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"Short-Selling Constraints: The Asymmetric Role of Institutional Ownership, Relative Short Interest, Options and Dividends"

By

Jose Gutierrez
Assistant Professor of Finance
Department of General Business and Finance
Sam Houston State University
936-294-3380
jag063@shsu.edu

Steve Johnson
Assistant Professor of Finance
Department of General Business and Finance
Sam Houston State University
936-294-1283
sjj008@shsu.edu

Robert Stretcher
Professor of Finance
Department of General Business and Finance
Sam Houston State University
936-294-3308
fin_rhs@shsu.edu

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Short-Selling Constraints: The Asymmetric Role of Institutional Ownership, Relative Short Interest, Options and Dividends

Abstract

We assess the effect of four short-sale constraints on stock returns in isolation and in combination, in generally falling versus generally rising markets, and considering relative effects for large/mid cap versus small/micro cap firms. We find that across our variety of model specifications, there is substantial evidence that our more fully specified model provides considerable additional explanatory power. We also find that the constraint behavior is asymmetric when testing during generally falling versus generally rising markets, and that small- and micro-cap firms provide important effects when viewed separately. Our results provide substantive pricing differences based on our model specification.

JEL Classification: G12; G14

Keywords: Short-selling; Short-sale constraints; Asymmetry; Asymmetric constraints; Constraints; Short interest; Relative short interest; Institutional ownership; Options; Option introduction; Dividends; Pessimism; Firm size

I. Introduction

It is widely documented in the finance literature that the degree to which short sellers are constrained in their activities depends on several key measures. The mainstream measures include institutional ownership, relative short interest, and the presence of options. Some evidence of a role for dividend- versus non-dividend-paying firms also exists. While the literature is rich with assessments of the roles of each individual measure, and even with some combined roles, the question remains as to the meaning and significance when all of the measures are specified simultaneously, and whether these measures have asymmetric effects in falling versus rising markets. This paper addresses these questions, and finds that a series of economically significant patterns emerge.

Using a random effects panel regression on a balanced dataset of 1,529 S&P Total Market Index firms, we examine the relationships between institutional ownership, relative short interest, options and dividends in rising and falling securities markets and the degree to which they may represent constraints to short-selling activities. Our analysis reveals an overall pattern where the effects of mid to lower levels of institutional ownership, the absence of exchange-traded options, the presence of cash dividends, and low levels of relative short interest are consistent with the presence of short-sale constraints. While each of these constraints is important in the aggregate, however, none of them behave as constraints during periods of generally falling securities markets. Instead, during a falling market, it appears that the explanatory power of these measures is either non-existent, or even the opposite of what we might hypothesize. During periods of a generally-rising market, however, all four proxies behave in a way that is more consistent with previous research. In addition, we find that small and micro-cap firms are more short-sale constrained than are large or mid-cap firms because of the additional possible constraint from lack of options .

II. Literature Review

Short sellers are generally believed to be sophisticated investors. This notion is supported in that short selling occurs despite greater transaction costs and larger downside risks associated with short selling relative to holding long positions.

The proceeds from a short sale are not immediately available to the short seller, but instead are frozen as collateral for the owner of the borrowed shares. While the short seller can earn interest on these proceeds, the earned rate is normally below the market rate. The difference between the market rate for lending the shares and the below-market rate earned rate for the short seller represents compensation to the lender during the delay of availability of short sale proceeds. Another item related to the cost of short selling is the tax treatment. Short sale profits are taxed at the short-term capital gains rate, regardless of the length of time the short position is open.

There are risks associated with short-selling as well. The maximum gain for a short seller is the price of the stock if the stock price falls to zero, but the potential loss is unlimited (if the stock price rises without end). Another risk to the short seller is that the loan can be recalled at the lender's option. This can happen if the lender decides to sell those shares. Then, if the short seller is unable to locate a new lender, then the short seller must purchase shares in the open market, return them to the original lender, and close the position. Short sellers have the ability to avoid this risk by choosing to borrow on a term basis, but additional fees may be involved.

Based on these points, Diamond and Verrechia (1987) suggest that short sellers will not trade unless they expect the price of the asset to fall by an amount large enough to compensate them for the additional costs and risks associated with short selling. The authors then propose that short sellers are more informed than holders of long positions.

When investors are unable to short sell an asset or unwilling to incur the higher costs of doing so, that asset is said to be short-sale constrained. We define a constraint as anything that makes short selling less attractive or more difficult relative to a long position.

Miller (1977) argues that when investors differ in their beliefs as to the value of an asset, the presence of short-sale constraints can generate deviations from fundamental value. More specifically, Miller argues that investors with bullish opinions about a stock will rationally take long positions. Bearish investors, on the other hand, would like to short the stock; being unable to do so because of a constraint, they instead sit on the sidelines and do not trade. In this case, the price of the stock represents the opinions of only the most optimistic investors, translating into artificially inflated prices, and thus lower subsequent returns. For any given degree of divergence in investor expectations, the greater the short-sale constraint, the greater the price and return bias will be.

It is traditionally held that one of the proxies for a short selling constraint is the proportion of institutional ownership (IO) in a given stock. D'Avolio (2002) shows that institutional investors are the main suppliers of stock loans. Therefore, IO could be a proxy of the loan supply as well as a proxy for the cost of short selling. Short sellers must borrow shares from an investor willing to lend. Low levels of IO may thus be consistent with low loan supply. Furthermore, if loan supply is thin, the short seller may have to pay a sizable fee, making it more expensive to short sell. Chen, Hong, and Stein (2002), Nagel (2004), and Asquith, Pathak, and Ritter (2005) use IO as a proxy for short-sale constraints and demonstrate that the cross-sectional underperformance in returns is stronger when IO is low than when it is moderate or high.

A second common metric for the degree of constraint to short selling is relative short interest (RSI), the ratio of the number of shares which have been sold short to the number of shares outstanding. This proxy was first proposed by Figlewski (1981), and approximates the demand to short sell a given stock. It is traditionally held that as the level of RSI for a given firm increases, it becomes more difficult to short that firm at the margin. Asquith and Meulbroek (1995) and Desai, Ramesh, Thiagarajan, and Blachandran (2002) find negative and significant abnormal returns for stocks with high short interest levels. Chen et al. (2002), however, point out that using short interest to proxy for short-

sale constraints is problematic for at least two reasons. First, most stocks have little or no short interest outstanding at any given time, and, second, low short interest may reflect the high transaction costs of shorting. Indeed, Boehme, Danielsen, and Sorescu (2006) however point out that a stock with high levels of short interest must be relatively unconstrained rather than highly constrained. Thus, it is arguable that low levels of short interest, as opposed to high levels, are more representative of a short-selling constraint.

The lack of exchange-traded options for a given stock may represent another form of a short-sale constraint. With options, investors can take a short position in a stock without having to short sell the stock directly. For instance, by either buying put options or writing call options, an investor can take a synthetic short position and bet on the expected downward movement in the value of a particular asset. However, when stocks do not have exchange-traded options, this synthetic short position cannot be created, thereby making it possible for pessimists to trade on their information only by short selling the stock directly. Figlewski and Webb (1993), Danielsen and Sorescu (2001), and Phillips (2011) find that firms with exchange-traded options are in fact less short-sale constrained. Furthermore, the lack of options, combined with either low levels of IO and/or constrained levels of RSI, might make it extremely difficult for investors to take a short position in a given stock.

A lack of exchange-traded options, however, is not a common feature among either large cap or mid cap stocks. At the end of 2011, all of the S&P 500 firms had exchange-traded options, and at least 99% of S&P 400 mid-cap firms had exchange-traded options. There is a considerable drop-off in exchange traded options, however, in the S&P small cap and S&P microcap firms. Starting with the S&P Total Market Index, which has 3,773 constituent firms, and dropping the S&P 500 large-cap and the S&P 400 mid-cap firms, only about 57% of the remaining S&P small cap and S&P microcap firms have exchange-traded options.

The decision to introduce a stock option is not made by a firm's board of directors, but instead is made at the discretion of the option exchange. Mayhew and Mihov (2004) point out that if the primary motivation of the exchange is the long-term profitability of the exchange, then the board of the option exchange will select stocks which are likely to generate the largest long-term trading volume. Danielsen, Van Ness, and Warr (2007) examine stock characteristics which are predictive of option introduction and find that stocks with high market capitalization, improving liquidity and high abnormal volatility are favored for option listing. Phillips (2011) argues that while it is unlikely that option exchanges are attempting to select stocks with improving efficiency, it is possible that they may indirectly do so based on their selection criteria. He supports this conclusion by citing an increase in IO, suggesting that stocks undergo an increase in investor recognition and/or popularity prior to option introduction.

If option introduction reduces short-sale constraints, it would be expected to be predictive of negative abnormal returns as historical negative information withheld from the market is impounded in stock prices. Conrad (1989) and Detemple and Jorion (1990), however, investigate whether option introductions change the price levels of underlying stocks and find positive effects. Sorescu (2000) and Danielsen and Sorescu (2001), on the other hand, find that for options listed from 1980 to 1995, the underlying stock realizes negative abnormal returns following option introduction. Using a control sample of non-optioned stocks having similar characteristics to those selected for option introduction, Mayhew and Mihov (2005) find that the control portfolio exhibits similar negative abnormal returns, suggesting that the relationship between option introduction and negative abnormal return may be spurious and more a result of stock characteristics common at the time of option listing. Ni, Pearson, and Poteshman (2005) further show that stocks with exchange-listed options tend to cluster at option strike prices on expiration dates. They also show that there is no corresponding change in the distribution of the closing prices of non-optionable stocks. Phillips (2011) finds that option introduction alleviates 79% of the price adjustment efficiency disparity between short-sale constrained and

unconstrained stocks in relation to negative news. No significant improvement in adjustment efficiency is found in response to positive news.

Finally, dividend paying firms may be more short-sale constrained than non-dividend paying firms (Dechow, Huton, Meulbroek, and Sloan 2001). Consider a short seller shorting a dividend paying firm. The paid dividends belong to the lender of the shares, not to the short seller. Thus, the short seller must transfer any paid dividends back to the lender once the position is closed. In frictionless capital markets, the share price should fall by the amount of the dividend. However, Frank and Jagannathan (1998) demonstrate that the ex-dividend stock price is normally higher than the pre-dividend stock price less the amount of the dividend. For example, if a firm pays a $0.10 dividend, but the share price only falls by $0.09, then the short seller will have to make up the difference, which represents a material cost to the short-seller. Research by Michaely and Vila (1995 & 1996), and Koski and Scruggs (1998) show that trading volume increases after dividend announcements and before the ex-dividend date, suggesting that some traders engage in a dividend-capturing strategy. They also document abnormal trading activity prior to the ex-dividend date. They conjecture that securities dealers may short a stock cum-dividend and buy it back ex-dividend if they believe the price decrease on the ex-dividend date will be greater than the amount of the dividend plus any additional transaction costs.

In this paper, all of the four above-referenced constraints are investigated in isolation, as well as in combination with one another. Beyond that, their behavior under both a generally-falling securities market and a generally-rising securities market is addressed, as well as their behavior across large and mid-cap firms versus small and micro-cap firms.

III. Data Source and Selection Procedure

The data for this study are compiled from four different sources and spans September 2007 through December 2011. Data on stock returns are from the Center for Research in Security Prices

(CRSP) Daily Stocks File for NYSE, AMEX, and NASDAQ stocks. Semi-monthly IO and RSI data are compiled by ShortSqueeze.com, which provides data on a universe of approximately 7,000 firms. Exchange-traded options data are compiled by DeltaNeutral.com, which provides end-of-day quotes for options on all optioned stocks for the U.S. Equities markets, including every stock, index, and ETF for all strike prices and expiration dates. Finally, the Fama-French factor returns are obtained from Kenneth French's website. September 2007 marks the beginning of the analysis because it is the first month where stock exchanges were required to provide standardized semi-monthly, as opposed to monthly, data regarding IO and RSI on a stock-by-stock basis.

