The 2008 Short Selling Ban: Effects on Banned Stocks with and without Traded Options

by

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ABSTRACT

This paper provides one of the first empirical analyses of market and investor reaction to the 2008 U.S. short selling ban. Empirical tests are used to examine stock prices and options volume for three different groups: banned stocks with traded options, banned stocks without traded options and a control group of non-banned S&P 500 stocks. The findings indicate that investors used options to synthetically short sell banned stocks with traded options. Banned stocks that could not be synthetically short sold had returns of +10% relative to both banned stocks that could be synthetically short sold and the control group during the ban. Banned stocks that could be synthetically short sold had +22% abnormal options volume during the ban while the control group experienced no change in options volume. These results are partially explained by the exemption of options market-makers from the ban.

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I. INTRODUCTION

The United States Securities and Exchange Commission (SEC) unexpectedly banned short selling in 797[1] financial stocks during September and October 2008. This paper presents one of the first empirical analyses of market and investor behavior related to the ban. The main finding of the paper is that investors used synthetic short selling strategies to circumvent the ban by taking options positions on banned stocks that had traded options available.

An important theoretical and practical aspect of financial markets is that investors should be able to efficiently express their views through a trading strategy. This concept is crucial for two reasons. Firstly, it allows investors to allocate their capital as they see most fit, and secondly, it aggregates all investors' heterogeneous opinions through supply, demand and ultimately price. When investors have negative views of a company's current market valuation or future prospects, short selling is a common trading strategy to express this view and benefit from a decreasing stock price. As short selling is more restricted, short sellers are less able to bring their negative opinions to the marketplace, creating an environment in which stocks may reflect too much optimistic information and consequentially become overvalued.

The presence of options markets allows investors to form a portfolio that replicates the payoffs from short selling. A key aspect of the 2008 short selling ban is that options market-makers were exempted from ban and allowed to continue short selling throughout the ban. In the presence of short selling constraints, options allow investors an alternative way to short sell. If investors trade with an options market-maker

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[1] The SEC press release stated 799 stocks were to be banned, however they released only 797 on the list of banned stocks

to synthetically short sell, the market-maker can hedge their long exposure generated by investors' synthetic short sales by short selling the underlying stock. Since market-makers were exempted from the ban, they could hedge their long exposure by directly shorting the underlying stocks which were off-limits to non-exempt investors.

This study finds that the introduction of the short selling ban did not prevent the stock prices of banned firms with traded options from falling. During the ban period, stock prices of banned firms with traded options decreased 24.6% while non-banned S&P 500 stocks decreased by 23.7% and stock prices of banned firms without exchange traded options decreased by 14.7%. This evidence shows that the ban boosted stock prices in banned stocks by about 10% during the ban, but only if the stocks did not have traded options. Once the ban expired, this trend was quickly reversed, as banned stocks with traded options increased 8.0% by the end of 2008 and banned stocks without traded options decreased by 7.3%.

Furthermore, the options volume on banned stocks with traded options during the ban period was 21.80% higher than the average volume over the entire sample period from February 1, 2008 until December 31, 2008. The options volume on non-banned S&P 500 stocks was not statistically changed during the ban period relative to the average options volume on these stocks over the sample period. As non-banned S&P 500 stock prices fell 23.7% with little change in options activity and no new restrictions in short selling, the banned financial stocks with traded options fell approximately the same amount but with restricted short selling and increased options volume. This increased options volume was likely from synthetic short selling, which was in turn driving market-makers to short sell as a hedge their long exposure in options.

II. BACKGROUND AND HYPOTHESIS[2]

A. Political Overview

As bubbles in financial and housing markets collapsed throughout 2008, the SEC and regulators around the world took several steps to prevent speculators and short sellers from driving stock prices down to dangerous levels. In July 2008, the SEC restricted naked short selling in 19 stocks of financial companies until August 12, 2008. Further restrictions on naked short selling were taken on September 17, 2008, when the SEC banned naked short selling in all U.S. stocks, effective 12:01am ET on September 18, 2008. On Thursday, September 18, 2008, the U.K.'s Financial Services Authority (FSA) temporarily banned short selling in 32 financial stocks, effective September 19, 2008 and lasting until January 16, 2009. The FSA's ban also required the disclosure of short positions exceeding 0.25% of total shares outstanding.

Also on September 18, after the U.S. equity markets closed, the SEC, "acting in concert with the U.K. Financial Services Authority,"[3] banned short selling in 797 financial stocks. The SEC emergency order[4] was effective immediately. This initial ban order covered 10 business days (until 11:59pm ET on October 2, 2008), but was later extended.

As Boehmer, et.al[5]. note, understanding the specific details of the ban are crucial for understanding investor and market reaction to the ban. The last short selling ban in the United States occurred in September 1931, when the New York Stock Exchange

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[2] I am very grateful to Ekkehart Boehmer, Charles M. Jones and Xioyan Zhang for their paper "Shackling Short Sellers: The 2008 Short Selling Ban", which provided an outstanding overview of the short selling ban and a relevant literature review, both of which I referenced heavily while working on this paper.
[3] SEC Press Release, September 19, 2008, http://www.sec.gov/news/press/2008/2008-211.htm
[4] SEC release no. 34-58592, and pursuant to Section 12(k)(2) of the Securities Exchange Act of 1934
[5] Boehmer, Ekkehart, Jones, Charles M., Zhang, Xiaoyan, 2008, Shackling Short Sellers: The 2008 Shorting Ban, working paper, Mays Business School, Texas A&M University.

banned all short sales in reaction to England's abandonment of the gold standard. According to Jones[6], short selling of all stocks was banned, including short sales by specialists and other market-makers. This action provoked a market reaction similar to a short squeeze by buyers, "who realized that at least in the short-term there would be few that could stand in the way of their efforts to drive prices up."[7]

The scope of the 2008 SEC short selling ban was not as wide as the one in 1931. Market-makers (defined in the emergency order as "registered market makers, block positioners, or other market makers obligated to quote in the over-the counter market") that were selling short in order to provide market making activity were allowed to continue their short selling activities. Also, Boehmer, et. al. note that the shorting ban became effective on a so-called "triple witching day," the last day of trading before expiration of index options, equity options on individual stocks, and index futures. Barclay, Hendershott, and Jones[8] found evidence that these days are associated with large order imbalances and excess volatility. Accordingly, the SEC granted a 24-hour delay for options market-makers as part of their market making and hedging processes in order to limit volatility and price swings as much as possible. This exemption was later extended to last through the entire ban.

