Mad Money, Smart Money: Is There a "Rationality Gap" between Stock and Option Markets?

Abstract

This paper documents evidence of a "rationality gap" between stock and option markets. While extant research has examined information contained in stock and option markets, divergent behavior between the two markets has rarely been studied. If investors in these markets are not equally rational, they should respond differently to random noise. Based on the short-lived price pressure effect associated with *Mad Money*, a popular CNBC investment show hosted by Jim Cramer, we document the existence of a "rationality gap." The abnormal difference between option implied stock prices and actual stock prices is negative and significant around the arrival of noisy information. We conclude that the stock market is more susceptible to noisy information than the option market.

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I. Introduction

Are investors in different trading venues equally rational when it comes to reacting to random noise? This paper examines the differential response of option and stock markets to noisy information. Debate on the informational role of option markets has a long history. In a frictionless, dynamically complete market, options are redundant securities. Thus, the option market may not contain more (or higher quality) information than the stock market. On the other hand, in an incomplete market with frictions, given the advantages of high leverage, built-in downside protection, and the absence of short sale constraints, the option market would seem ideal for informed traders. Thus, stock and option market prices may diverge in response to noisy information.

It has been argued that the stock market should react to information quicker and more accurately than the option market due to greater liquidity and narrower bid-ask spreads. Proponents of this hypothesis have investigated whether the stock market leads in information discovery through Granger causality and similar techniques. While results differ, many researchers consistently find no significant lead in the option market. For example, Stephan and Whaley (1990) find that option implied stock prices cannot predict future stock price changes. Chan, Chung, and Johnson (1993) analyze the lead-lag relation between stock and option high frequency returns, and find no evidence that option price changes lead stock price changes. Diltz and Kim (1996), Finucane (1999), O'Connor (1999), and Chan, Chung, and Fong (2002) document similar findings. Previous literature on the implied volatility in the option market also documents short-horizon underreaction and long-horizon overreaction to information arrival (i.e., Stein (1989), Poteshman (2001)).

On the other hand, the opponents of the "stock-leads-option" hypothesis suggest the option market could be the preferred habitat for informed trading due to opportunities

to exploit leverage, absence of short-sale constraints, and built-in downside protection.[1] If informed traders prefer the option market, the option prices should be less responsive to noisy information. Manaster and Rendleman (1982) and Tucker (1987) were among the first to use option prices to predict prices in the underlying stock market. They suggested that option implied stock prices represent the option market's assessment of the underlying assets' value, finding that the implied stock prices contain information not fully reflected in stock prices. Kumar, Sarin, and Shastri (1992) document abnormal option returns prior to block trading in the underlying stock. Employing Hasbrouck's (1995) information-share approach, Chakravarty, Gulen and Mayhew (2004) show that about seventeen percent of price discovery occurs in the option market. Research using "sequential-trade" models also suggests that informed traders may trade in the option market.[2] Easley, O'Hara, and Srinivas (1998) use signed option trading volume to show that the option markets contain information about stock price changes. Cao, Chen, and Griffin (2005) and others document abnormal trading volume in the option market prior to takeover announcements.

Nevertheless, the existing literature has not explored the comparative rationality of trading behavior in the stock and option markets. This paper aims to understand which market behaves more rationally when stock and option markets diverge in response to information arrival. Rational trading behavior reveals trader quality, and thus where informed traders are more likely to operate. Divergence between stock and option markets should signal the difference in belief between these two groups of traders. Examination of stock and option market divergence uncovers which market is more susceptible to noise trading.

This paper tests market rationality based on the price pressure hypothesis proposed by Scholes (1972). The price pressure hypothesis asserts that prices may diverge temporarily from efficient information values. Uninformed shifts in excess

[1] See, for example, Black (1975), Cox and Rubinstein (1985), Easley et al. (1998), and Chakravarty, Gulen, and Mayhew (2004). After SEC removing short-sale constraints in July 2007, the informational role of the option market could have changed. This is beyond the scope of this study.