The starting universe of stocks is defined as all S&P Total Market Index[a] (S&P TMI) firms which were part of the S&P TMI from September 2007 through December 2011. The S&P TMI is used because it allows for some degree of homogeneity with regard to firm quality, which is especially necessary for small or micro-cap firms. As of December 2011, there were 3,773 constituent firms which made up the S&P TMI. 998 firms were dropped that were not part of the index starting from September 2007. An additional 986 firms were lost based on not having an observation in each of the firm-specific datasets (CRSP, ShortSqueeze.com, and DeltaNeutral.com), at each of the possible 104 semi-monthly data points. Finally, 260 firms began the dataset without exchange-traded options, but finished with them. These 260 firms were dropped in order to test the long-term impact of exchange-traded options on short-selling constraints without having to deal with the directional impact of their introduction. Based on the previous research of Figlewski and Webb (1993), Danielsen and Sorescu (2001), and Mayhew and Mihov (2005), it is argued that that the introduction of exchange-traded options represent an economically important relaxation of short-sale constraints, however, there is no consensus as to whether the impact on returns was positive or negative. Therefore, in order to focus on the long-term role that the presence

[a] Criteria for S&P TMI inclusion can be found at:

https://www.sp-indexdata.com/idpfiles/indexalert/prc/active/factsheets/fs-sp-total-market-index-ltr.pdf

(or lack) of options plays on short-selling constraints, the 260 option-introducing firms are removed. The final dataset consists of a balanced panel of 1,529 S&P TMI firms.

IV. Methodology

In this investigation, a cross section of stock returns of 1,529 companies over 52 months from September 14, 2007 through December 30, 2011 is examined. A random effects panel regression is used to control for both firm-specific and time-specific random effects and the Arellano (1987) version of the White (1980) heteroscedasticity-consistent covariance matrix corrected standard errors to control for heteroscedasticity and auto correlation. Based on previous research into factor models, specifically, Fama and French (1993 & 1996), and Carhart (1997), the model controls for the market, size, value, and momentum factors.

The following regressions are estimated using a semi-monthly time horizon. The time subscript is suppressed.

(1)

$$(R_i - R_f) = \alpha + \sum_{j=1}^{4} \Omega_j \phi_j + \beta_1 \lambda_1 + \beta_2 \lambda_2 + \mu_i + \eta + \varepsilon_i$$

(2)

$$(R_i - R_f) = \alpha + \sum_{j=1}^{4} \Omega_j \phi_j + \beta_3 \lambda_3 + \beta_4 \lambda_4 + \mu_i + \eta \ + \varepsilon_i$$

(3)

$$(R_i - R_f) = \alpha + \sum_{j=1}^{4} \Omega_j \phi_j + \beta_5 \lambda_5 + \mu_i + \eta \ + \varepsilon_i$$

(4)

$$(R_i - R_f) = \alpha + \sum_{j=1}^{4} \Omega_j \phi_j + \beta_6 \lambda_6 + \mu_i + \eta \ + \varepsilon_i$$

where:

β_1 through β_6 = regression coefficients for λ_1 through λ_6, respectively
λ_1 = 1 if top tercile of short interest, 0 otherwise
λ_2 = 1 if middle tercile of short interest, 0 otherwise
λ_3 = 1 if middle tercile of institutional ownership, 0 otherwise
λ_4 = 1 if lower tercile of institutional ownership, 0 otherwise
λ_5 = 1 if the stock is optioned, 0 otherwise

λ_6 = 1 if the stock pays a cash dividend in the current month, 0 otherwise
Ω = a vector of coefficients for the control variables
ϕ = the values of the control variables
λ = the values of the constraint variables
μ = the firm specific random effect, normally distributed with mean = 0
η = the time specific random effect, normally distributed with mean = 0
ε = the error term
α = the intercept term
$(R_i - R_f)$ = the excess return on stock i

and

(5)

$$(R_i - R_f) = \sum_{j=1}^{4} \Omega_j \phi_j + \sum_{k=1}^{6} \beta_k \lambda_k + \mu_i + \eta + \varepsilon_i$$

where:

β = a vector of coefficients for the constraint variables

R_i represents the semi-monthly return on the i^{th} firm (at time *t*), and R_f is one-half the return of the one-month Treasury bill[b]. The first four control variables are the excess return on the market portfolio $(R_M - R_f)$, the difference between the returns of value-weighted portfolios of small and big firm stocks (SMB), the difference in returns of value-weighted portfolios of high and low book-to-market stocks (HML), and the difference in returns of value-weighted portfolios of firms with high and low prior momentum (UMD), or up minus down.

V. Summary Statistics

A. Sample

Panel A of Table 1 provides a breakdown of the 1,529 S&P TMI firms used in the study. 348 of the 1,529 firms are S&P 500 large-cap firms, 189 are S&P 400 mid-cap firms, and the remaining 992 are S&P small and micro-cap firms. Panel B of Table 1 provides summary statistics for IO and RSI for all 1,529 firms. Panels C and D provide the same summary statistics across large and mid-cap firms and small and

[b] Monthly risk-free rates of return are multiplied by 0.50 and applied to both mid and end-of-month regressions.

micro-cap firms, respectively. Both variables are calculated for each firm separately before the cross-sectional sample statistics are computed.

D'Avoilo (2002) shows that institutional investors are the main suppliers of stock loans. Thus, as the level of IO falls, the supply of shortable shares falls with it, thereby constraining the short sale of a given stock. Panel B of Table 1 shows that the average outstanding shares owned by institutions is approximately 61.48% of a firm's outstanding shares. However, as evidenced by Panels C and D, institutional investors hold smaller portions of small and micro-cap firms (53.19%) versus large or mid-cap firms (76.80%). This finding, combined with the findings of D'Avolio (2002) is consistent with the notion of small and micro-cap firms being more short-sale constrained than large or mid-cap firms.

The role of RSI was proposed by Figlewski (1981), and approximates the demand to short sell a given stock. It is traditionally held that as the level of RSI for a given firm increases, the demand to short that stock increases, thereby making it more difficult to short that firm at the margin. Consistent with the findings of Chen et al. (2002), however, we observe that on average, firms have little or no short interest outstanding, as evidenced by an average of only 5.63% of outstanding shares shorted at any given time. A separation of large and mid-cap firms (4.87%) from small and micro-cap firms (6.04%) shows that low levels of RSI are not a function of market cap.

(Insert Table 1 Here)

The lack of a tradable option means that investors are only able to take a short position in a stock directly, as opposed to taking a synthetic short position by purchasing put options or selling call options. The lack of exchange-traded options is thus consistent with higher levels of short-selling constraint. Another potential short-selling constraint concerns cash dividends paid by the firm. If the value of a stock does not drop by the amount of the paid dividend, as shown by Frank and Jagannathan (1998), then shorting a stock that is scheduled to pay a dividend exposes the short seller to increased levels of risk. In the context of this study, the presence of a dividend is also consistent with increased

levels of short-selling constraint since the short seller would be responsible for transferring all paid dividends to the original lender. However, if the stock price does not fall by at least the amount of the dividend, then the short seller must come up with the difference. This difference represents a material cost to the short seller.

Panel B of Table 1 also provides a breakdown of both the option and dividend status for the 1,529 firms in the study. The exchange-traded option section shows that, of the 1,529 investigated firms, 1,107 (72.4%) have traded options and the remaining 422 (27.6%) do not. The dividend-paying section provides a breakdown of dividend paying versus non-dividend paying firms. 653 firms (42.7%) did not pay any cash dividends during the term, while 876 firms (57.3%) paid at least one dividend from September 2007 to December 2011.

Panels C and D of Table 1 provide the same breakdown as Panel A, but for large and mid-cap firms versus small and micro-cap firms. It is interesting to note that all 537 (100%) large or mid-cap firms have exchange-traded options, and 414 (77.1%) paid at least one cash dividend during the study. Small and micro-cap firms, on the other hand, are much more evenly split across both fronts. 570 of the 992 (57.5%) small and micro-cap firms have exchange-traded options, whereas 422 (42.5%) do not, and 462 (46.6%) pay cash dividends, whereas 530 (53.4%) do not.

In summary, if the lack of exchange-traded options does in fact represent a short-selling constraint, then that constraint only applies to small and micro-cap firms, and not to large or mid-cap firms. Second, if cash dividends represent a short-selling constraint, then that constraint applies to all large and mid-cap firms, but only to about half of the small and micro-cap firms. Therefore, it may be useful to examine firms separately based on size. Otherwise, the presence of options and the payment of cash dividends may be proxies for size rather than specific short selling constraint measures.

B. Test Windows: Full-Term, Generally Rising, and Generally Falling Securities Market

Figure 1 presents the weekly performance of the S&P 500 index from September 2007 through December 2011. Our analysis is conducted across the full term, as well as a "generally falling" term and a "generally rising" term. The generally falling term is from September 14, 2007 through February 27, 2009, and spans 36 semi-monthly data points for 1,241 firms. The generally rising term is from March 13, 2009 through December 30, 2011, and spans 68 semi-monthly data points for the same 1,529 firms. We analyze the data in this manner based on our proposition that short-selling constraints may behave in an asymmetric fashion.

(Insert Figure 1 Here)

C. Test of Differences

Table 2 presents a difference of mean test for IO and RSI for each of the three groups of firms (all firms, large & mid-cap, and small & micro-cap). The test is conducted three times, once across option status, once across dividend status, and once across falling versus rising securities markets. Panel A contains results for all 1,529 firms, Panel B contains results for large and mid-cap firms only, and Panel C contains results for small and micro-cap firms only.

Panel A of Table 2 shows that the means of both IO and RSI are statistically higher in the case where the firm has exchange-traded options. With regard to IO, the results show that, on average, for firms with exchange-traded options, 72.73% of outstanding shares are institutionally owned, versus 34.74% for firms without exchange-traded options. This finding is consistent with Fehrs and Mendenhall (1994), who examined the average number of institutional investors of optioned stocks relative to a non-optioned control sample, and found that optioned stocks attract a greater number of institutional investors. Boehmer and Kelley (2009) found that stocks with greater IO are priced more efficiently to the extent that their prices more closely follow a random walk. The authors argued that if options attract institutional investors, and if institutional investors are more informed and sophisticated than the

average investor, then greater institutional investor holdings will contribute to improved informational efficiency.

(Insert Table 2 Here)

Panel A of Table 2 also presents results for tests of differences in IO and RSI based on the dividend-paying status of firms. In the case of IO, it appears as though institutional holdings are slightly heavier for dividend-paying firms. In the case of RSI, however, there appears to be slightly reduced values for dividend paying firms.

Finally, Panel A of Table 2 shows results for tests of differences in IO and RSI depending on whether the overall securities market (represented by the S&P 500 index) was "generally falling" or "generally rising". From September 2007 through February 2009, when the S&P 500 index was generally falling, stocks had statistically lower levels of IO and statistically higher levels of RSI, compared to the period March 2009 through December 2011, when the S&P 500 index was generally rising. Lower levels of institutional ownership during falling markets is consistent with the notion of "flight to quality", whereas higher levels of RSI during this same time frame is consistent with the idea of traders taking advantage of a generally falling market by increasing their short position across securities.