On September 21, the SEC made three amendments to the original ban, effective immediately[9]. First, exchanges were given the authority to determine the ban status of a firm listed on their exchange. Second, options market-makers were allowed to remain

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[6] Jones, Charles M., 2008, Shorting restrictions: revisiting the 1930's, working paper, Columbia Business School.
[7] Boehmer, Ekkehart, Jones, Charles M., Zhang, Xiaoyan, 2008, Shackling Short Sellers: The 2008 Shorting Ban, working paper, Mays Business School, Texas A&M University.
[8] Barclay, Michael, Terrence Hendershott, and Charles Jones, 2008, Order consolidation, price efficiency, and extreme liquidity shocks, *Journal of Financial and Quantitative Analysis* 43, 93-122.
[9] SEC release no. 34-58611

exempt from the ban for the entire length of the ban. The SEC clarified that all market-makers were to be exempted (including ETFs and OTC market-makers). Third, the SEC stated that "a market maker may not effect a short sale…if the market maker knows that the customer's or counterparty's transaction will result in the customer or counterparty establishing or increasing an economic net short position (i.e., through actual positions, derivatives, or otherwise) in the issued share capital of a firm covered by this Order." Boehmer et. al. note that "[t]his language seems designed to discourage the use of listed or OTC derivatives to take a bearish position in the covered stocks, though its main result was probably to provide market-makers with considerable incentives to avoid knowledge of a customer or counterparty's net positions."

On October 2, the SEC extended the ban until the earlier date of either October 17 or three business days following the enactment of President Bush's bailout package[10]. The bailout package became law on the evening of Friday, October 3. The SEC subsequently announced that the ban would end at 11:59pm ET on October 8, 2008, after which all normal shorting activity could resume[11]. The ban lasted for a total of 14 trading days, from September 19, 2008 through October 8, 2008.

B. Literature Review

The most closely related research to this study is a working paper by Boehmer, Jones and Zhang[12] in which they examine the effect of the ban on short selling volume, stock prices and returns, volatility, and short selling spreads. In their research, Boehmer et. al. find that, the start of the shorting ban is associated with stock price increases for

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[10] Formally known as H.R. 1424, the Emergency Economic Stabilization Act of 2008
[11] Note that naked short selling still remained banned
[12] Boehmer, Ekkehart, Jones, Charles M., Zhang, Xiaoyan, 2008, Shackling Short Sellers: The 2008 Shorting Ban, working paper, Mays Business School, Texas A&M University.

banned stocks, that shorting activity drops by about 85% in the banned stocks and that

banned stocks suffered a degradation in market quality, as measured by spreads, price

impacts, and intraday volatility. Boehmer et. al. point out that the decreased short selling

observed in banned shares, "suggest[s] there was not massive substitution by hedge funds

and other short sellers into derivatives."

In theory, supply and demand would predict that banning short selling would

result in lower supply and higher prices for the stocks. Figlewski[13], Miller[14] and Harrison

and Kreps[15] using models and empirical testing found that restricting short selling

prevents short sellers from bringing negative information to the market and as a

consequence, prices become artificially high. Empirical findings show that the abnormal

return on equity repurchases is only about one third of the size that equity offerings are

overpriced[16]. This difference between returns signifies that it is easier to get overpriced

than underpriced, a phenomena largely explained by short selling constraints. Duffie,

Garleanu and Pedersen[17] found that search frictions in the stock lending market result in

the inability for short sellers to drive prices to fundamental levels. In contrast, Diamond

and Verrechia[18] theorized that if all market players are rational, short selling restrictions

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[13] Figlewski, Steven, The Informational Effects of Restrictions on Short Sales: Some Empirical Evidence, *The Journal of Financial and Quantitative Analysis*, Vol. 16, No. 4, Proceedings of 16th Annual Conference of the Western Finance Association, June 18-20, 1981, Jackson Hole, Wyoming (Nov., 1981), pp. 463-476

[14] Miller, Edward M., 1977, Risk, uncertainty, and divergence of opinion, *Journal of Finance* 32, 1151-1168.

[15] Harrison, J.M., Kreps, David., 1978, Speculative Investor Behavior in a Stock Market with heterogeneous Expectations, *Quarterly Journal of Economics,* XCII(2), 323-336.

[16] Loughran, Timothy, and Ritter, Jay (1997). The operating performance of firms conducting seasoned equity offerings. Journal of Finance 52:5, 1823-1850.

And: Ikenberry, David, Lakonishok, Josef, and Vermaelen, Theo (1995). Market Underreaction to Open Market Share Repurchases. Journal of Financial Economics, 39:181-208.

[17] Duffie, Darrell, Nicolae Garleanu, and Lasse Heje Pedersen, 2002, Securities Lending, Shorting, and Pricing, *Journal of Financial Economics*, vol. 66, pp. 307-339.

[18] Diamond, Douglas W. and Robert E. Verrecchia, 1987, Constraints on short-selling and asset price adjustment to private information, *Journal of Financial Economics* 18, 277-311.

do not cause stock prices to be biased, although downward price adjustments may be slower in taking effect.