[2] In "sequential-trade" models, informed traders can trade in either the stock or the option market. These models suggest that the amount of informed trading in option markets should be related to the depth or liquidity of both the stock and option markets, and the amount of leverage achievable with options. See, for example, Biais and Hillion (1994), Easley et al. (1998), Mayhew et al (1995), Cao et al. (2005), and Pan and Poteshman (2006).

demand compensate liquidity providers as prices return to equilibrium values. Past research has documented abnormal returns and trading volumes around the arrival of irrelevant information. Driven by noise trading from naïve investors, abnormal returns are reversed shortly thereafter.[3] We gauge market rationality by the strength of price pressure effects in response to noisy information in the form of recommendations made by CNBC's *Mad Money* flamboyant host Jim Cramer.[4] We provide evidence that his recommendations are a good example of noisy information, and also that stock and option prices diverge as a result.

Engelberg, Sasseville, and Williams (2009) document that CNBC's *Mad Money* show spreads noisy information, and it exerts a short-lived price pressure on the stock market. They report that Cramer's buy recommendations are followed by an economically and statistically significant 5.19% cumulative abnormal return overnight for small-cap stocks, and 1.96% overnight for their entire sample. These positive returns reverse to negative values within several days. Earlier, Balcarcel and Chen (2007) recorded similar results. Although *Mad Money* is popular among individual investors, it disseminates noisy information known by professionals.[5] Thus, it constitutes a reasonable test for market rationality. If the option market responds to Mr. Cramer's recommendations similarly to the stock market, we assert that the option market possesses no rationality advantage. In case it reacts even more intensively than the stock market, we conclude the option market behaves less rationally than the stock market. If the option market exhibits little or no price pressure effect compared to the stock market, we suggest the option market possesses greater rationality and its investors better informed than stock market investors. When informed traders prefer the option market and uninformed investors prefer stock trading, the stock price implied by the

[3]See, for example, Harris and Gurel (1986), Lynch and Mendenhall (1997), Wurgler and Zhuravskaya (2002), Mitchell, Pulvino, and Stafford (2004), Coval and Stafford (2004), Corwin (2003), Liang (1999), Carhart et al. (2002), Cohen, Gompers, and Vuolteenaho (2002), Hotchkiss and Strickland (2003), Engelberg, Sassville, and Williams (2009), and Balcarcel and Chen (2007).

[4]The show's animated host, Jim Cramer, draws more than 398,000 viewers daily according to the Philadelphia Enquirer, January 8, 2006. Recent estimates provided by Nielsen ranges from 400,000 to 600,000. The show airs three times a day during weekdays at 6:00 p.m., 9:00 p.m., and 12:00 midnight.

[5] For example, see "Cramer's Star Outshines His Stock Picks," by Bill Alpert (Barron, Feb. 7, 2009).

corresponding option (hereafter implied stock price) should differ significantly from the actual stock price around the arrival of noisy information.

We estimate the implied stock price from the option market using both the sequential approach (i.e., Stephan and Whaley (1990), and Chakravarty et al. (2004)) and the option boundary approach (see, for example, Bodurtha and Courtadon (1986), Finucane (1991), and Ofek, Richardson and Whitelaw (2004)).[6] Using the standard event time methodology,[7] we examine trading behavior in the stock and option markets in response to Mr. Cramer's recommendations. Our sample consists of 1,157 Cramer buy recommendations from July 2005 through April 2007.

We document two major findings. First, in the absence of a price pressure effect, the option market behaves more rationally than the stock market. A 3.33% abnormal return the day after Mr. Cramer's buy recommendation suggests that the price pressure effect exists in the stock market for small-cap stocks. This is consistent with other studies examining *Mad Money* effects on stock market. These results are reversed during the ensuing two weeks. The cumulative abnormal return declines to -2.93% within a month. In contrast, the (option) implied stock prices are significantly lower than actual stock prices following the buy recommendations. This indicates that either the option market is less responsive to the noisy information than the stock market, or option traders may actually trade against the naïve stock investors.