VI. Empirical Results: Individual Constraint Variables

Miller's (1977) overpricing hypothesis states that high levels of short-sale constraints may prohibit investors from short selling certain stocks. If investors are unable to short sell these stocks, then the price of these securities may be artificially high, which should translate into lower subsequent returns. Once the constraint is removed, however, and investors are again free to short these securities, the stock price may fall. Past studies demonstrated that (individually or in some combinations) low levels of IO, high levels of RSI, the absence of exchange-traded options, and the presence of dividends are all consistent with the notion of a short-sale constraint. In this section of the study, individual firm

returns are regressed on each of the aforementioned constraints individually to determine if the presence of any of the constraints does in fact reduce the returns associated with the corresponding stock. The vector of control variables is included in each regression. This analysis is repeated for the "generally falling" portion of the sample period, and again for the "generally rising" portion to ascertain whether each/any of the constraints behave asymmetrically depending on the market environment.

Panels A, B, and C of Table 3a provide semi-monthly return analysis based on the full term, the "generally falling" term, and the "generally rising" term, respectively. The four columns of results in each panel coincide with IO, RSI, option status, and dividend status, respectively. Both IO and RSI are divided into terciles (low, mid, & high). We report the results for the full sample of 1,529 firms in table 3a. We report the results separately for the 537 large- and mid-cap firms in table 3b, and for the 992 small- and micro-cap firms in table 3c.

D'Avolio (2002) found that institutional investors are the main suppliers of stock loans, thereby allowing IO to proxy for short-selling loan supply. Proposed by Figlewski (1981), RSI approximates the demand to short sell a given stock. It is traditionally held that as the level of RSI for a given firm increases, it becomes more difficult to short that firm at the margin. Based on this, low levels of RSI are used to represent a relatively unconstrained stock. In the case of IO, high levels of IO are consistent with a relatively unconstrained stock. The tercile representing the lowest short-sale constraint (high IO and low RSI) is used as the "base case." A test is then run to determine whether the two other terciles of that variable are statistically different from the corresponding base case with regard to their impact on firm returns.

A value of 1 is assigned if a firm has exchange-traded options, 0 otherwise. Similar to both IO and RSI, the least constrained condition (in this setting, the presence of options) is used as the base case. A test is then run to determine whether the lack of tradable options has a statistically different impact on firm returns relative to that base case. The presence of exchange-traded options is considered

to be the least constrained condition because options allow investors to bet on the downward movement in a stock without having to short the stock directly. With tradable options, investors can establish synthetic short positions by either buying puts or writing calls.

Finally, a value of 1 is assigned if a firm pays a cash dividend in the current month, 0 otherwise. Based on the results of Frank and Jagannathan (1998), a test is run to determine if cash dividends represent a material cost to short sellers when the stock price does not fall by the amount of the dividend. Due to their result, the absence of cash dividends is used as the least constrained case. It should be noted that a dividend-paying firm is categorized as "dividend-paying" only during the month of an actual dividend payment. So although a firm may pay a consistent quarterly dividend throughout the study, it is categorized as "no dividend payment" during all months where no actual dividend is paid. The purpose for this is to solely test the effect of an actual dividend payment on the decision of a short seller.

(Insert Table 3a Here)

A. Individual Constraint Variables: Full-Term

The first column of Panel A presents the results for IO. The results indicate that low levels of IO translate into lower firm returns at a statistically significant level, relative to high levels of IO. This is consistent with Miller's (1977) theory that short-sale constrained stocks will have artificially high prices and yield lower returns. The results for RSI, on the other hand, are the opposite of results from previous literature. Column 2 shows that firms with mid and high levels of RSI tend to have higher returns compared to firms with low levels of RSI. This is more consistent with the findings of Chen et al. (2002) who claim that higher levels of short interest could mean that the stock is relatively unconstrained rather than highly constrained. Based on the results from column 2, it might be argued that low, as opposed to high, levels of relative short interest are more consistent with a short selling constraint, since low levels of short interest may reflect the high cost of shorting. The third column tests the impact

of exchange-traded options on firm returns. Again, consistent with expectations, the results indicate that the lack of a tradable option prohibits traders from taking a synthetic short position, which leads to inflated prices and lower returns. The fourth column of Panel A tests the impact that the presence of cash dividends have on firm returns. Interestingly enough, this last constraint does not impact firm returns in the full-term, relative to the corresponding least constrained base case.

B. Individual Constraint Variables: Generally Falling Market

The previous regressions are re-run across the "generally falling" market, from September 2007 through February 2009. If the short-selling constraint variables behave symmetrically, then we should expect to find the same pattern on both the "generally falling" and "generally rising" markets as for the entire full-term analysis.

Panel B of Table 3a presents the results for the "generally falling" market. In the full-term analysis, low IO and the absence of exchange-traded options had a statistically negative impact on firm returns and mid and high levels of RSI had a statistically positive impact, but during a falling market, of the three, only IO is able to maintain its explanatory power. On the other hand, whereas the presence of cash dividends did not have any explanatory power in the full-term analysis, the presence of dividends in a generally falling market actually increase firm returns.

Concerning the question of why cash dividends contribute to higher firm returns, research by Michaely and Vila (1995 & 1996), and Koski and Scruggs (1998) may provide some guidance. In their research, they show that trading volume increases after dividend announcements and before the ex-dividend date, suggesting that some traders engage in a dividend-capturing strategy. A dividend-capturing strategy may in fact be popular during a falling securities market if the objective is to soften the blow to an investor's portfolio.

C. Individual Constraint Variables: Generally Rising Market

The previous regressions are once again re-run across the "generally rising" market, from March 2009 through December 2011. In Panel C of Table 3a, we observe the constraints behaving in a manner nearly universally consistent with theoretical expectations. Particularly, in the case of IO, where low levels of IO are consistent with the most short-sale constrained case, firm returns are reduced by nearly a quarter of a percent (-0.241%) per half-month. Mid and high levels of RSI have a statistically and economically significant effect on firm returns. However, as seen in the full-term analysis, the traditionally-held view that high levels of RSI are consistent with short-sale constraints appears to be backwards. Column 2 of Panel C again supports the results of Chen et al. (2002) who argue that low, as opposed to high, levels of relative short interest are more consistent with a short selling constraint, since it may represent the high cost of shorting. Related to this point, Jones and Lamont (2002) show that stocks that are expensive to short have larger price-earnings ratios and earn lower subsequent returns, consistent with the hypothesis that they are overpriced. Finally, a reference back to Table 1 will show that even the maximum level of RSI only reaches 35.53%, which hardly seems to be a "constrained level." This last point is consistent with Asquith et al. (2005), who find that the typical firm has very little short interest.

Columns 3 and 4, which report results for option and dividend status respectively, provide additional insight concerning the asymmetric behavior of short-selling constraints. Theory suggests that the lack of tradable options and the presence of cash dividends should make a stock more short-sale constrained, which should translate into lower subsequent returns. In a generally rising market, this appears to be precisely the case. In particular, the absence of exchange-traded options and the presence of cash dividends are responsible for a reduction in firm returns in the order of -0.463% and -0.202%, respectively, per half-month.

D. Individual Constraint Variables: Large & Mid-Cap versus Small & Micro-Cap

Because all large and mid-cap firms have exchange-traded options, they are potentially only exposed to three (IO, RSI, and Dividends) of the four possible short-selling constraints. Small and micro-cap firms, on the other hand, could potentially be exposed to all four. Moreover, if there is in fact a hierarchy with regard to the relative strength of the constraints, then it is possible for the behavior of the constraints to differ between large and mid-cap firms versus small and micro-cap firms due to this differential exposure. This question is investigated, and results are reported in Tables 3b and 3c. Table 3b presents results for the 537 large and mid-cap firms, whereas Table 3c presents the results for the 992 small and micro-cap firms.

(Insert Tables 3b and 3c here)

Table 3a shows that low levels of IO behaved as constraints across the board in the full-term. However, results in table 3c indicate that IO only acts as a constraint for small- and micro-cap firms over the full term, and over the rising market term. There is no significant effect over the falling market term. Table 3b reports that mid levels of IO have statistical power for large- and mid-cap firms, albeit with the opposite sign (positive). With regard to RSI, it again appears that firms with mid and high levels of RSI, regardless of market cap, tend to have higher returns compared to firms with low levels of RSI. This constraint also demonstrates an asymmetric behavior, having no statistical power, or having power in the opposite direction in the generally falling term versus the full term or the generally rising term.

As previously mentioned, all large and mid-cap firms in our sample have exchange-traded options. Therefore, any constraint due to the lack of tradable options will only occur for small or micro-cap firms. As seen in Table 3c, the lack of tradable options behaves as a constraint for small and micro-cap firms, but again, asymmetrically. In the generally falling term, the lack of exchange-traded options had zero impact on firm returns. In the full term, however, as well as in the generally rising term, the absence of exchange-traded options is responsible for a reduction in firm returns in the order of -0.229% and -0.445%, respectively, per half-month.

The analysis of the impact that cash dividends have on short-selling constraints for all 1,529 firms yielded zero power in the full-term, a positive impact on returns in the generally falling term, and a negative impact in the generally rising term. Parsing the data, however, between large and mid-cap firms versus small and micro-cap firms yields additional results. For the 537 large and mid-cap firms, the presence of a cash dividend had a negative and statistically significant impact on returns across all three terms analyzed. This is consistent with cash dividends representing a material cost to the short seller when the stock price does not fall by the amount of the dividend, as supported by the work of Frank and Jagannathan (1998). For the 992 small and micro-cap firms, on the other hand, the presence of dividends only had a statistically significant impact on returns in the generally falling term, but with the opposite sign. This result is more in line with a dividend-capturing strategy in a falling market in an attempt to soften the blow to a portfolio.

VII. Empirical Results: Combined Constraint Variables

The final part of the analysis consists of a full specification test of all four constraint variables simultaneously, allowing for possible interaction effects. After categorizing both IO and RSI as either "low", "mid", or "high", and assigning either a "0" or "1" for option and dividend status, there are a total of 36 (3 X 3 X 2 X 2) possible combinations of the four aforementioned constraint variables. By definition, the most constrained stocks will be those with low IO and high RSI, with no exchange-traded options, that pay cash dividends. Each firm has one of these possible combinations at each of the 104 semi-monthly data points. As in prior sections, the full specification model is then run across the 18-month "generally falling" term and the 34-month "generally rising" term to examine whether any/all of the constraints have asymmetric effects.

(Insert Table 4a Here)

A. Combined Constraint Variables: Full-Term

The first column of Table 4a provides the full-specification results for the entire 52-month term. The resulting pattern is somewhat ambiguous, and there is no clear-cut pattern as to what combination of constraints has a statistically significant impact on firm returns. As a general summary, there are a total of 10 statistically significant results in column 1. Each of the 10 statistically significant results has a negative coefficient, indicating that each has a negative impact on firm returns, consistent with Miller's (1977) overpricing hypothesis.

Beyond this, Panel A of Table 5a provides a simple variable count to give an indication of the number of times a specific variable tercile (in the case of IO and RSI) or binary level (in the case of option and dividend status) was responsible for any of the 10 statistically significant results. Low, mid, and high IO were represented 4, 4, and 2 times, respectively. Low, mid, and high RSI were represented 6, 2, and 2 times, respectively. With regard to option status, a "lack of tradable options" was represented 7 times, whereas "presence of tradable options" was represented 3 times. Finally, with regard to dividend status, "no cash dividend" was represented 4 times, while "presence of cash dividend" was represented 6 times. Based on this summary of the entire 52-month term, it can be argued that low to mid levels of IO, low levels of RSI, a lack of exchange-traded options, and the presence of a cash dividend are indeed consistent with short-sale constraints.

