LP and Short Squeeze.



Sam Courtney

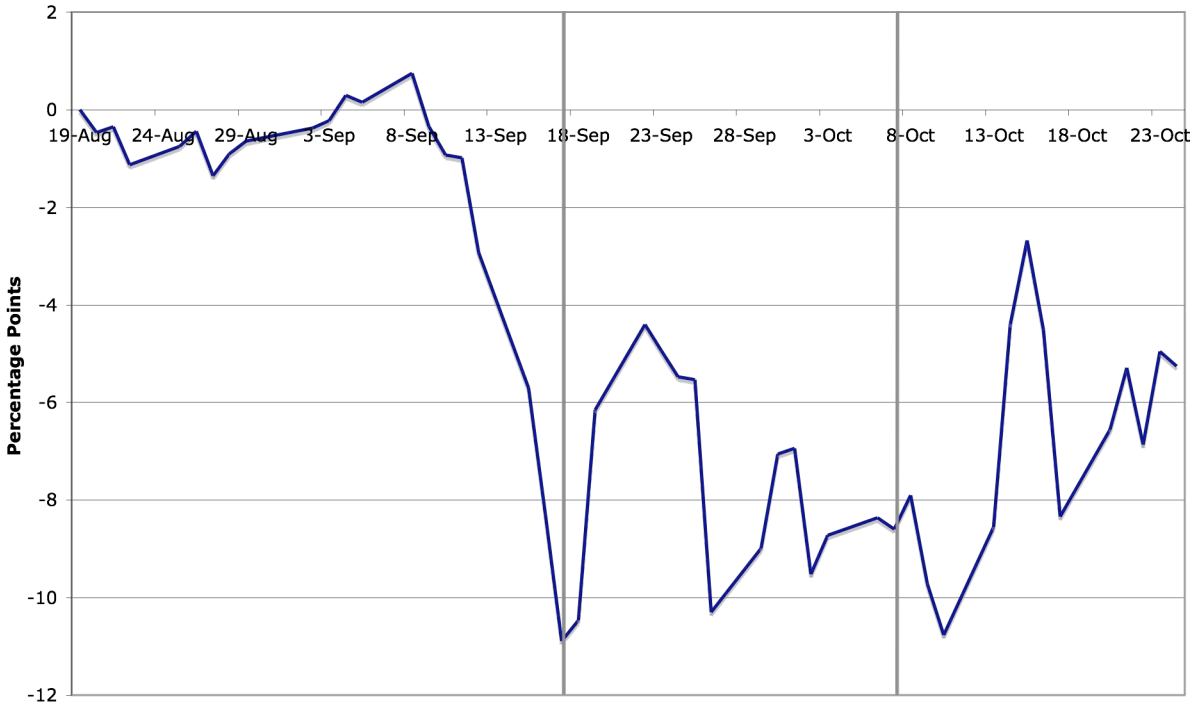
Appendix VIII

Chart depicting "Short Percent Discontinuity Spread" represents real average price spreads in the "Top 50 Percentile Shorted by Float Percent" and "Bottom 50 Percentile Shorted by Float Percent" groups. The two vertical grey lines indicate the dates that the SEC short selling ban was implemented and removed. Values are indexed to August 20, 2008 levels. Sources: Bloomberg LP and Short Squeeze.



Appendix IX

Chart depicting "Abnormal Bond Spread Correlated" represents spreads in the "Ban Bond Index Correlated" and "S&P 60 Bond Index Correlated". The two vertical grey lines indicate the dates that the SEC short selling ban was implemented and removed. Values are indexed to August 20, 2008 levels. Source: Bloomberg LP.



Appendix X

Table depicts correlation levels between the CDS index and equity index.

df = 46	r(46) = .372	p < .01
Ban Entities:		**8/19/2008 - 10/24/2008**
r = -0.712		
S&P Entities:		**8/19/2008 - 10/24/2008**
r = -0.970		
Ban Entities:		**9/19/2008 - 10/8/2008**
r = -0.666		

Appendix XI

Table depicts regression results of "Abnormal CDS Spread" equation.

Sample: 8/19/2008 10/24/2008

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BANDUMMY	29.077	8.532	3.408	0.002
GOLD	0.179	0.099	1.819	0.077
SPXINDEX	-0.085	0.047	-1.820	0.077
US3M	-4.040	11.748	-0.344	0.733
VIXINDEX	-0.608	0.408	-1.492	0.145
R-squared	0.482	Mean dependent var	20.593	20.593
Adjusted R-squared	0.425	S.D. dependent var	26.215	26.215
S.E. of regression	19.880	Akaike info criterion	8.931	8.931
Sum squared resid	14228.260	Schwarz criterion	9.140	9.140
Log likelihood	-178.090	Hannan-Quinn criter.	9.007	9.007
Durbin-Watson stat	0.571			

Appendix XII

Table depicts descriptive statistics of regression variables in "Abnormal CDS Spreads" equation.

	AVG	MED	STDEV	MIN	MAX	QUARTILE 1	QUARTILE 3
US0003M Index	3.50	3.21	0.71	2.81	4.82	2.81	4.16
SPX Index	1139.83	1199.61	139.29	876.77	1300.68	997.57	1257.98
GOLDS Comdty	826.10	826.90	48.61	721.45	913.25	796.90	863.85
VIX Index	39.25	34.30	17.92	18.81	79.13	22.96	53.25

References

Abid, F. and N. Naifar. 2006. "The Determinants of Credit Default Swap Rates: An Explanatory Study," *International Journal of Theoretical and Applied Finance*, *9*(1): pp. 23-42.

Amato, J.D. 2005. "Risk Aversion and Risk Premia in the CDS Market," *BIS Quarterly Review*, December pp. 55-68.

Boehmer, E., C.M. Jones, and X. Zhang. 2008. "Shackling Short Sellers: The 2008 Shorting Ban," Texas A&M University, Columbia Business School, Cornell University. Working Paper, November.

Byström, Hans. 2008. "Credit Default Swaps and Equity Prices: The iTraxx CDS Index Market," in N. Wagner, eds., *Credit Risk Models, Derivatives, and Management*. CRC Press, pp. 69-84.

"Charlie Rose Interviews Jim Chanos." *The Charlie Rose Show*. PBS. 12 Apr. 2010. Television.

Claes, A. and M. De Ceuster. 2008. "Single Name Credit Default Swap Valuation: A Review," in N. Wagner, eds., *Credit Risk Models, Derivatives, and Management*. CRC Press, pp. 69-84.

Cossin, D. and T. Hricko. 2001. "Exploring of Credit Risk in Credit Default Swap Transaction Data," HEC Lausanne. Working Paper, May.

Hull, J., M. Predescu, and A. White. 2004. "The Relationship between Credit Default Swap Spreads, Bond Yields, and Credit Rating Announcements," *Journal of Banking & Finance*, November *28*(11): pp. 2789-2811.

Longstaff, F.A., S. Mithal, E. Neis. 2003. "The Credit-Default Swap Market: Is Credit Protection Priced Correctly?," NBER. Working Paper, August.

Sougné, D., C. Heuchenne, and G. Hübner. 2008. "The Determinants of Credit Default Swap Prices: An Industry-Based Investigation," in N. Wagner, eds., *Credit Risk Models, Derivatives, and Management*. CRC Press, pp. 85-96.

Younglai, Rachelle. "SEC Chief Has Regrets Over Short-Selling Ban." *Reuters*. 31 Dec. 2008.