Second, we show that the bid-ask spreads in the option market decrease significantly and option trading volumes are abnormally high following a recommendation. Abnormal trading activity lasts more than five days following the recommendation. This finding strengthens the abnormal price results, and it suggests that option market makers narrow the bid-ask spreads in anticipation of lesser adverse selection.

The remainder of this paper is organized as follows. Section II presents the methodology, and Section III describes the data. We discuss empirical findings in Section IV, while Section V conducts robustness tests. Conclusions are presented in Section VI.

[6] A detailed description is presented in Section III.A of this paper.
[7] We follow the event study design documented in Mikkelson and Partch (1988).

II. Methodology

We conduct event studies on actual and option implied stock prices to examine the rationality of trading behavior in the stock and option markets in response to recommendations made by CNBC's *Mad Money* host Jim Cramer. Although the show's noisy background, dramatic camera effect, and the boisterous host may seem silly to some, evidence shows that Mr. Cramer's recommendations actually affect stock prices in the short run. We explore the possibility of a "rationality gap" between stock and option markets according to the relation between implied stock prices in the option market and the observed stock prices in the stock market.

If noise traders are equally likely to trade in stock and option markets, option implied stock prices should move with the observed prices in the stock market in the direction consistent with Mr. Cramer's recommendations. If noise traders dominate the stock market, then stock prices should be more responsive to the recommendations than the implied prices. On the other hand, when naïve traders are more active in the option market, implied prices should exhibit greater reaction to the noisy information than the stock prices. Thus, the abnormal behavior between the implied price and stock price reveals the "rationality gap" between these two markets. If implied relative to actual prices behave normally, we conclude there is no "rationality gap". If the difference between implied and actual prices decrease (increase), we conclude that the option market is more (less) rational than the stock market.

We use a standard event study procedure (see, for example, Mikkelson and Parch (1988) and Liang (1999)) to test the rationality in the stock and option markets around the event date. Stock prices are observed directly from the stock market. Implied stock prices are derived from option premiums using two approaches — the sequential approach and the option boundary approach. Section A discusses the methodology for estimating the implied stock price from the option market. Section B describes the event study procedure.

A. Implied Stock Price Estimation

We estimate the implied stock price derived from option premium in two distinct ways — the sequential approach and the option boundary approach. The sequential approach inserts the previous period implied volatility into an option pricing model and solves for the implied stock price backward (see, for example, Stephan and Whaley (1990), Kutner (1998), Chakravarty, Gulen, and Mahyhew (2004)). The option boundary approach uses the option boundary conditions to gauge the divergence between implied stock price and actual stock price (see, for example, Cox and Rubinstein (1985), Bodurtha and Courtadon (1986), Finucane (1991), and Ofek, Richardson and Whitelaw (2004)). We employ both approaches, with one serving as a robustness check for the other.

1. The Sequential Approach

We use Barone-Adesi and Whaley's (1986) American option pricing model (BAW model hereafter) for both calls and puts (see Appendix A). Denote the observed option premium by *O*, the latent true stock price by *S*, the volatility by σ, and all the other observable variables (i.e., the risk-free rate, time to maturity and strike price) by *R*. The theoretical option pricing model *f(.)* may be specified as:

$$O_t = f(S_t; \sigma_t; R_t), \tag{1}$$

The implied volatility of the previous period, $\hat{\sigma}_{t-1}$, is used as a proxy for σ_t, and we estimate the implied stock price by inverting the option model with respect to *S*:

$$\hat{S}_t = f_S^{-1}(O_t; \hat{\sigma}_{t-1}; R_t), \tag{2}$$

where $\hat{S}_t$ is the implied stock price derived from the option premium. Our calculation algorithm follows the Generalized Newton Method (see Appendix B). To minimize the measurement error, we employ a three-step procedure. We first calculate $\hat{\sigma}_{t-1}$ given all the observed variables at time *t-1*. We then trace each option by its sequential series (option ID), adjust $\hat{\sigma}_{t-1}$ according to the passage of time, and insert the adjusted $\hat{\sigma}_{t-1}$ into

the option pricing model to invert $\hat{S}_t$ at time *t*.[8] If there is more than one option in an option category at time *t*, instead of using randomly assigned weights to various options, we pool observations and estimate the best implied stock price by minimizing the difference between the model and market option premium.[9] $\hat{S}_t$ is then used in the event study to test the option market's reaction.