(Insert Table 5a here)

B. Combined Constraint Variables: Generally Falling Market

The previous combined constraint variable panel regression is re-run across the "generally falling" market, from September 2007 through February 2009, to test if the short-sale constraint combinations behave asymmetrically. The results from column 2 of Table 4a indicate, simply, that in a falling market, conventional measures of short-selling constraints are not priced. None of the possible 36 short-sale constraint combinations have any statistically significant impact on firm returns (positive or negative).

C. Combined Constraint Variables: Generally Rising Market

The regression is once again re-run across the "generally rising" market, from March 2009 through December 2011. The results from column 3 of Table 4a provide further evidence of the asymmetric behavior of short-selling constraints and their impact on firm return. Unlike the "generally falling" period results, the "generally rising" period results strongly imply that certain combinations of short-selling constraints do lead to artificially inflated prices that translate into lower subsequent returns. In fact, there are eight different combinations of constraints that have a statistically significant negative impact on firm return.

Table 5a also provides a simple variable count to give an indication of the number of times a specific variable tercile or binary level was responsible for any of the eight statistically significant results. Low, mid, and high IO was represented 5, 2, and 1 times, respectively. Low, mid, and high RSI was represented 3, 1, and 4 times, respectively. With regard to option status, a "lack of tradable options" was represented 6 times whereas "presence of tradable options" was represented 2 times. Finally, with regard to dividend status, "no cash dividend" was represented 3 times, while "presence of cash dividend" was represented 5 times. Based on the results of column 3 of Table 4a, it can be argued that in a rising market, low levels of IO, the lack of exchange-traded options, and the presence of cash dividends are likely the three best indicators of a short-selling constraint.

D. Combined Constraint Variables: Large & Mid-Cap versus Small & Micro-Cap

Again, because the lack of exchange-traded options only apply to small and micro-cap firms, the four-constraint, full specification test allowing for all possible interaction effects is run again, this time separating the large and mid-cap results from the small and micro-cap results. There are 36 possible combinations of the four constraint variables for small and micro-cap firms, however, for the large and mid-cap firms, there only a total of 18 (3 X 3 X 2 X 1) possible combinations. Table 4b presents the comprehensive results for the 537 large and mid-cap firms, whereas Table 4c presents the

comprehensive results for the 992 small and micro-cap firms. These two tables are then summarized in Tables 5b and 5c, respectively.

(Insert Tables 4b, 4c, 5b, and 5c here)

Focusing first on Tables 4b and 5b (large and mid-cap firms), there are a total of eight negative and significant results across all three periods analyzed. It is worth noting however, that there are no significant results in the generally falling term, which further suggests asymmetric behavior of the short-selling constraints. Beyond that, it is interesting to note that the presence of cash dividends appears in seven of the eight combinations, and low levels of RSI appear in six of the eight. In summary, all large and mid-cap firms have exchange-traded options, which render that particular constraint irrelevant; where the lack of options does not apply, though, it appears that firms with low levels of RSI and cash dividends tend to generate lower returns.

Focusing next on Tables 4c and 5c (small and micro-cap firms), there are a total of 22 negative and significant results across all three periods analyzed. While large and mid-cap firms had zero significant results in the generally falling term, small and micro-cap firms had one of the 22 appear in the generally falling term, providing additional support of the asymmetric behavior of the constraints.

In the case of short-selling constraints for small and micro-cap firms, the lack of exchange-traded options appears in 14 of the 22 combinations, low or mid levels of IO appear in 18 of the 22, and low or mid levels of RSI appear in 17 of the 22. Taking the lack of options into account, dividends do not seem to be as important a driver for small and micro-cap firms as for large and mid-cap firms.

VIII. Concluding Remarks

Using S&P Total Market Index firm data from September 2007 through December 2011, we assessed the pricing of a variety of short sale constraints both in isolation and in a more fully specified model. Individually specified, lower returns (artificially higher prices) are associated with low IO and lack

of options; mid and high RSI had a positive impact, while dividend payment does not indicate a significant impact. Simultaneously specified, the four constraint variables present a pattern generally in agreement with Miller's (1977) overpricing hypothesis.

Parsing the full term into generally falling and generally rising markets, we find substantial support for asymmetry in the pricing of constraints. Individually specified, only IO maintained explanatory power in a generally falling market. The presence of dividends, having no explanatory power in the full term, increased firm returns in the generally falling market. In the generally rising market, however, all of our constraint variables were priced, with mid and high RSI again having a positive impact on returns. This provides substantive evidence that asymmetric effects are present. Turning to the more fully specified model (that exhibited some ambiguous significant results in the full term), we find that none of the short-selling constraints have any pricing results in the generally falling market. However, in the generally rising market, eight different constraint combinations present a statistically significant negative impact on firm returns, generally in agreement with previous research.

Since the lack of exchange traded options only applies to small- and micro-cap stocks, the models were re-specified to capture differences. Individually specified, while low levels of IO behaved as constraints across the board in the full-term, this result is driven by small and micro-cap firms, and only in the full term, and to a slightly stronger case, in the rising securities market term. Mid levels of IO have statistical power for large and mid-cap firms, albeit with the opposite sign (positive). With regard to RSI, it again appears that firms with mid and high levels of RSI, regardless of market cap, tend to have higher returns compared to firms with low levels of RSI. This constraint also demonstrates an asymmetric behavior, having no statistical power, or having power in the opposite direction in the generally falling term versus the full term or the generally rising term. Absence or presence of exchange traded options represent a possible constraint only for small or micro-cap firms, the lack of tradable options as a constraint for small and micro-cap firms. Again, the effect is asymmetrical: in the generally falling term,

the lack of exchange-traded options had zero impact on firm returns, but in the full term and in the generally rising term, the absence of exchange-traded options is responsible for a reduction in firm returns in the order of -0.229% and -0.445%, respectively, per half-month. The presence of cash dividends yielded no explanatory power in the full-term, a positive impact on returns in the generally falling term, and a negative impact on returns in the generally rising term. For the large and mid-cap firms, the presence of a cash dividend had a negative and statistically significant impact on returns across all three terms analyzed. For small and micro-cap firms, the presence of dividends only had a statistically significant impact on returns in the generally falling term, but with the opposite sign. This result is more in line with a dividend-capturing strategy in a falling market in an attempt to soften the blow to a portfolio.

Our more fully specified model for large/mid versus small/micro firms yielded greater insight. For large- and mid-cap firms, eight significant, negative results occurred, none of which appeared during the generally falling market, suggesting further support for asymmetry; cash dividends and low RSI appear prominent in the combinations that had significance. For small- and micro-cap firms, 22 significant, negative results were present, only one of which occurred in the generally falling market. As suspected, the lack of options had a strong effect in the 22 significant results for small- and micro-cap firms, being present in 17 out of the 22.

Our study suggests practical guidance for short sellers, since many of our results imply substantive pricing outcomes. Public policy changes may also be implied; since investors may be able to apply these outcomes to more closely identify over- or under-valued stocks, it may be in the public interest to increase market liquidity by increasing the frequency and quality of information used by short-sellers and to improve the collection and archiving of short-sale activity information. Promoting the possibility of synthetic short positions through greater availability of option structures for small and

micro-cap stocks may also have the potential of curbing over-valuation of stocks by enabling pessimistic influences.

This study also suggests items of importance to researchers. Our results hint that models incorporating all four constraint variables simultaneously may provide greater insight when exploring effects of short-sale constraints. Different constraint effects in generally falling and generally rising markets suggest that asymmetry could be a significant effect in other studies. Finally, the significant results from our extension to small- and micro-cap stocks suggest that the lack of options may significantly deter synthetic short positions.

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Figure 1
Weekly Performance for the S&P 500 large-cap and S&P 600 small-cap indices (September 2007 through December 2011, smoothed +/-1).

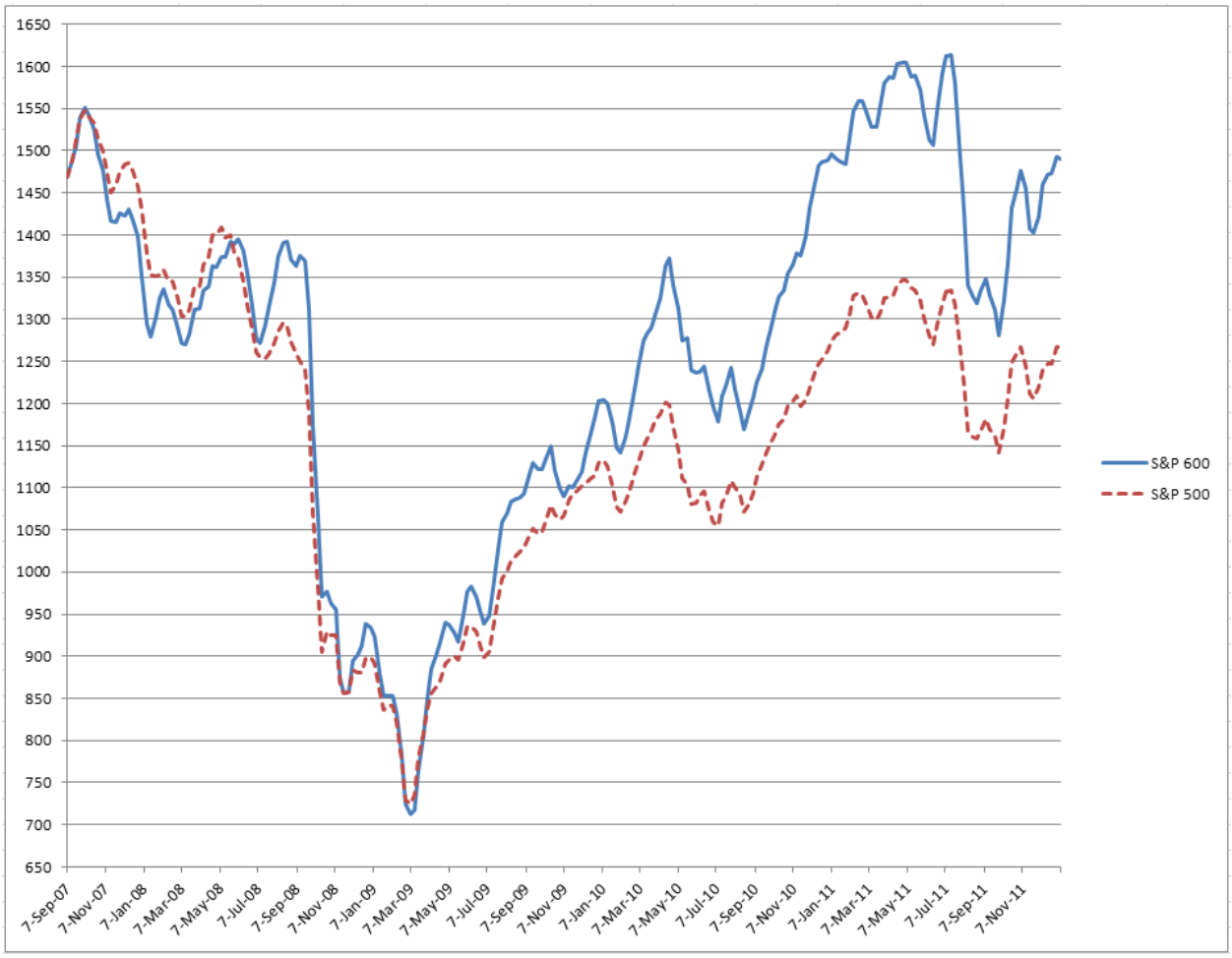

Figure 1 presents the smoothed weekly performance of the S&P 500 large-cap and the S&P 600 small-cap indices from September 2007 through December 2011. Our analysis is conducted across the full term, a "generally falling" term and a "generally rising" term. The generally falling term is from September 14, 2007 through February 27, 2009, and spans 36 semi-monthly data points. The generally rising term is from March 13, 2009 through December 30, 2011, and spans 68 semi-monthly data points.