Short selling is a more advanced trade than simply buying and selling, and it can be reasoned that investors looking to make such trades are therefore more informed when making these trades. Diamond and Verrechia[19] support this argument and also note that a short seller would never short sell for liquidity reasons. Empirical testing has provided evidence that short sellers are "informed" investors. Boehmer et. al.[20] point to Dechow et al.[21], Desai, Krishnamurthy, and Venkataraman[22], Cohen, Diether, and Malloy[23], and Boehmer, Jones, and Zhang[24] to, "show that in aggregate short sellers appear to trade based on (and be well-informed about) fundamentals, and they earn excess returns. Aitken, Frino, McCorry, and Swan[25] show that in Australia, where a short sale is publicly identified as such immediately on execution, short sales have a larger impact on price than regular-way sales."

Empirical findings have generally shown that when short selling is banned, costly, complicated or generally difficult, stocks can become overvalued. Lamont and Thaler[26]

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[19] Diamond, Douglas W. and Robert E. Verrecchia, 1987, Constraints on short-selling and asset price adjustment to private information, *Journal of Financial Economics* 18, 277-311.

[20] Boehmer, Ekkehart, Jones, Charles M., Zhang, Xiaoyan, 2008, Shackling Short Sellers: The 2008 Shorting Ban, working paper, Mays Business School, Texas A&M University.

[21] Dechow, Patricia, Amy Hutton, Lisa Meulbroek, and Richard G. Sloan, 2001, Short-sellers, fundamental analysis, and stock returns, *Journal of Financial Economics* 61, 77-106.

[22] Desai, Hemang, Srinivasan Krishnamurthy, and Kumar Venkataraman, 2006, Do short sellers target firms with poor earnings quality? Evidence from earnings restatements, *Review of Accounting Studies* 11, 71-90.

[23] Cohen, Lauren, Karl Diether, and Christopher Malloy, 2007, Supply and demand shifts in the shorting market, *Journal of Finance* 62, 2061-2096.

[24] Boehmer, Ekkehart, Charles M. Jones, and Xiaoyan Zhang, 2008a, Which shorts are informed?, *Journal of Finance* 63, 491-527.

[25] Aitken MJ, Frino A, McCorry MS, Swan PL, 1998, Short sales are almost instantaneously bad news: evidence from the Australian Stock Exchange, *Journal of Finance* 53, 2205-2223.

[26] Lamont, Owen A. and Richard H. Thaler, 2003, Can the market add and subtract? Mispricing in tech stock carve-outs, *Journal of Political Economy* 111:227-268.

and Mitchell, Pulvino and Stafford[27] studied technology spin-offs during the late 1990s and found that these spinoffs were so overpriced that arbitrage was an obvious strategy but difficulty in short selling these firms prevented effective arbitrage. Pontiff[28] found similar arbitrage constraints due to short-selling difficulties in the closed-end fund market.

Boehmer et. al. also discuss the short selling literature regarding market structure changes and price reaction:

> A number of researchers have also studied market structure changes that make it easier or harder to short. For example, Jones (2008)[29] finds significant price effects when shorting is restricted during the Great Depression. Danielsen and Sorescu (2001)[30] show that the introduction 3 of listed options on a given stock eases shorting constraints and reduces share prices lightly. Ho (1996)[31] finds an increase in stock return volatility when short sales were restricted during the Pan Electric crisis in the Singapore market in 1985-1986. Chang, Cheng, and Yu (2007)[32] find price effects in Hong Kong when specific stocks are designated as eligible for shorting. Rhee (2003)[33] finds some evidence of price effects in Japan following imposition of an uptick rule there. In contrast, Diether, Werner, and Lee (2008)[34] find that Regulation SHO's pilot program to suspend short sale price tests does not affect share prices, and Boehmer, Jones, and Zhang (2008b)[35] find similar evidence when U.S. short sale price tests are removed completely in 2007.
>   Shorting restrictions also affect liquidity and the adjustment of

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[27] Mitchell, Mark, Todd Pulvino, and Erik Stafford, 2002, Limited arbitrage in equity markets, *Journal of Finance* 57(2):551-584.

[28] Pontiff, Jeffrey, 1996, Costly arbitrage: evidence from closed-end funds, *Quarterly Journal of Economics* 111, 1135-1151.

[29] Jones, Charles M., 2008, Shorting restrictions: revisiting the 1930's, working paper, Columbia Business School.

[30] Danielsen, Bartley R. and Sorin M. Sorescu, 2001, Why do option introductions depress stock prices? A study of diminishing short sale constraints, *Journal of Financial and Quantitative Analysis* 36, 451-484.

[31] Ho, Kim Wai, 1996, Short-sales restrictions and volatility: the case of the stock exchange of Singapore, *Pacific-Basin Finance Journal* 4, 377-391.

[32] Chang, Eric C., Joseph W. Cheng, and Yinghui Yu, 2007, Short-sales constraints and price discovery: evidence from the Hong Kong market, *Journal of Finance* 62, 2097-2121.

[33] Rhee, S. Ghon, 2003, Short-sale constraints: good or bad news for the stock market?, Organization for Economic Cooperation and Development report.

[34] Lee, C. M. C. and M. Ready, 1991, Inferring trade direction from intraday data, *Journal of Finance* 46, 733-746.

[35] Boehmer, Ekkehart, Charles M. Jones, and Xiaoyan Zhang, 2008b, Unshackling short sellers: The repeal of the Uptick Rule, working paper, Columbia University.

prices to new information. Diamond and Verrecchia (1987)[36] predict that if there are shorting constraints, prices will adjust more slowly to negative information. Reed (2007)[37] finds an asymmetric price adjustment in response to information about earnings, and Bris, Goetzmann, and Zhu (2007)[38] find that downward price moves are slower in markets where shorting is prohibited. Using weekly data on share lending supply and borrowing fees from 26 markets, Saffi and Sigurdsson (2007)[39] show that less constrained firms (proxied by high lending supply and a low borrowing fee) are more efficiently priced in that they have shorter price delays. Boehmer and Wu (2008)[40] document that short selling makes prices more informationally efficient and reduces post-earnings announcement drift. Diether, Werner, and Lee (2009)[41] find that the 2005 pilot program to suspend price tests in the U.S. slightly worsens some measures of market quality, and Boehmer, Jones, and Zhang (2008b)[42] find that market quality worsens further when the uptick rule is repealed completely.