This approach is one of the most commonly used methods to derive the implied price. However, because it employs the BAW model and uses the previous period implied volatility in estimating current period implied stock price, it may suffer from measurement errors due to model-misspecification and non-synchronous trading. Although a large option data sample mitigates the impact of the measurement errors, we use the option boundary approach as a robustness check in our tests.

2. The Option Boundary Approach

The option boundary approach gauges the degree of divergence between implied and actual stock prices according to the option boundary conditions. We employ American option boundaries with market frictions (see Bodurtha and Courtadon (1986)) to extract the option market's expectations about stock prices. With market frictions, the upper boundaries for American call and put options are specified in inequalities (3) and (4), respectively:

$$(P^a + S^a - X e^{-r\times\tau}) + (T_X + T_S + T_P) \geq C^b - T_C \qquad (3)$$

$$(C^a - S^b e^{-q\times\tau} + X) + (T_X + T_S + T_C) \geq P^b - T_P \qquad (4)$$

where *S*, *P*, *C*, *X*, *r*, *q* and τ refer to the observed stock price, put premium, call premium, strike price, risk-free rate, dividend yield, and time to maturity, respectively. The superscripts, "^{a}" and "^{b}", denote ask and bid of the quotes. T_X, T_S, T_P, and T_C are the transaction costs for exercising options, trading stocks, trading puts, and trading calls,

[8] The adjustment of $\hat{\sigma}_{t-1}$ according to the passage of time, based on the partial differential of vega to time-to-maturity, should not be ignored, particularly when the time to maturity is short (i.e., less than fifteen days).

[9] This procedure is similar to Whaley's (1982) approach of estimating implied volatilities based on the options in a specific category. Instead of estimating the implied volatilities, this paper uses this procedure to calculate the implied stock prices.

respectively. Given inequalities (3) and (4), the lower and upper bounds of the implied stock prices, respectively, can be expressed as:

$$S^a \geq C^b - P^a + X e^{-r\times\tau} - (T_X + T_S + T_P + T_C) = L_{ow} \qquad (5)$$

$$S^b \leq [C^a - P^b + X + (T_X + T_S + T_P + T_C)] / e^{-q\times\tau} = H_{igh} \qquad (6)$$

These two inequalities yield a range for the implied stock price. (L_{ow}–S^a) measures the distance between the lower bound and the observed stock price. The greater the distance, the higher the call premium is relative to the put premium. By the same token, (S^b–H_{igh}) $e^{-q\times\tau}$ determines the distance between the observed stock price and the upper bound. The greater the distance, the higher the put premium is relative to the call premium. Hence, the difference between (L_{ow}–S^a) and (S^b–H_{igh}) $e^{-q\times\tau}$ gauges the bias of the range for the implied stock price in the option market. It can be specified as:

$$Divergence = (C^a + C^b - P^a - P^b) - (S^a + S^b e^{-q\times\tau}) + X(1 + e^{-r\times\tau}), \qquad (7)$$

Equation (7) suggests that the larger (smaller) the *Divergence*, the higher (lower) the implied stock price relative to the observed stock price. [10] In practice, because the short sale constraints, the upper boundary condition in inequality (5) is more likely to be violated, thus *Divergence* tends to be negative (see, for example, Ofek, Richardson and Whitelaw (2004)).

Figure 1 illustrates the ranges and *Divergence*. If the range of L_{ow} to H_{igh} is not biased toward either side, *Divergence* is zero. However, as the range of L_{ow}' (L_{ow}'') to H_{igh}' (H_{igh}'') is biased toward the left (right), then *Divergence* is less (greater) than zero and the implied stock price is more likely to be smaller (greater) than the observed stock price. Thus, *Divergence* measures the bias of the range and reveals the expectations from the option market. If there is more than one *Divergence* in an option category at time *t*, the vega-weighed mean of the *Divergence*s is used in the event study.