Table 1
Summary Statistics

Panel A.

S&P 500 Large-Cap	348
S&P 400 Mid-Cap	189
S&P TMI less Large and Mid-Cap	992
	1,529

Panel B. All Firms (1,529)

	N	Mean	Std Dev	Median	Min	Max
Institutional Ownership (IO)	1,529	61.48	24.86	68.88	1.75	96.69
Relative Short Interest (RSI)	1,529	5.63	5.09	4.29	0.02	35.53

Exchange-Traded Options	1,107	72.4%
No Exchange-Traded Options	422	27.6%
All Firms	1,529	100.0%
Dividend Paying	876	57.3%
Non-Dividend Paying	653	42.7%
All Firms	1,529	100.0%

Panel C. Large & Mid-Cap (537)

	N	Mean	Std Dev	Median	Min	Max
Institutional Ownership (IO)	537	76.80	12.42	79.01	5.51	95.81
Relative Short Interest (RSI)	537	4.87	4.03	3.43	0.71	34.90

Exchange-Traded Options	537	100.0%
No Exchange-Traded Options	0	0.0%
All Firms	537	100.0%
Dividend Paying	414	77.1%
Non-Dividend Paying	123	22.9%
All Firms	537	100.0%

Panel D. Small & Micro-Cap (992)

	N	Mean	Std Dev	Median	Min	Max
Institutional Ownership (IO)	992	53.19	25.95	54.44	1.75	96.69
Relative Short Interest (RSI)	992	6.04	5.54	4.78	0.02	35.53

Exchange-Traded Options	570	57.5%
No Exchange-Traded Options	422	42.5%
All Firms	992	100.0%
Dividend Paying	462	46.6%
Non-Dividend Paying	530	53.4%
All Firms	992	100.0%

Table 1 contains summary statistics for the short-selling constraints and firms used in this study. The sample consists of 1,529 firms. To be included in the sample, a firm had to be included in the S&P TMI index from September 2007 through December 2011. Beyond this, we remove any firm that could not be matched up with CRSP, ShortSqueeze.com, and DeltaNeutral.com datasets at every one of the 104

semi-monthly data points between September 2007 and December 2011. Finally, 260 firms who introduced options between September 2007 and December 2011 were removed, leaving 1,529 S&P TMI firms. Panel A provides an S&P index breakdown of the 1,529 firms in the study. Panel B provides descriptive statistics for two proxies for short-selling constraints (IO and RSI) for all firms. The IO and RSI variables are calculated for each firm separately before the cross-sectional sample statistics are computed. Panel B also lists the number of firms that had exchange-listed options, those that did not, and proportion of firms that paid dividends versus those that did not. Panels C and D duplicate Panel B, but for large and mid-cap, and small and micro-cap firms, respectively.

Table 2

Institutional Ownership and Relative Short Interest Across Option Status, Dividend Status, and Falling Versus Rising Securities Markets

Panel A. All Firms (1,529)

	No Opt	Opt	Diff	t
Institutional Ownership (IO)	34.71	72.73	-38.02	-51.14 ***
Relative Short Interest (RSI)	2.00	6.96	-4.96	-31.18 ***

	No Div	Div	Diff	t
Institutional Ownership (IO)	59.77	62.82	-3.05	-3.52 ***
Relative Short Interest (RSI)	5.77	4.64	1.13	7.13 ***

	Falling	Rising	Diff	t
Institutional Ownership (IO)	57.81	61.66	-3.85	-2.52 **
Relative Short Interest (RSI)	6.97	4.90	2.08	10.27 ***

Panel B. Large & Mid-Cap (537)

	No Opt	Opt	Diff	t
Institutional Ownership (IO)				
Relative Short Interest (RSI)				

	No Div	Div	Diff	t
Institutional Ownership (IO)	77.42	75.07	2.36	2.34 **
Relative Short Interest (RSI)	5.00	4.26	0.74	6.42 ***

	Falling	Rising	Diff	t
Institutional Ownership (IO)	74.35	78.14	-3.79	-1.87 *
Relative Short Interest (RSI)	5.50	4.51	0.99	6.57 ***

Panel C. Small & Micro-Cap (992)

	No Opt	Opt	Diff	t
Institutional Ownership (IO)	34.71	67.66	-32.96	-46.73 ***
Relative Short Interest (RSI)	2.00	8.97	-6.97	-28.96 ***

	No Div	Div	Diff	t
Institutional Ownership (IO)	50.97	47.63	3.34	3.92 ***
Relative Short Interest (RSI)	6.13	5.05	1.07	5.32 ***

	Falling	Rising	Diff	t
Institutional Ownership (IO)	47.14	52.38	-5.24	-4.28 ***
Relative Short Interest (RSI)	7.77	5.11	2.66	10.46 ***

Table 2 provides a difference of mean test for institutional ownership and relative short interest. The test is conducted three times across option status, dividend status, and falling versus rising securities markets. Equality of the means is tested by the t test. *, **, *** denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively. The sample period is September 2007 through December 2011.

Table 3a (All Firms)

Overvaluation as a function of individual short-sale constraint proxies.

	All Firms (1,529)											
	Panel A.				*Panel B.*				*Panel C.*			
	Full Term: Sep 2007 through Dec 2011				**Generally Falling: Sep 2007 through Feb 2009**				**Generally Rising: Mar 2009 through Dec 2011**			
Intercept	-0.404	-0.669 *	-0.424	-0.512	-0.146	-0.266	-0.277	-0.344	-0.267	-0.614	-0.254	-0.350
	(-1.19)	(-1.90)	(-1.23)	(-1.45)	(-0.14)	(-0.25)	(-0.26)	(-0.33)	(-0.69)	(-1.53)	(-0.63)	(-0.88)
Rm - Rf	1.029 ***	1.033 ***	1.032 ***	1.032 ***	1.127 **	1.131 **	1.129 **	1.129 **	0.926 ***	0.926 ***	0.926 ***	0.925 ***
	(3.86)	(3.87)	(3.87)	(3.87)	(2.27)	(2.28)	(2.28)	(2.28)	(4.04)	(4.04)	(4.04)	(4.04)
SMB	0.626	0.620	0.622	0.622	0.405	0.399	0.399	0.396	0.729 *	0.726 *	0.729 *	0.729 *
	(1.47)	(1.45)	(1.46)	(1.46)	(0.40)	(0.39)	(0.39)	(0.39)	(1.87)	(1.87)	(1.87)	(1.87)
HML	0.177	0.175	0.175	0.175	0.217	0.222	0.214	0.213	0.170	0.171	0.170	0.171
	(0.39)	(0.38)	(0.38)	(0.38)	(0.25)	(0.26)	(0.25)	(0.25)	(0.45)	(0.45)	(0.45)	(0.45)
UMD	-0.086	-0.086	-0.086	-0.086	-0.179	-0.176	-0.178	-0.179	-0.076	-0.075	-0.076	-0.075
	(-0.51)	(-0.51)	(-0.51)	(-0.51)	(-0.41)	(-0.40)	(-0.41)	(-0.41)	(-0.48)	(-0.47)	(-0.48)	(-0.48)
Mid IO	0.011				-0.026				-0.038			
	(0.21)				(-0.20)				(-0.60)			
Low IO	-0.263 ***				-0.317 ***				-0.241 ***			
	(-5.39)				(-2.74)				(-4.06)			
High RSI		0.196 ***				-0.165				0.431 ***		
		(3.59)				(-1.41)				(5.70)		
Mid RSI		0.258 ***				0.133				0.319 ***		
		(5.21)				(1.06)				(5.59)		
No Options			-0.347 ***				-0.122				-0.463 ***	
			(-7.73)				(-1.11)				(-7.30)	
Dividends				-0.051				0.229 *				-0.202 ***
				(-0.96)				(1.92)				(-3.59)

A random effects panel regression is used to control for both firm-specific and time-specific random effects and the Arellano (1987) version of the White (1980) heteroscedasticity-consistent covariance matrix corrected standard errors to control for heteroscedasticity and auto correlation. The model is used to test semi-monthly returns for 1,241 firms are shown as a function of the individual short-sale constraint proxies, controlling for the market, size, value, momentum, and option introduction. Our analysis is conducted across the full term, a "generally falling" term and a "generally rising" term. The generally falling term is from September 14, 2007 through February 27, 2009, and spans 36 semi-monthly data points. The generally rising term is from March 13, 2009 through December 30, 2011, and spans 68 semi-monthly data points. Returns are expressed in percentages per half-month. *, **, *** denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

Table 3b (Large and Mid-Cap Firms)

Overvaluation as a function of individual short-sale constraint proxies.

	Large and Mid-Cap Firms (537)			
	Panel A.			
	Full Term: Sep 2007 through Dec 2011			
Intercept	-0.308	-0.410		-0.159
	(-1.01)	(-1.29)	(0.00)	(-0.52)
Rm - Rf	1.082 ***	1.083 ***		1.081 ***
	(3.49)	(3.49)	(0.00)	(3.48)
SMB	0.313	0.309		0.312
	(0.71)	(0.70)	(0.00)	(0.71)
HML	0.088	0.088		0.090
	(0.17)	(0.17)	(0.00)	(0.17)
UMD	-0.063	-0.062		-0.061
	(-0.37)	(-0.36)	(0.00)	(-0.36)
Mid IO	0.122 *			
	(1.84)			
Low IO	0.067			
	(1.04)			
High RSI		0.269 ***		
		(4.60)		
Mid RSI		0.236 ***		
		(3.81)		
No Options				
			(0.00)	
Dividends				-0.364 ***
				(-6.31)

	Panel B.			
	Generally Falling: Sep 2007 through Feb 2009			
Intercept	-0.125	0.346		0.184
	(-0.15)	(0.44)	(0.00)	(0.23)
Rm - Rf	1.188 **	1.187 **		1.189 **
	(2.22)	(2.21)	(0.00)	(2.22)
SMB	0.044	0.050		0.043
	(0.05)	(0.06)	(0.00)	(0.05)
HML	0.105	0.104		0.104
	(0.11)	(0.11)	(0.00)	(0.11)
UMD	-0.181	-0.182		-0.180
	(-0.38)	(-0.38)	(0.00)	(-0.38)
Mid IO	0.507 ***			
	(3.22)			
Low IO	0.256			
	(1.59)			
High RSI		-0.404 ***		
		(-2.69)		
Mid RSI		-0.190		
		(-1.32)		
No Options				
			(0.00)	
Dividends				-0.211 *
				(-1.68)

	Panel C.			
	Generally Rising: Mar 2009 through Dec 2011			
Intercept	-0.186	-0.540		-0.085
	(-0.50)	(-1.40)	(0.00)	(-0.23)
Rm - Rf	1.003 ***	0.999 ***		1.000 ***
	(4.01)	(4.00)	(0.00)	(4.00)
SMB	0.401	0.399		0.398
	(0.93)	(0.93)	(0.00)	(0.93)
HML	0.110	0.112		0.116
	(0.30)	(0.30)	(0.00)	(0.32)
UMD	-0.046	-0.042		-0.045
	(-0.28)	(-0.25)	(0.00)	(-0.27)
Mid IO	-0.039			
	(-0.53)			
Low IO	0.003			
	(0.05)			
High RSI		0.670 ***		
		(8.60)		
Mid RSI		0.439 ***		
		(6.42)		
No Options				
			(0.00)	
Dividends				-0.447 ***
				(-6.87)

A random effects panel regression is used to control for both firm-specific and time-specific random effects and the Arellano (1987) version of the White (1980) heteroscedasticity-consistent covariance matrix corrected standard errors to control for heteroscedasticity and auto correlation. The model is used to test semi-monthly returns for 1,241 firms are shown as a function of the individual short-sale constraint proxies, controlling for the market, size, value, momentum, and option introduction. Our analysis is conducted across the full term, a "generally falling" term and a "generally rising" term. The generally falling term is from September 14, 2007 through February 27, 2009, and spans 36 semi-monthly data points. The generally rising term is from March 13, 2009 through December 30, 2011, and spans 68 semi-monthly data points. Returns are expressed in percentages per half-month. *, **, *** denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

Table 3c (Small and Micro-Cap Firms)

Overvaluation as a function of individual short-sale constraint proxies.