Figlewski and Webb[43] provide empirical evidence that the presence of tradable options increases transactional and informational efficiency on such stocks by reducing the effect of constraints on short sales. The same study also suggested that short selling constraints can cause stock prices to not fully account for negative information. Figlewski and Webb show that this effect seems to be reduced by the presence of tradable options and provide evidence that the presence of tradable options increases the amount of short selling in the underlying shares.

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[36] Diamond, Douglas W. and Robert E. Verrecchia, 1987, Constraints on short-selling and asset price adjustment to private information, *Journal of Financial Economics* 18, 277-311.

[37] Reed, Adam, 2007, Costly short-selling and stock price adjustment to earnings announcements, working paper, University of North Carolina.

[38] Bris, Arturo, William N. Goetzmann and Ning Zhu, 2007, Efficiency and the bear: short sales and markets around the world, *Journal of Finance* 62, 1029-1079.

[39] Saffi, Pedro A., and Kari Sigurdsson, 2007, Price efficiency and short-selling, Working paper, London Business School.

[40] Boehmer, Ekkehart and Julie Wu, 2008, Short selling and the informational efficiency of prices, working paper, Texas A&M University.

[41] Diether, Karl B., Kuan-Hui Lee, and Ingrid M. Werner, 2009, It's SHO time! Short-sale price tests and market quality, forthcoming, *Journal of Finance*.

[42] Boehmer, Ekkehart, Charles M. Jones, and Xiaoyan Zhang, 2008b, Unshackling short sellers: The repeal of the Uptick Rule, working paper, Columbia University

[43] Figlewski, Stephen, and Webb, Gwendolyn, P., 1993, Options, Short Sales, and Market Completeness, *Journal of Finance*, 48.2, pp. 761-777.

Battalio and Schultz[44] found that synthetic short selling very closely replicates actual short selling, even in hard-to-borrow shares. Specifically the authors note that, "short sales of synthetic shares, formed by buying puts and writing calls, are a viable alternative to selling actual shares short… the expected proceeds from a synthetic short sale averaged about 99.5% of the expected proceeds from the short sale of actual shares. Even the hard-to-borrow stocks in our sample could be easily sold short synthetically, yielding proceeds that were on average only 0.6% less than the proceeds of an actual short-sale."

Overall the literature support the view that short selling constraints often exist and limit negative information from reaching the market, and can result in stocks becoming overvalued. Regarding synthetic short selling, Boehmer et. al. assert that not much synthetic short selling occurred during the ban, yet previous research in the area would indicate that such a trading strategy should be possible for informed investors to effectively implement during the ban.

C. Hypotheses

Stock Prices

Since investors can use options to synthetically short sell, and the options market-makers can short sell to hedge the long options exposure from these trades, it is hypothesized that the returns on banned stocks with traded options will be similar to the returns on the control group of non-banned S&P 500 stocks. Furthermore, it is hypothesized that returns on banned stocks with traded options will be lower than returns on banned stocks without traded options, since there will be less hedging-driven short

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[44] Battalio, Robert H. and Schultz, Paul H., Options and the Bubble (March 2004). AFA 2005 Philadelphia Meetings; EFA 2004 Maastricht Meetings Paper No. 3081. Available at SSRN: http://ssrn.com/abstract=558543

selling in the stocks without tradable options and limit negative information from driving down the stock price.

Options Volume

Additionally, it is hypothesized that the options volume on the banned stocks with tradable options will be significantly higher during the short selling ban than the volume before and after as investors that would normally short sell shift to using options to execute synthetic short sales. Also, it is hypothesized that the non-banned S&P 500 stocks will not experience a significant change in options volume due to the ban. Since investors can directly short sell the control group of non-banned S&P 500 stocks, no significant changes in options markets are expected for these stocks between the before, during and after ban periods.

III. DATA

The sample period for this study extends from February 1, 2008 through December 31, 2008. The study divided the 797 banned stocks into two groups, those with traded options and those without traded options. The non-banned S&P 500 stocks were used as a control group.

Due to data constraints and the timeliness of the study, all options data was downloaded from a Bloomberg terminal. Bloomberg was used to determine that 277 of the 797 banned stocks had exchange traded options. Put and call volumes were collected daily for each of the 277 banned stocks as well as the S&P 500 stocks with exchange traded options.

The Center for Research in Security Prices (CRSP) database was used to collect information on the daily stock prices over the course of the sample period. Due to

incomplete or missing data, the stock price history was attained for 270 of the 277 banned stocks with exchange traded options, 476 of the 520 banned stocks without exchange traded options, and 498 of the 500 S&P 500 stocks.

IV. METHODOLOGY

Two analyses were used to evaluate the hypotheses. The first analysis examines the returns on banned stocks with and without traded options with the non-banned S&P 500 stocks are used as a control group. This analysis examines the average returns on stocks over holding periods of the entire sample period as well as before, during and after the ban. Because the existence of options allows investors to synthetically short sell and may result in market-makers short selling to hedge options positions, this method will look for evidence that banned stocks without tradable options had higher returns than banned stocks with traded options and the control group. T-tests will be used to determine whether the differences between the groups and holding periods are statistically significant.

The second analysis examines options volume on the banned stocks with traded options compared to the control group of non-banned S&P 500 stocks. Specifically, this analysis first averages the options volume for the two groups over the entire sample period. Then for each group the analysis compares the options volume before, during and after the ban to the average over the entire period in order to determine abnormal option trading volumes. T-tests will be used to determine if the differences found are statistically significant.