<<Insert Figure 1 about here>>

3. The Relation between Implied Stock Price and Divergence

Although both the implied stock price and *Divergence* measure the discrepancy between the stock and option markets, they have different merits. The implied stock

[10] This argument is consistent with Bodurtha and Courtadon (1986).

price, derived from the sequential approach, is a direct measure of the stock price reflected in the option market, but it may suffer from model-specification errors. On the other hand, the *Divergence*, based on option boundaries, is a model-free estimate, but it is not a direct measurement of stock price. By employing both approaches, we have an inherent mutual robustness check.

B. Event Study Procedure

We use a standard event study procedure (see, for example, Mikkelson and Parch (1988) and Liang (1999)) to test the abnormal stock returns around the event date. We now discuss procedures to obtain abnormal returns in both stock and option markets.

1. Stock Market Returns

To analyze stock price behavior, we first specify a benchmark return and define the daily abnormal price change in the event window as the difference between the actual return and the benchmark return. We use the following three-factor model to generate benchmark returns:

$$R_{it}=\alpha_i + \beta_m R_{mt} + \beta_{SMB} SMB_t + \beta_{HML} HML_t + \varepsilon_{it}, \qquad (8)$$

where R_{it} is the log return for common stock i on day t, R_m is the log return for the *CRSP* value-weighted market index, *SMB* is the difference between the daily returns on portfolios of small and big stocks, and *HML* is the difference between the daily returns on stock portfolios of high and low book-to-market values.[11] ε_{it} is the random error term of stock i on day t. We define the announcement day as day 0, and then estimate the model parameters for a 150-day period from day -154 through day -5. The abnormal returns for common stock i from day +1 to day +30 are estimated from:

$$AR_{it} = R_{it} - (\alpha_i + \beta_m R_{mt} + \beta_{SMB} SMB_t + \beta_{HML} HML_t) = \varepsilon'_{it}, t = 1, 2,\ldots,30. \quad (9)$$

The cumulative abnormal returns for the portfolio consisting of N stocks from day t_1 to day t_2 are:

[11] R_m, SMB, and HML are obtained from http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/.

$$CAR = \frac{1}{N}\sum_{i=1}^{N}\sum_{t=t_1}^{t_2} AR_{it}\ , \qquad (10)$$

Statistical tests are based on the following z-statistic corrected for serial dependence. As in Mikkelson and Parch (1988), the test statistics are:

$$Z(CAR) = \frac{1}{N}\sum_{i=1}^{N}\left(\sum_{t=t_1}^{t_2} AR_{it} \Big/ \sqrt{VAR\sum_{t=t_1}^{t_2} AR_{it}}\right), \qquad (11)$$

2. The Price Difference between Stock and Option Markets

The abnormal behavior of implied stock prices and corresponding divergences are analyzed similarly to that in the stock market. We first specify a benchmark price relation between the option and stock markets. Then, we define the abnormal price relation as the difference between the actual and benchmark price relation in the event window. This study uses two estimates for the price relation. The first estimate is calculated as the option implied stock price minus the actual stock price. The second estimate is the *Divergence* derived from the option boundaries. The benchmark relation for stock *i* is specified as:

$$\overline{Diff_i} = \sum_{t=-154}^{-5} Diff_{i,t} / 150 \qquad (12)$$

where *Diff=SDC, SDP, or DIV,* and are defined as:

$$SDC_{i,t} = \frac{SC_{i,t} - S_{i,t}}{S_{i,t}}\ ,\ SDP_{i,t} = \frac{SP_{i,t} - S_{i,t}}{S_{i,t}}\text{, and } DIV_{i,t} = \frac{Divergence_{i,t}}{S_{i,t}}.$$

$SC_{i,t}$ and $SP_{i,t}$ are the implied stock prices from call and put options, respectively, derived from equation (2). $Divergence_{i,t}$ measures the degree of divergence between option implied and actual stock prices specified in equation (7). Consistent with the benchmark in the stock market, the benchmark for options is estimated based on a 150-day period from day -154 to day -5. A positive (negative) *Diff* indicates the implied stock price is relatively larger (smaller) than the actual stock price.