	Small and Micro-Cap Firms (992)											
	Panel A.				*Panel B.*				*Panel C.*			
	Full Term: Sep 2007 through Dec 2011				**Generally Falling: Sep 2007 through Feb 2009**				**Generally Rising: Mar 2009 through Dec 2011**			
Intercept	-0.534	-0.827 **	-0.572	-0.674 *	-0.505	-0.624	-0.635	-0.592	-0.326	-0.676	-0.293	-0.470
	(-1.51)	(-2.33)	(-1.59)	(-1.88)	(-0.45)	(-0.56)	(-0.56)	(-0.53)	(-0.79)	(-1.61)	(-0.69)	(-1.14)
Rm - Rf	1.003 ***	1.006 ***	1.005 ***	1.005 ***	1.097 **	1.099 **	1.097 **	1.097 **	0.885 ***	0.886 ***	0.885 ***	0.884 ***
	(3.84)	(3.84)	(3.84)	(3.84)	(2.23)	(2.23)	(2.23)	(2.23)	(3.79)	(3.80)	(3.79)	(3.79)
SMB	0.792 *	0.787 *	0.788 *	0.790 *	0.594	0.593	0.594	0.591	0.906 **	0.903 **	0.906 **	0.906 **
	(1.89)	(1.88)	(1.89)	(1.88)	(0.57)	(0.57)	(0.57)	(0.56)	(2.36)	(2.35)	(2.36)	(2.36)
HML	0.224	0.221	0.222	0.222	0.274	0.279	0.274	0.272	0.202	0.204	0.202	0.202
	(0.49)	(0.49)	(0.49)	(0.49)	(0.32)	(0.33)	(0.32)	(0.32)	(0.51)	(0.51)	(0.51)	(0.51)
UMD	-0.098	-0.099	-0.098	-0.098	-0.175	-0.174	-0.175	-0.177	-0.092	-0.092	-0.092	-0.092
	(-0.57)	(-0.58)	(-0.57)	(-0.57)	(-0.41)	(-0.40)	(-0.41)	(-0.41)	(-0.56)	(-0.56)	(-0.56)	(-0.56)
Mid IO	-0.121				-0.049				-0.138			
	(-1.48)				(-0.26)				(-1.45)			
Low IO	-0.219 ***				-0.065				-0.281 ***			
	(-3.06)				(-0.39)				(-3.33)			
High RSI		0.227 ***				0.037				0.360 ***		
		(3.01)				(0.23)				(3.32)		
Mid RSI		0.256 ***				0.248				0.268 ***		
		(3.64)				(1.35)				(3.30)		
No Options			-0.229 ***				0.192				-0.445 ***	
			(-4.31)				(1.45)				(-5.87)	
Dividends				0.048				0.344 *				-0.117
				(0.55)				(1.76)				(-1.28)

A random effects panel regression is used to control for both firm-specific and time-specific random effects and the Arellano (1987) version of the White (1980) heteroscedasticity-consistent covariance matrix corrected standard errors to control for heteroscedasticity and auto correlation. The model is used to test semi-monthly returns for 1,241 firms are shown as a function of the individual short-sale constraint proxies, controlling for the market, size, value, momentum, and option introduction. Our analysis is conducted across the full term, a "generally falling" term and a "generally rising" term. The generally falling term is from September 14, 2007 through February 27, 2009, and spans 36 semi-monthly data points. The generally rising term is from March 13, 2009 through December 30, 2011, and spans 68 semi-monthly data points. Returns are expressed in percentages per half-month. *, **, *** denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

Table 4a (All Firms)

Overvaluation as a function of all four combined constraint proxies.

All Firms (1,529)

	Full Term	Falling	Rising
Rm - Rf	1.030 ***	1.128 **	0.925 ***
	(3.87)	(2.27)	(4.04)
SMB	0.624	0.410	0.726 *
	(1.46)	(0.40)	(1.86)
HML	0.177	0.218	0.173
	(0.39)	(0.25)	(0.46)
UMD	-0.085	-0.176	-0.075
	(-0.51)	(-0.40)	(-0.47)
Low IO, No Opt, Div, Low RSI	-0.678 *	-0.175	-0.719
	(-1.78)	(-0.16)	(-1.62)
Low IO, No Opt, Div, Mid RSI	-0.052	1.239	-0.493
	(-0.13)	(1.06)	(-1.08)
Low IO, No Opt, Div, High RSI	-0.241	0.704	-1.245 *
	(-0.47)	(0.60)	(-1.90)
Low IO, No Opt, No Div, Low RSI	-0.875 **	-0.601	-0.767 *
	(-2.46)	(-0.57)	(-1.81)
Low IO, No Opt, No Div, Mid RSI	-0.761 **	-0.232	-0.790 *
	(-2.07)	(-0.21)	(-1.86)
Low IO, No Opt, No Div, High RSI	-0.628	-0.079	-0.856 *
	(-1.49)	(-0.07)	(-1.70)
Low IO, Opt, Div, Low RSI	-0.543	0.410	-0.733
	(-1.33)	(0.36)	(-1.54)
Low IO, Opt, Div, Mid RSI	-0.566	-0.417	-0.404
	(-1.36)	(-0.35)	(-0.89)
Low IO, Opt, Div, High RSI	-0.919 **	-0.737	-0.742 *
	(-2.37)	(-0.67)	(-1.66)
Low IO, Opt, No Div, Low RSI	-0.197	0.446	-0.220
	(-0.51)	(0.40)	(-0.48)
Low IO, Opt, No Div, Mid RSI	-0.535	-0.447	-0.345
	(-1.48)	(-0.42)	(-0.82)
Low IO, Opt, No Div, High RSI	-0.595	-0.633	-0.196
	(-1.63)	(-0.59)	(-0.46)
Mid IO, No Opt, Div, Low RSI	-1.092 *	-0.585	-1.048 *
	(-1.91)	(-0.32)	(-1.72)
Mid IO, No Opt, Div, Mid RSI	-0.389	0.643	-0.556
	(-0.84)	(0.49)	(-1.12)
Mid IO, No Opt, Div, High RSI	-1.476 **	-1.279	-1.290 *
	(-2.27)	(-1.03)	(-1.71)
Mid IO, No Opt, No Div, Low RSI	-0.875 **	-1.063	-0.571
	(-2.34)	(-0.99)	(-1.27)
Mid IO, No Opt, No Div, Mid RSI	-0.605	-0.328	-0.492
	(-1.61)	(-0.30)	(-1.11)
Mid IO, No Opt, No Div, High RSI	-0.752	-0.329	-0.934
	(-1.18)	(-0.27)	(-1.14)
Mid IO, Opt, Div, Low RSI	-0.560	0.148	-0.660
	(-1.60)	(0.14)	(-1.64)
Mid IO, Opt, Div, Mid RSI	-0.690 *	-0.471	-0.555
	(-1.82)	(-0.41)	(-1.33)
Mid IO, Opt, Div, High RSI	-0.522	-0.305	-0.376
	(-1.30)	(-0.27)	(0.85)

Full Term		Falling		Rising	
2,949	1.87%	1,136	2.12%	1,813	1.74%
1,366	0.87%	476	0.89%	890	0.86%
576	0.37%	353	0.66%	223	0.21%
20,833	13.23%	6,726	12.57%	14,107	13.57%
5,743	3.65%	2,005	3.75%	3,738	3.60%
2,015	1.28%	1,068	2.00%	947	0.91%
564	0.36%	170	0.32%	394	0.38%
1,048	0.67%	335	0.63%	713	0.69%
2,286	1.45%	1,194	2.23%	1,092	1.05%
3,255	2.07%	857	1.60%	2,398	2.31%
8,278	5.26%	2,493	4.66%	5,785	5.56%
22,873	14.52%	11,427	21.35%	11,446	11.01%
426	0.27%	92	0.17%	334	0.32%
577	0.37%	155	0.29%	422	0.41%
144	0.09%	96	0.18%	48	0.05%
4,301	2.73%	1,289	2.41%	3,012	2.90%
2,410	1.53%	585	1.09%	1,825	1.76%
609	0.39%	370	0.69%	239	0.23%
2,830	1.80%	900	1.68%	1,930	1.86%
2,469	1.57%	742	1.39%	1,727	1.66%
1,391	0.88%	601	1.12%	790	0.76%

Mid IO, Opt, No Div, Low RSI	-0.325		0.352	-0.413	7,927	5.03%	2,574	4.81%	5,353	5.15%
	(-0.92)		(0.34)	(-1.02)						
Mid IO, Opt, No Div, Mid RSI	-0.174		0.027	-0.030	10,935	6.94%	2,636	4.93%	8,299	7.98%
	(-0.49)		(0.03)	(-0.07)						
Mid IO, Opt, No Div, High RSI	-0.198		-0.184	0.096	8,890	5.64%	3,756	7.02%	5,134	4.94%
	(-0.54)		(-0.17)	(0.22)						
High IO, No Opt, Div, Low RSI	-3.190		-22.542	0.273	55	0.03%	8	0.01%	47	0.05%
	(-1.15)		(-1.24)	(0.17)						
High IO, No Opt, Div, Mid RSI	-0.753		-3.007	-0.123	138	0.09%	23	0.04%	115	0.11%
	(-1.04)		(-0.85)	(-0.24)						
High IO, No Opt, Div, High RSI	-1.221		-1.469	0.567	54	0.03%	42	0.08%	12	0.01%
	(-0.55)		(-0.50)	(0.70)						
High IO, No Opt, No Div, Low RSI	-0.842	*	-0.194	-0.803	385	0.24%	76	0.14%	309	0.30%
	(-1.65)		(-0.11)	(-1.43)						
High IO, No Opt, No Div, Mid RSI	-0.161		1.385	-0.314	672	0.43%	119	0.22%	553	0.53%
	(-0.39)		(0.86)	(-0.65)						
High IO, No Opt, No Div, High RSI	-0.348		-0.326	0.273	213	0.14%	151	0.28%	62	0.06%
	(-0.54)		(-0.26)	(0.38)						
High IO, Opt, Div, Low RSI	-0.688	**	0.268	-0.787	*	2,472	1.57%	572	1.07%	1,900	1.83%
	(-1.97)		(0.25)	(-1.95)						
High IO, Opt, Div, Mid RSI	-0.385		-0.101	-0.279	2,819	1.79%	721	1.35%	2,098	2.02%
	(-1.06)		(-0.09)	(-0.67)						
High IO, Opt, Div, High RSI	-0.151		0.035	0.005	1,808	1.15%	652	1.22%	1,156	1.11%
	(-0.39)		(0.03)	(0.01)						
High IO, Opt, No Div, Low RSI	-0.536		-0.126	-0.470	8,258	5.24%	1,985	3.71%	6,273	6.03%
	(-1.56)		(-0.12)	(-1.18)						
High IO, Opt, No Div, Mid RSI	-0.333		-0.128	-0.197	15,170	9.63%	3,246	6.07%	11,924	11.47%
	(-0.96)		(-0.12)	(-0.49)						
High IO, Opt, No Div, High RSI	-0.366		-0.319	-0.131	10,748	6.82%	3,884	7.26%	6,864	6.60%
	(-1.02)		(-0.30)	(-0.31)						
					157,487	100%	53,515	100%	103,972	100%

A random effects panel regression is used to control for both firm-specific and time-specific random effects and the Arellano (1987) version of the White (1980) heteroscedasticity-consistent covariance matrix corrected standard errors to control for heteroscedasticity and auto correlation. The model is used to test semi-monthly returns for 1,241 firms are shown as a function of the four combined short-sale constraint proxies and all interactions, controlling for the market, size, value, momentum, and option introduction. Our analysis is conducted across the full term, a "generally falling" term and a "generally rising" term. The generally falling term is from September 14, 2007 through February 27, 2009, and spans 36 semi-monthly data points. The generally rising term is from March 13, 2009 through December 30, 2011, and spans 68 semi-monthly data points. Returns are expressed in percentages per half-month. *, **, *** denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

Table 4b (Large and Mid-Cap Firms)

Overvaluation as a function of all four combined constraint proxies.