V. RESULTS

Analysis 1: Stock Returns

This analysis evaluates two hypotheses: (1) that returns on banned stocks without traded options will be higher than returns on banned stocks with traded options and non-banned S&P 500 stocks during the ban period, and (2) that over the entire sample period, the returns on banned stocks with traded options will be similar to the returns on the control group of non-banned S&P 500 stocks

Table 1 shows the holding period returns over four different periods: the entire sample period, before the ban, during the ban and after the ban. For each of these periods, the returns are shown for three groups: banned stocks with traded options, banned stocks without traded options and non-banned S&P 500 stocks as a control group.

Over the entire sample period, the average return on banned stocks with tradable options was –34.2%, the average return on banned stocks without tradable options was –36.0% and the average return on non-banned S&P 500 stocks was –36.5%. T-tests show that the returns for the entire sampling period for all of these groups were not statistically different from one another. We can conclude that the returns on the stocks of the three groups were not different from February 1, 2008 to December 31, 2008.

During the ban period, the average return on banned stocks with traded options was –24.6%, the average return on banned stocks without traded options was –14.7% and the average return on non-banned S&P 500 stocks was –23.7%. T-testing confirms the hypothesis that the banned stocks with tradable options did have lower returns during the ban than the banned stocks without tradable options. The difference between the –24.6% returns on banned stocks with tradable options and –14.7% on banned stocks without

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tradable options has a p-value less than 0.00000.

In other words, the banned stocks without tradable options were boosted approximately 10% over banned stocks with tradable options during the short selling ban. This effect can be explained in terms of the exemption given to options market-makers during the ban. As investors used synthetic short selling in the stocks with traded options, market-makers were left with long positions in the stocks. Then market-makers short sold the banned shares with traded options as a hedge for their options exposure, which indirectly reflected the investors' negative expectations in the stock price. This explanation goes a long way in explaining the extra 10% decrease in banned stocks with traded options relative to those without traded options. The evidence confirms the first hypothesis; banned stocks without traded options could not be synthetically short sold and consequentially they received a 10% boost in prices and returns.

Following the end of the ban, this difference in returns disappeared, and even slightly reversed as the banned stocks with traded options returned +8.0% from October 9 to December 31, 2008 and the banned stocks without traded returned –7.3% (difference between groups significant, p-value = .017). It is possible that investors who had used synthetic short selling during the ban were repurchasing the stocks after the ban in order to capture returns they made from price decreases, similar to a short seller "covering" their position by purchasing the stock and delivering it back to the lender. For the stocks that did not have tradable options during the ban, the end of the ban was the first time in 14 trading days in which investors could short sell these stocks. Since these stock prices seemed to be inflated relative to the banned stocks with traded options and the non-banned S&P 500 stocks, investors likely short sold these shares following the end of the

ban, which explains the observed price decrease after the ban.

It appears that the SEC's short-selling ban did accomplish its goal of boosting the prices of banned stocks, provided these stocks did not have traded options. However, this effect only lasted for the duration of the short selling ban. As soon as the ban ended, the prices of the banned firms that could not be synthetically short sold decreased relative to the banned firms that could be synthetically short sold. Essentially, all three groups ended 2008 with the same returns from the beginning of February 2008; the difference was in how the ban manipulated returns throughout that period.

The second hypothesis was that the returns on banned stocks with traded options will be similar to the returns on the control group of non-banned S&P 500 stocks. The evidence for this pattern is not clear. The returns on these two groups were not statistically different over the entire sample period as well as before and during the short selling ban. However, after the short selling ban (from 10/9/08 to 12/31/08), the banned stocks with traded options returned +8.0% while the non-banned S&P 500 stocks returned –5.4%, a statistically significant difference at a 1% confidence level. It is possible that the end of the ban signified positive news for the banned stocks and caused synthetic short sellers to cover their positions in order to profit from the 24% price decrease in banned stocks with traded options during the ban before optimistic investors began increasing prices. Covering positions combined with positive news of the end of the ban and passing of the bailout package would mean increased buying and increasing prices in these stocks. Since non-banned S&P 500 stocks were not financial firms, investors may have believed this group was not affected as much by the end of the ban and the bailout package, causing these stocks to reacted less to important news during the

period after the ban.

Figure 1 provides a graph depicting the returns in each period on banned stocks with and without traded options relative to the non-banned S&P 500 stocks.

Analysis 2: Options Volume

This analysis evaluates two hypotheses: (1) that that the options volume on the banned stocks with tradable options will be significantly higher during the short selling ban than the volume before and after the ban, and (2) that the non-banned S&P 500 stocks will not experience a significant change in options volume due to the ban.

Table 2 shows the average daily volume on call and put options before, during and after the ban as well as over the entire sample period for banned stocks with traded options and non-banned S&P 500 stocks as a control group. For the banned stocks with traded options, the total options volume (calls plus puts) is 21.80% higher during the ban period relative to the entire sample period. This number is 2.99% for the non-banned S&P 500 stocks. Meanwhile, the total options volume on banned stocks before the ban is 0.05% below the average over the entire sample period, and after the ban this number is 5.21% below the sample period average.

T-tests confirm that the +21.80% abnormal volume on banned stocks with traded options during the ban is a statistically significant finding when compared with the options volume on these stocks in the before and after ban periods, p-values of t-tests for mean difference are .026 and .013 respectively. This finding supports the hypothesis that the options volume on banned stocks with tradable options was be significantly higher during the short selling ban than the volume before and after the ban. Additionally, the difference between options volume in the before and after periods for the banned stocks

is not statistically different.