The abnormal price differences for option *i* from day +1 to day +30 are estimated from:

$$A\_Diff_{it} = Diff_{it} - \overline{Diff_i}\ ,\ t = 1, 2, \ldots, 30. \qquad (13)$$

If the option market responds to the price pressure in a similar manner as the stock market, implied stock price should move along with the stock price and the abnormal price difference, A_Diff_{it}, should be close to zero. On the other hand, if *A_Diff* behaves abnormally during the event window under study, it indicates the existence of a "rationality gap" between option and stock markets.

The cumulative abnormal price difference for the portfolio consisting of N stocks from day t_1 to day t_2 is:

$$CA\_Diff = \frac{1}{N}\sum_{i=1}^{N}\sum_{t=t_1}^{t_2} A\_Diff_{it}\,, \qquad (14)$$

The test statistic takes the following form:

$$Z(CA\_Diff) = \frac{1}{N}\sum_{i=1}^{N}\left(\sum_{t=t_1}^{t_2} A\_Diff_{it} \Big/ \sqrt{VAR\sum_{t=t_1}^{t_2} A\_Diff_{it}}\right), \qquad (15)$$

In addition to the z-statistic, we also conduct the generalized sign test. The null for the generalized sign test is that the proportion of positive (negative) abnormal price differences during the event window is the same as in the estimation period.

Since existing literature shows strong evidence of a price pressure effect in the stock market, we propose the following three hypotheses.

H_1: If $CA\_Diff < 0$ and statistically significant, the option market does not respond to the noisy information (i.e., Cramer's recommendations) in the same way as the stock market. We conclude the option market behaves more rationally than the stock market.

H_2: If $CA\_Diff = 0$, the option market responds to the noisy information similar to the stock market. We conclude no "rationality gap" exists between stock and option markets.

H_3: If $CA\_Diff > 0$ and statistically significant, the option market is more responsive to the noisy information than the stock market. We conclude the option market is less rational than the stock market.

Our measurement of abnormal performance alleviates the potential measurement error and non-synchronous trading problems. We examine *A_Diff* based on $\overline{Diff}$ as a benchmark, not relying solely on one method: neither implied prices nor divergence

alone. Hence the impact of the potential measurement errors on *CA_Diff* is minimized.[12] Abnormal trading activities such as trading volume and bid-ask spreads are calculated based upon the same principle. The procedures are detailed in Appendix C.

III. Data

Following Balcarcel and Chen (2007) and Engelberg et al (2009), we obtained Cramer's 1,193 buy recommendations from MyMoneyWatch.com from July 2005 through April 2007. Upon matching the stock with the option data, 1,157 buy recommendations are available for analysis. We also partitioned the sample into two equally divided sub-periods. The first sub-period runs from July 2005 to May 2006, and the second sub-period is from June 2006 to April 2007. The split point, May 2006, is approximately the time when the first version of Engelberg et al.'s paper received press attention. Consequently the test results for the two sub-periods may reveal whether investors learned from the price pressure effect.

We use CRSP daily stock returns and the value-weighted index returns to estimate benchmark stock returns and to calculate *CARs*. The daily trading volume and shares outstanding are used to calculate the abnormal trading volume (see Appendix C, equations C.1 – C.5). We use daily closing bid and ask prices to calculate the abnormal spread (see Appendix C, equations C.6 – C.10). We also explore a possible size effect by partitioning sample firms into small-, medium-, and large-capitalization categories five trading days prior to the recommendation.

We obtained daily option data from the OPRA (Options Price Reporting Authority). The option records are organized by series, including symbol, expiration month, strike price, type of options, open interest, daily trading volume, bid and ask prices, and underlying stock symbol and price. We discard observations with negative bid-ask spread or with stock spread greater than 10% of the price (see Korajczyk and Sadka (2004), and Engelberg et al. (2009)).