Large and Mid-Cap Firms (537)

	Full Term	Falling	Rising	Full Term		Falling		Rising	
Rm - Rf	1.082 ***	1.184 **	0.996 ***						
	(3.48)	(2.21)	(3.98)						
SMB	0.307	0.060	0.395						
	(0.70)	(0.07)	(0.92)						
HML	0.090	0.105	0.116						
	(0.17)	(0.11)	(0.32)						
UMD	-0.060	-0.178	-0.040						
	(-0.35)	(-0.37)	(-0.24)						
Low IO, No Opt, Div, Low RSI				0	0.00%	0	0.00%	0	0.00%
	(0.00)	(0.00)	(0.00)						
Low IO, No Opt, Div, Mid RSI				0	0.00%	0	0.00%	0	0.00%
	(0.00)	(0.00)	(0.00)						
Low IO, No Opt, Div, High RSI				0	0.00%	0	0.00%	0	0.00%
	(0.00)	(0.00)	(0.00)						
Low IO, No Opt, No Div, Low RSI				0	0.00%	0	0.00%	0	0.00%
	(0.00)	(0.00)	(0.00)						
Low IO, No Opt, No Div, Mid RSI				0	0.00%	0	0.00%	0	0.00%
	(0.00)	(0.00)	(0.00)						
Low IO, No Opt, No Div, High RSI				0	0.00%	0	0.00%	0	0.00%
	(0.00)	(0.00)	(0.00)						
Low IO, Opt, Div, Low RSI	-0.545	0.356	-0.758 *	2,208	3.99%	742	3.95%	1,466	4.01%
	(-1.63)	(0.44)	(-1.89)						
Low IO, Opt, Div, Mid RSI	-0.556	-0.349	-0.388	1,631	2.95%	610	3.25%	1,021	2.80%
	(-1.43)	(-0.36)	(-0.95)						
Low IO, Opt, Div, High RSI	-0.988 ***	-0.611	-0.929 **	1,768	3.20%	766	4.08%	1,002	2.74%
	(-2.65)	(-0.69)	(-2.06)						
Low IO, Opt, No Div, Low RSI	-0.136	0.711	-0.357	5,474	9.90%	2,018	10.74%	3,456	9.46%
	(-0.40)	(0.87)	(-0.90)						
Low IO, Opt, No Div, Mid RSI	-0.142	0.167	-0.031	4,832	8.74%	1,893	10.07%	2,939	8.05%
	(-0.42)	(0.20)	(-0.08)						
Low IO, Opt, No Div, High RSI	-0.042	-0.051	0.323	7,703	13.93%	3,294	17.53%	4,409	12.07%
	(-0.13)	(-0.06)	(0.79)						
Mid IO, No Opt, Div, Low RSI				0	0.00%	0	0.00%	0	0.00%
	(0.00)	(0.00)	(0.00)						
Mid IO, No Opt, Div, Mid RSI				0	0.00%	0	0.00%	0	0.00%
	(0.00)	(0.00)	(0.00)						
Mid IO, No Opt, Div, High RSI				0	0.00%	0	0.00%	0	0.00%
	(0.00)	(0.00)	(0.00)						
Mid IO, No Opt, No Div, Low RSI				0	0.00%	0	0.00%	0	0.00%
	(0.00)	(0.00)	(0.00)						
Mid IO, No Opt, No Div, Mid RSI				0	0.00%	0	0.00%	0	0.00%
	(0.00)	(0.00)	(0.00)						
Mid IO, No Opt, No Div, High RSI				0	0.00%	0	0.00%	0	0.00%
	(0.00)	(0.00)	(0.00)						
Mid IO, Opt, Div, Low RSI	-0.636 *	0.320	-0.827 **	1,801	3.26%	492	2.62%	1,309	3.58%
	(-1.93)	(0.38)	(-2.09)						
Mid IO, Opt, Div, Mid RSI	-0.284	0.130	-0.244	1,436	2.60%	438	2.33%	998	2.73%
	(-0.78)	(0.14)	(-0.60)						
Mid IO, Opt, Div, High RSI	0.234	0.523	0.377	905	1.64%	321	1.71%	584	1.60%
	(0.61)	(0.58)	(0.81)						

Mid IO, Opt, No Div, Low RSI	-0.288	0.644	-0.491	4,674	8.45%	1,380	7.34%	3,294	9.02%
	(-0.90)	(0.79)	(-1.27)						
Mid IO, Opt, No Div, Mid RSI	-0.137	0.182	-0.066	4,238	7.66%	1,262	6.71%	2,976	8.15%
	(-0.41)	(0.21)	(-0.16)						
Mid IO, Opt, No Div, High RSI	0.115	0.316	0.337	2,855	5.16%	1,034	5.50%	1,821	4.99%
	(0.33)	(0.36)	(0.79)						
High IO, No Opt, Div, Low RSI				0	0.00%	0	0.00%	0	0.00%
	(0.00)	(0.00)	(0.00)						
High IO, No Opt, Div, Mid RSI				0	0.00%	0	0.00%	0	0.00%
	(0.00)	(0.00)	(0.00)						
High IO, No Opt, Div, High RSI				0	0.00%	0	0.00%	0	0.00%
	(0.00)	(0.00)	(0.00)						
High IO, No Opt, No Div, Low RSI				0	0.00%	0	0.00%	0	0.00%
	(0.00)	(0.00)	(0.00)						
High IO, No Opt, No Div, Mid RSI				0	0.00%	0	0.00%	0	0.00%
	(0.00)	(0.00)	(0.00)						
High IO, No Opt, No Div, High RSI				0	0.00%	0	0.00%	0	0.00%
	(0.00)	(0.00)	(0.00)						
High IO, Opt, Div, Low RSI	-0.887 **	-0.338	-0.950 **	1,086	1.96%	241	1.28%	845	2.31%
	(-2.46)	(-0.35)	(-2.31)						
High IO, Opt, Div, Mid RSI	-0.221	-0.161	-0.065	1,100	1.99%	338	1.80%	762	2.09%
	(-0.60)	(0.17)	(-0.15)						
High IO, Opt, Div, High RSI	-0.354	0.016	-0.248	1,033	1.87%	350	1.86%	683	1.87%
	(-0.98)	(0.02)	(-0.55)						
High IO, Opt, No Div, Low RSI	-0.638 *	-0.878	-0.440	3,656	6.61%	845	4.50%	2,811	7.70%
	(-1.86)	(-1.02)	(-1.10)						
High IO, Opt, No Div, Mid RSI	-0.066	0.356	-0.056	4,972	8.99%	1,498	7.97%	3,474	9.51%
	(-0.19)	(0.43)	(-0.14)						
High IO, Opt, No Div, High RSI	-0.163	-0.257	0.151	3,939	7.12%	1,273	6.77%	2,666	7.30%
	(-0.47)	(-0.31)	(0.36)						
				55,311	100%	18,795	100%	36,516	100%

A random effects panel regression is used to control for both firm-specific and time-specific random effects and the Arellano (1987) version of the White (1980) heteroscedasticity-consistent covariance matrix corrected standard errors to control for heteroscedasticity and auto correlation. The model is used to test semi-monthly returns for 1,241 firms are shown as a function of the four combined short-sale constraint proxies and all interactions, controlling for the market, size, value, momentum, and option introduction. Our analysis is conducted across the full term, a "generally falling" term and a "generally rising" term. The generally falling term is from September 14, 2007 through February 27, 2009, and spans 36 semi-monthly data points. The generally rising term is from March 13, 2009 through December 30, 2011, and spans 68 semi-monthly data points. Returns are expressed in percentages per half-month. *, **, *** denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

Table 4c (Small and Micro-Cap Firms)

Overvaluation as a function of all four combined constraint proxies.

Small and Micro-Cap Firms (992)

	Full Term	Falling	Rising	Full Term		Falling		Rising	
Rm - Rf	1.004 ***	1.092 **	0.885 ***						
	(3.84)	(2.22)	(3.79)						
SMB	0.791 *	0.605	0.906 **						
	(1.88)	(0.58)	(2.36)						
HML	0.222	0.258	0.202						
	(0.49)	(0.30)	(0.51)						
UMD	-0.099	-0.178	-0.093						
	(-0.58)	(-0.41)	(-0.57)						
Low IO, No Opt, Div, Low RSI	-0.704 *	-0.011	-0.929 **	2,345	2.30%	971	2.80%	1,374	2.04%
	(-1.81)	(-0.01)	(-1.98)						
Low IO, No Opt, Div, Mid RSI	-0.046	1.030	-0.494	942	0.92%	372	1.07%	570	0.84%
	(-0.11)	(0.84)	(-1.04)						
Low IO, No Opt, Div, High RSI	-0.316	0.616	-2.055 ***	237	0.23%	167	0.48%	70	0.10%
	(-0.51)	(0.46)	(-2.60)						
Low IO, No Opt, No Div, Low RSI	-0.939 ***	-0.564	-0.885 **	16,317	15.97%	5,289	15.23%	11,028	16.35%
	(-2.60)	(-0.50)	(-2.03)						
Low IO, No Opt, No Div, Mid RSI	-0.730 *	-0.114	-0.874 *	3,899	3.82%	1,551	4.47%	2,348	3.48%
	(-1.89)	(-0.10)	(-1.94)						
Low IO, No Opt, No Div, High RSI	-0.786	-0.459	-0.832	1,106	1.08%	602	1.73%	504	0.75%
	(-1.61)	(-0.39)	(-1.43)						
Low IO, Opt, Div, Low RSI	0.324	2.821	-0.004	87	0.09%	15	0.04%	72	0.11%
	(0.29)	(0.54)	(-0.01)						
Low IO, Opt, Div, Mid RSI	-0.406	-0.440	-0.182	472	0.46%	124	0.36%	348	0.52%
	(-0.74)	(-0.28)	(-0.34)						
Low IO, Opt, Div, High RSI	-0.737 *	-0.896	-0.169	1,190	1.16%	694	2.00%	496	0.74%
	(-1.73)	(-0.76)	(-0.33)						
Low IO, Opt, No Div, Low RSI	-0.013	0.300	0.099	1,405	1.38%	331	0.95%	1,074	1.59%
	(-0.03)	(0.21)	(0.17)						
Low IO, Opt, No Div, Mid RSI	-0.678 *	-0.991	-0.334	5,156	5.05%	1,475	4.25%	3,681	5.46%
	(-1.80)	(-0.86)	(-0.77)						
Low IO, Opt, No Div, High RSI	-0.726 *	-0.811	-0.307	14,987	14.67%	8,075	23.26%	6,912	10.25%
	(-1.92)	(-0.71)	(-0.71)						
Mid IO, No Opt, Div, Low RSI	-0.746 *	-0.447	-0.639	1,002	0.98%	258	0.74%	744	1.10%
	(-1.70)	(-0.34)	(-1.31)						
Mid IO, No Opt, Div, Mid RSI	0.171	1.618	-0.234	911	0.89%	279	0.80%	632	0.94%
	(0.41)	(1.29)	(-0.49)						
Mid IO, No Opt, Div, High RSI	-1.506 *	-1.039	-1.709 *	260	0.25%	138	0.40%	122	0.18%
	(-1.96)	(-0.76)	(-1.78)						
Mid IO, No Opt, No Div, Low RSI	-0.829 **	-0.904	-0.568	8,258	8.08%	2,546	7.33%	5,712	8.47%
	(-2.26)	(-0.80)	(-1.30)						
Mid IO, No Opt, No Div, Mid RSI	-0.683 *	-0.605	-0.495	3,484	3.41%	971	2.80%	2,513	3.73%
	(-1.79)	(-0.51)	(-1.12)						
Mid IO, No Opt, No Div, High RSI	-0.722	-0.146	-1.016	822	0.80%	418	1.20%	404	0.60%
	(-1.40)	(-0.12)	(-1.51)						
Mid IO, Opt, Div, Low RSI	-0.434	-6.483 *	0.372	172	0.17%	16	0.05%	156	0.23%
	(-0.76)	(-1.82)	(0.63)						
Mid IO, Opt, Div, Mid RSI	-1.931 ***	-1.662	-1.809 ***	404	0.40%	101	0.29%	303	0.45%
	(-2.89)	(-0.87)	(-2.88)						
Mid IO, Opt, Div, High RSI	-0.917	-0.589	-0.954	311	0.30%	163	0.47%	148	0.22%
	(-1.11)	(-0.33)	(-1.37)						