For the non-banned S&P 500 stocks, t-tests show no significant differences in options volume before, during and after the ban. Compared to the average over the entire period, the options volume on the non-banned S&P 500 stocks before the ban was +1.01%, during the ban was +2.99% and after the ban was –3.56%. None of these differences were statistically significant upon t-testing. This finding supports the second hypothesis that the non-banned S&P 500 stocks would not experience a significant change in options volume throughout the sample period.

The evidence supporting these two hypotheses provides further support that investors were using synthetic short selling on the banned stocks if traded options were available. It was observed that the banned stocks with traded options and the non-banned S&P 500 stocks decreased by approximately the same amount during the ban. The banned stocks with traded options experience a significant increase in options volume, which likely drove market-makers to use their exemption to actually short sell shares as a hedge to exposure to synthetic short sales. The non-banned S&P 500 stocks could be directly short sold by investors, so options markets for these stocks did not have an increased importance during the ban, and we do not see a jump in options volume. As the results show, options markets for the non-banned S&P 500 stocks did not show significant volume changes before, during or after the ban. It seems apparent that investors were using options during the ban to synthetically short sell banned stocks with traded options.

Figure 2 provides a graphical comparison of the abnormal options volume on banned stocks with traded options and non-banned S&P 500 stocks over before, during

and after the ban periods.

VI. CONCLUSION

The empirical findings of this paper support the theory that investors used options to synthetically short sell banned stocks during the short sell ban. This finding comes in contrast to the assertion by Boehmer, Jones and Zhang[45] that there was not much substitution by short sellers into derivatives. The results are more in line with Figlewski and Webb's[46] and Battalio and Schultz's[47] findings that the presence of traded options creates more actual short selling and that synthetic short selling very closely replicates actual short selling.

Empirical evidence shows that the exceptions made by the SEC during the 2008 short selling ban appear to have defeated the purpose of the ban for the stocks with tradable options. Additionally, evidence shows that the positive effect that the ban had for banned stocks without tradable options was quickly reversed upon the end of the ban. As investors substituted into synthetic short selling using options, options market-makers hedged their exposure by short selling using their exempt status. This theory is supported by evidence in both stock returns and options volume before, during and after the 2008 short selling ban.

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TABLE 1: STOCK RETURN ANALYSIS

This table displays the holding period returns for three groups (banned stocks with traded options, banned stocks without traded options and non-banned S&P 500 stocks) over four different periods: the entire sample period (2/1/08 to 12/31/08), before the ban (2/1/08 to 9/18/08), during the ban (9/19/08 to 10/8/08) and after the ban (10/9/08 to 12/31/08). Additionally, the difference between the two banned stock groups and the control group are shown to highlight how the ban influenced banned stocks relative to stocks not affected by the ban. ***, **, and * denote statistical significance at the 1%, 5% and 10% level, respectively.

	Average Holding Period Return				
	Before Ban (2/1/08 - 9/18/08)	During Ban (9/19/08 - 10/8/09)	After Ban (10/9/08 - 12/31/08)	Entire Period (2/1/08 - 12/31/08)	Sample Size
Non-banned S&P 500	-10.2%	-23.7%	-5.4%	-36.5%	438
Banned Stocks With Traded Options	-13.5%	-24.6%	8.0%	-34.2%	270
Banned Stocks Without Traded Options	-18.1%	-14.7%	-7.3%	-36.0%	476
Difference: Banned with Options – Non-banned S&P	-3.3%*	-0.8%	13.4%***	2.3%	
Difference: Banned without Options – Non-banned S&P	-7.9%***	9.0%***	-1.9%	0.5%	

STOCK RETURN ANALYSIS T-TESTS

		Before Ban				During Ban	
Banned with Options vs. Banned Without Options	t-Test: Two-Sample Assuming Unequal Variances				t-Test: Two-Sample Assuming Unequal Variances		
	Before Ban	Banned With Options	Banned Without Options		During Ban	Banned With Options	Banned Without Options
		Variable 1	*Variable 2*			*Variable 1*	*Variable 2*
	Mean	-13.5043%	-18.0566%		Mean	-24.5699%	-14.7236%
	Variance	0.0852	0.0767		Variance	0.0580	0.0230
	Observations	270.00	476.00		Observations	270.00	476.00
	Hypothesized Mean Difference	0.00			Hypothesized Mean Difference	0.00	
	df	535.00			df	392.00	
	t Stat	2.0850			t Stat	-6.0721	
	P(T<=t) one-tail	0.0188			P(T<=t) one-tail	0.0000	
	t Critical one-tail	1.6477			t Critical one-tail	1.6488	
	P(T<=t) two-tail	0.0375			P(T<=t) two-tail	0.0000	
	t Critical two-tail	1.9644			t Critical two-tail	1.9660	
Banned with Options vs. Non-banned S&P 500	t-Test: Two-Sample Assuming Unequal Variances				t-Test: Two-Sample Assuming Unequal Variances		
	Before Ban	Banned With Options	Non-banned S&P 500		During Ban	Banned With Options	Non-banned S&P 500
		Variable 1	*Variable 2*			*Variable 1*	*Variable 2*
	Mean	-13.5043%	-10.1743%		Mean	-24.5699%	-23.7470%
	Variance	0.0852	0.0405		Variance	0.0580	0.0108
	Observations	270.00	438.00		Observations	270.00	438.00
	Hypothesized Mean Difference	0.00			Hypothesized Mean Difference	0.00	
	df	427.00			df	332.00	
	t Stat	-1.6485			t Stat	-0.5319	
	P(T<=t) one-tail	0.0500			P(T<=t) one-tail	0.2976	
	t Critical one-tail	1.6484			t Critical one-tail	1.6495	
	P(T<=t) two-tail	0.1000			P(T<=t) two-tail	0.5952	
	t Critical two-tail	1.9655			t Critical two-tail	1.9671	
Banned without Options vs. Non-banned S&P 500	t-Test: Two-Sample Assuming Unequal Variances				t-Test: Two-Sample Assuming Unequal Variances		
	Before Ban	Banned Without Options	Non-banned S&P 500		During Ban	Banned Without Options	Non-banned S&P 500
		Variable 1	*Variable 2*			*Variable 1*	*Variable 2*
	Mean	-18.0566%	-10.1743%		Mean	-14.7236%	-23.7470%
	Variance	0.0767	0.0405		Variance	0.0230	0.0108
	Observations	476.00	438.00		Observations	476.00	438.00
	Hypothesized Mean Difference	0.00			Hypothesized Mean Difference	0.00	
	df	866.00			df	845.00	
	t Stat	-4.9488			t Stat	10.5603	
	P(T<=t) one-tail	0.0000			P(T<=t) one-tail	0.0000	
	t Critical one-tail	1.6466			t Critical one-tail	1.6467	
	P(T<=t) two-tail	0.0000			P(T<=t) two-tail	0.0000	
	t Critical two-tail	1.9627			t Critical two-tail	1.9628	