Mid IO, Opt, No Div, Low RSI	-0.294		-0.439	-0.062	1,815	1.78%	285	0.82%	1,530	2.27%
	(-0.71)		(-0.29)	(-0.13)						
Mid IO, Opt, No Div, Mid RSI	-0.518		-0.311	-0.370	4,872	4.77%	1,102	3.17%	3,770	5.59%
	(-1.31)		(-0.26)	(-0.80)						
Mid IO, Opt, No Div, High RSI	-0.576		-0.554	-0.322	4,755	4.65%	1,981	5.71%	2,774	4.11%
	(-1.38)		(-0.48)	(-0.60)						
High IO, No Opt, Div, Low RSI	-2.004	**	-6.100	-0.797	202	0.20%	40	0.12%	162	0.24%
	(-2.13)		(-1.48)	(-1.14)						
High IO, No Opt, Div, Mid RSI	-0.923		-1.563	-0.412	319	0.31%	98	0.28%	221	0.33%
	(-1.47)		(-0.90)	(-0.78)						
High IO, No Opt, Div, High RSI	-1.925		-2.240	1.103	67	0.07%	58	0.17%	9	0.01%
	(-1.10)		(-0.99)	(0.93)						
High IO, No Opt, No Div, Low RSI	-1.079	***	-1.400	-0.749	1,603	1.57%	411	1.18%	1,192	1.77%
	(-2.59)		(-1.09)	(-1.50)						
High IO, No Opt, No Div, Mid RSI	-0.348		0.315	-0.370	1,405	1.38%	373	1.07%	1,032	1.53%
	(-0.85)		(0.25)	(-0.77)						
High IO, No Opt, No Div, High RSI	-0.594		-0.290	-1.099	287	0.28%	228	0.66%	59	0.09%
	(-0.82)		(-0.23)	(-0.99)						
High IO, Opt, Div, Low RSI	-0.095		1.785	-0.056	217	0.21%	15	0.04%	202	0.30%
	(-0.17)		(0.80)	(-0.09)						
High IO, Opt, Div, Mid RSI	-0.939	**	-1.630	-0.640	1,039	1.02%	144	0.41%	895	1.33%
	(-2.20)		(-1.12)	(-1.35)						
High IO, Opt, Div, High RSI	-0.182		0.059	-0.076	827	0.81%	317	0.91%	510	0.76%
	(-0.39)		(0.05)	(-0.14)						
High IO, Opt, No Div, Low RSI	-0.976	**	-1.791	-0.662	1,933	1.89%	252	0.73%	1,681	2.49%
	(-2.29)		(-1.36)	(-1.38)						
High IO, Opt, No Div, Mid RSI	-0.487		-0.731	-0.257	10,513	10.29%	1,393	4.01%	9,120	13.52%
	(-1.36)		(-0.63)	(-0.61)						
High IO, Opt, No Div, High RSI	-0.359		-0.238	-0.179	8,555	8.37%	3,467	9.99%	5,088	7.54%
	(-0.96)		(-0.21)	(-0.39)						
					102,176	100%	34,720	100%	67,456	100%

A random effects panel regression is used to control for both firm-specific and time-specific random effects and the Arellano (1987) version of the White (1980) heteroscedasticity-consistent covariance matrix corrected standard errors to control for heteroscedasticity and auto correlation. The model is used to test semi-monthly returns for 1,241 firms are shown as a function of the four combined short-sale constraint proxies and all interactions, controlling for the market, size, value, momentum, and option introduction. Our analysis is conducted across the full term, a "generally falling" term and a "generally rising" term. The generally falling term is from September 14, 2007 through February 27, 2009, and spans 36 semi-monthly data points. The generally rising term is from March 13, 2009 through December 30, 2011, and spans 68 semi-monthly data points. Returns are expressed in percentages per half-month. *, **, *** denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

Table 5a (All Firms)
Variable count for each of the statistically significant results from Table 4a.

Panel A. Full-Term: Sep 2007 through Dec 2011

		IO			Options		Dividends		RSI		
Result	Coeff	Low	Mid	High	No	Yes	No	Yes	Low	Mid	High
1	-0.678	1			1			1	1		
2	-0.875	1			1		1		1		
3	-0.761	1			1		1			1	
4	-0.919	1				1		1			1
5	-1.092		1		1			1	1		
6	-1.476		1		1			1			1
7	-0.875		1		1		1		1		
8	-0.690		1			1		1		1	
9	-0.842			1	1		1		1		
10	-0.688			1		1		1	1		
		4	4	2	7	3	4	6	6	2	2

Panel B. Generally Falling: Sep 2007 through Feb 2009

		IO			Options		Dividends		RSI		
Result	Coeff	Low	Mid	High	No	Yes	No	Yes	Low	Mid	High
0		0	0	0	0	0	0	0	0	0	0

Panel C. Generally Rising: Mar 2009 through Dec 2011

		IO			Options		Dividends		RSI		
Result	Coeff	Low	Mid	High	No	Yes	No	Yes	Low	Mid	High
1	-1.245	1			1			1			1
2	-0.767	1			1		1		1		
3	-0.790	1			1		1			1	
4	-0.856	1			1		1				1
5	-0.742	1				1		1			1
6	-1.048		1		1			1	1		
7	-1.290		1		1			1			1
8	-0.787			1		1		1	1		
		5	2	1	6	2	3	5	3	1	4

Sum of Sums

IO			Options		Dividends		RSI		
Low	Mid	High	No	Yes	No	Yes	Low	Mid	High
9	6	3	13	5	7	11	9	3	6

Table 5 contains a count as to the number of times a variable tercile (in the case of IO and RSI) or binary level (in the case of option and dividend status) is responsible for any of the statistically significant results from the corresponding panels of Table 4a.

Table 5b (Large and Mid-Cap Firms)
Variable count for each of the statistically significant results from Table 4b.

Panel A. Full-Term: Sep 2007 through Dec 2011

		IO			Options		Dividends		RSI		
Result	Coeff	Low	Mid	High	No	Yes	No	Yes	Low	Mid	High
1	-0.988	1				1		1			1
2	-0.636		1			1		1	1		
3	-0.887			1		1		1	1		
4	-0.638			1		1	1		1		
		1	1	2	0	4	1	3	3	0	1

Panel B. Generally Falling: Sep 2007 through Feb 2009

		IO			Options		Dividends		RSI		
Result	Coeff	Low	Mid	High	No	Yes	No	Yes	Low	Mid	High
		0	0	0	0	0	0	0	0	0	0

Panel C. Generally Rising: Mar 2009 through Dec 2011

		IO			Options		Dividends		RSI		
Result	Coeff	Low	Mid	High	No	Yes	No	Yes	Low	Mid	High
1	-0.758	1				1		1	1		
2	-0.929	1				1		1			1
3	-0.827		1			1		1	1		
4	-0.950			1		1		1	1		
		2	1	1	0	4	0	4	3	0	1

Sum of Sums

	IO			Options		Dividends		RSI		
Low	Mid	High	No	Yes	No	Yes	Low	Mid	High
3	2	3	0	8	1	7	6	0	2

Table 5 contains a count as to the number of times a variable tercile (in the case of IO and RSI) or binary level (in the case of option and dividend status) is responsible for any of the statistically significant results from the corresponding panels of Table 4b.

Table 5c (Small and Micro-Cap Firms)
Variable count for each of the statistically significant results from Table 4c.

Panel A. Full-Term: Sep 2007 through Dec 2011

		IO			Options		Dividends		RSI		
Result	Coeff	Low	Mid	High	No	Yes	No	Yes	Low	Mid	High
1	-0.704	1			1			1	1		
2	-0.939	1			1		1		1		
3	-0.730	1			1		1			1	
4	-0.737	1				1		1			1
5	-0.678	1				1	1			1	
6	-0.726	1				1	1				1
7	-0.746		1		1			1	1		
8	-1.506		1		1			1			1
9	-0.829		1		1		1		1		
10	-0.683		1		1		1			1	
11	-1.931		1			1		1		1	
12	-2.004			1	1			1	1		
13	-1.079			1	1		1		1		
14	-0.939			1		1		1		1	
15	-0.976			1		1	1		1		
		6	5	4	9	6	8	7	7	5	3

Panel B. Generally Falling: Sep 2007 through Feb 2009

		IO			Options		Dividends		RSI		
Result	Coeff	Low	Mid	High	No	Yes	No	Yes	Low	Mid	High
1	-6.483		1			1		1	1		
		0	1	0	0	1	0	1	1	0	0

Panel C. Generally Rising: Mar 2009 through Dec 2011

		IO			Options		Dividends		RSI		
Result	Coeff	Low	Mid	High	No	Yes	No	Yes	Low	Mid	High
1	-0.929	1			1			1	1		
2	-2.055	1			1			1			1
3	-0.885	1			1		1		1		
4	-0.874	1			1		1			1	
5	-1.709		1		1			1			1
6	-1.809		1			1		1		1	
		4	2	0	5	1	2	4	2	2	2

Sum of Sums

IO			Options		Dividends		RSI		
Low	Mid	High	No	Yes	No	Yes	Low	Mid	High
10	8	4	14	8	10	12	10	7	5

Table 5 contains a count as to the number of times a variable tercile (in the case of IO and RSI) or binary level (in the case of option and dividend status) is responsible for any of the statistically significant results from the corresponding panels of Table 4c.