STOCK RETURN ANALYSIS T-TESTS (CONTINUED)

	After Ban			Entire Period		
Banned with Options vs. Banned Without Options	t-Test: Two-Sample Assuming Unequal Variances			t-Test: Two-Sample Assuming Unequal Variances		
	After Ban	Banned With Options	Banned Without Options	Entire Period	Banned With Options	Banned Without Options
		Variable 1	*Variable 2*		*Variable 1*	*Variable 2*
	Mean	8.0371%	-7.3260%	Mean	-34.1856%	-36.0116%
	Variance	0.3625	1.8432	Variance	0.1096	0.2025
	Observations	270.00	476.00	Observations	270.00	476.00
	Hypothesized Mean Difference	0.00		Hypothesized Mean Difference	0.00	
	df	711.00		df	696.00	
	t Stat	2.1274		t Stat	0.6334	
	P(T<=t) one-tail	0.0169		P(T<=t) one-tail	0.2633	
	t Critical one-tail	1.6470		t Critical one-tail	1.6470	
	P(T<=t) two-tail	0.0337		P(T<=t) two-tail	0.5267	
	t Critical two-tail	1.9633		t Critical two-tail	1.9634	
Banned with Options vs. Non-banned S&P 500	t-Test: Two-Sample Assuming Unequal Variances			t-Test: Two-Sample Assuming Unequal Variances		
	After Ban	Banned With Options	Non-banned S&P 500	Entire Period	Banned With Options	Non-banned S&P 500
		Variable 1	*Variable 2*		*Variable 1*	*Variable 2*
	Mean	8.0371%	-5.3911%	Mean	-34.1856%	-36.5071%
	Variance	0.3625	0.0432	Variance	0.1096	0.0489
	Observations	270.00	438.00	Observations	270.00	438.00
	Hypothesized Mean Difference	0.00		Hypothesized Mean Difference	0.00	
	df	309.00		df	418.00	
	t Stat	3.5369		t Stat	1.0205	
	P(T<=t) one-tail	0.0002		P(T<=t) one-tail	0.1540	
	t Critical one-tail	1.6498		t Critical one-tail	1.6485	
	P(T<=t) two-tail	0.0005		P(T<=t) two-tail	0.3081	
	t Critical two-tail	1.9677		t Critical two-tail	1.9657	
Banned without Options vs. Non-banned S&P 500	t-Test: Two-Sample Assuming Unequal Variances			t-Test: Two-Sample Assuming Unequal Variances		
	After Ban	Banned Without Options	Non-banned S&P 500	Entire Period	Banned Without Options	Non-banned S&P 500
		Variable 1	*Variable 2*		*Variable 1*	*Variable 2*
	Mean	-7.3260%	-5.3911%	Mean	-36.0116%	-36.5071%
	Variance	1.8432	0.0432	Variance	0.2025	0.0489
	Observations	476.00	438.00	Observations	476.00	438.00
	Hypothesized Mean Difference	0.00		Hypothesized Mean Difference	0.00	
	df	499.00		df	704.00	
	t Stat	-0.3071		t Stat	0.2138	
	P(T<=t) one-tail	0.3795		P(T<=t) one-tail	0.4154	
	t Critical one-tail	1.6479		t Critical one-tail	1.6470	
	P(T<=t) two-tail	0.7589		P(T<=t) two-tail	0.8308	
	t Critical two-tail	1.9647		t Critical two-tail	1.9633	

TABLE 2: OPTION VOLUME ANALYSIS

This table displays the average daily volume for banned stocks with traded options and non-banned S&P 500 (as a control group) on call and put options for the entire sample period (2/1/08 to 12/31/08), before the ban (2/1/08 to 9/18/08), during the ban (9/19/08 to 10/8/08) and after the ban (10/9/08 to 12/31/08). The percentage difference from the average daily volume over the entire sample period is also computed to determine the abnormal options volume in the before, during and after periods. For the "% Difference From Average Daily Volume Over Entire Sample Period", ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

	Banned Stocks with Traded Options			Non-banned S&P 500 Stocks		
Average Daily Volume	**Aggregate Put**	**Aggregate Call**	**Aggregate Call and Put**	**Aggregate Put**	**Aggregate Call**	**Aggregate Call and Put**
Before Ban	701,769	633,361	1,335,130	2,315,795	1,709,684	4,025,478
During Ban	753,353	873,656	1,627,008	2,187,575	1,916,818	4,104,392
After Ban	638,189	628,013	1,266,202	2,060,364	1,783,359	3,843,723
Entire Period	689,207	646,605	1,335,812	2,244,996	1,740,417	3,985,412
% Difference From Average Daily Volume Over Entire Sample Period						
Before Ban	1.82%	-2.05%	-0.05%	3.15%	-1.77%	1.01%
During Ban	9.31%	35.11%***	21.80%**	-2.56%	10.14%	2.99%
After Ban	-7.40%	-2.88%	-5.21%	-8.22%	2.47%	-3.56%
Entire Period	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

OPTIONS VOLUME ANALYSIS T-TESTS ON AGGREGATE CALL AND PUT VOLUME

	Banned Stocks With Traded Options			Nonbanned S&P 500 Stocks		
Before Ban vs. During Ban	t-Test: Two-Sample Assuming Unequal Variances			t-Test: Two-Sample Assuming Unequal Variances		
	Banned Stocks With Traded Options	Before Ban	During Ban	Nonbanned S&P	Before Ban	During Ban
		Variable 1	*Variable 2*		*Variable 1*	*Variable 2*
	Mean	-0.0510%	21.7992%	Mean	1.0053%	2.9854%
	Variance	0.2201	0.0962	Variance	0.0485	0.0670
	Observations	160.00	14.00	Observations	160.00	14.00
	Hypothesized Mean Difference	0.00		Hypothesized Mean Difference	0.00	
	df	19.00		df	15.00	
	t Stat	-2.4059		t Stat	-0.2775	
	P(T<=t) one-tail	0.0132		P(T<=t) one-tail	0.3926	
	t Critical one-tail	1.7291		t Critical one-tail	1.7531	
	P(T<=t) two-tail	0.0265		P(T<=t) two-tail	0.7852	
	t Critical two-tail	2.0930		t Critical two-tail	2.1314	
After Ban vs. During Ban	t-Test: Two-Sample Assuming Unequal Variances			t-Test: Two-Sample Assuming Unequal Variances		
	Banned Stocks With Traded Options	After Ban	During Ban	Nonbanned S&P	After Ban	During Ban
		Variable 1	*Variable 2*		*Variable 1*	*Variable 2*
	Mean	-5.2110%	21.7992%	Mean	-3.5552%	2.9854%
	Variance	0.1903	0.0962	Variance	0.0766	0.0670
	Observations	57.00	14.00	Observations	57.00	14.00
	Hypothesized Mean Difference	0.00		Hypothesized Mean Difference	0.00	
	df	27.00		df	21.00	
	t Stat	-2.6729		t Stat	-0.8353	
	P(T<=t) one-tail	0.0063		P(T<=t) one-tail	0.2065	
	t Critical one-tail	1.7033		t Critical one-tail	1.7207	
	P(T<=t) two-tail	0.0126		P(T<=t) two-tail	0.4129	
	t Critical two-tail	2.0518		t Critical two-tail	2.0796	
Before Ban vs. After Ban	t-Test: Two-Sample Assuming Unequal Variances			t-Test: Two-Sample Assuming Unequal Variances		
	Banned Stocks With Traded Options	Before Ban	After Ban	Nonbanned S&P	Before Ban	After Ban
		Variable 1	*Variable 2*		*Variable 1*	*Variable 2*
	Mean	-0.0510%	-5.2110%	Mean	1.0053%	-3.5552%
	Variance	0.2201	0.1903	Variance	0.0485	0.0766
	Observations	160.00	57.00	Observations	160.00	57.00
	Hypothesized Mean Difference	0.00		Hypothesized Mean Difference	0.00	
	df	105.00		df	83.00	
	t Stat	0.7515		t Stat	1.1237	
	P(T<=t) one-tail	0.2270		P(T<=t) one-tail	0.1322	
	t Critical one-tail	1.6595		t Critical one-tail	1.6634	
	P(T<=t) two-tail	0.4540		P(T<=t) two-tail	0.2644	
	t Critical two-tail	1.9828		t Critical two-tail	1.9890	

FIGURE 1: HOLDING PERIOD RETURNS RELATIVE TO THE NON-BANNED S&P 500 STOCKS

This figure provides a graph depicting the returns on banned stocks with and without traded options relative to the non-banned S&P 500 stocks over the entire sample period, before the ban, during the ban and after the ban periods.
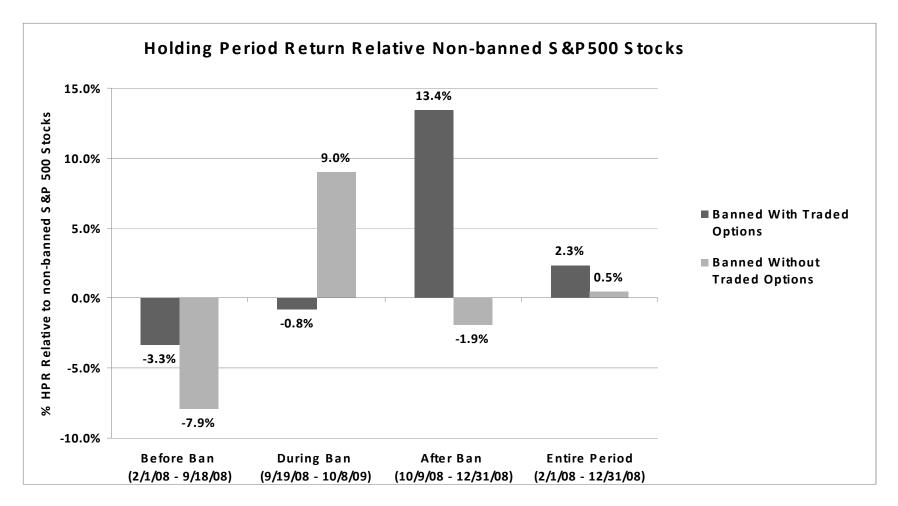

Holding Period Return Relative Non-banned S&P500 Stocks

This figure provides a graphical comparison of the abnormal options volume on banned stocks with traded options and non-banned S&P 500 stocks over before, during and after the ban periods. Abnormal volume is defined as the percentage above or below which the period's average volume differs from the average volume over the entire sample period.

Total Options Volume (Call and Put Combined): % Above Entire Sample Period Average