Options with maturity of 10 to 90 days are used to derive the implied stock prices. To calculate the *Divergence*, we classify options with delta between 0.20 and 0.40 as out-of-the-money (OTM); between 0.40 and 0.60 as at-the-money (ATM); and 0.60 to 0.80

[12] If the impact exists, it should only weaken the test results.

as in-the-money (ITM).[13] We discard options with delta less than 0.20 or greater than 0.80 to avoid thin trading/low liquidity problems. Based on option moneyness, the *Divergence* may be calculated based on a pair of OTM call and ITM put; ATM call and ATM put; or ITM call and OTM put. The average *Divergence* is calculated using vega-weights for all pairs of options.

IV. Empirical Results

A. Descriptive Statistics

Table 1 documents summary statistics for the recommended stocks. We calculate average firm size based on the market value of equity from day -5 through day -1. Spread and share turnover are computed from day -154 through day -5 prior to the event date. For the entire sample period, the sample consists of 1,157 stocks, among which 385 are small-caps; 387 are mid-caps; and 385 are large-caps. The average market capitalizations for small-cap, mid-cap and large-cap are approximately \$0.90, \$4.44, and \$39.88 billion, respectively. The average daily returns are positive across all sizes. The bid-ask spread for small-cap stocks (0.16%) is more than twice that of the large-cap (0.06%). This is consistent with the notion that small-cap market makers face greater adverse selection and (or) higher inventory/order processing costs (see Madhavan et al. (1997), and Liang (1999)). Also, size is negatively related to returns and systematic risk, similar to previous findings.

Sub-period sample statistics are mutually similar. We note that the first sub-period has 952 recommendations, more than four times the number in the second sub-period (205 picks). Mr. Cramer apparently became more selective during the second sub-period.

<<Insert Table 1 about here>>

Table 2 reports the descriptive statistics for options by firm size. We define the implied volatility ratio, *IV*, as implied volatility divided by the COBE's volatility index

[13] The classification of moneyness is arbitrary. We also conduct the test based on different delta groups (0.02~0.45 for OTM, 0.45~0.55 for ATM, and 0.55~0.98 for ITM) and the stock price to exercise price ratios. The test results are qualitatively similar.

(VIX). Option spread is calculated in the same manner as stock spread. Option turnover is computed using option trading volume divided by stock trading volume on a daily basis.

During the entire sample period, both *IV* and *Spread* are inversely related to firm size, which is consistent with the statistics found in Table 1 for systematic risk and spread of stocks. Nevertheless, option spreads are much larger than stock spreads. These larger option spreads reflect higher order processing cost and price discreteness. For instance, an out-of-the-money option could have bid and ask prices of \$1.00 and \$1.50, respectively, showing a 40% bid-ask spread. Large spreads enable option market makers to reveal their information or expectations about the underlying stock values without violating any boundary conditions and inviting arbitrageurs.

We also find a positive relation between size and option turnover. This suggests small-cap options are relatively less traded than large-cap options, and hence, have wider spreads. *SDC*, the differences between implied stock prices from calls and actual stock prices, are negative across different firm sizes. This indicates the implied prices from calls are slightly lower than the actual stock prices over the sample period. This is consistent with previous studies (i.e., Ofek, Richardson and Whitelaw (2004)) in that short-sale constraints result in asymmetric relations between observed stock market prices and option implied prices.[14] Nevertheless, this tendency should not affect the test results because $A\_Diff_{it} = Diff_{it} - \overline{Diff_i}$, i.e., the abnormal price differences are calculated based on the gap between the price differences and their averages over the estimation window. Abnormal price differences are thus calculated relative to their benchmark values. Put options have smaller turnovers than call options. This indicates that put options are traded less often than call options. *Divergence* estimates across all sizes show similar patterns as *SDC* and *SDP*.

<<Insert Table 2 about here>>

B. Results for the Whole Sample

[14] The short-sale constraints make it difficult to short sell "overvalued" stocks. Consequentially, stock prices have the tendency to be greater than the option implied stock prices.

1. Price Pressure Effect

Table 3 documents the price pressure effect of Mr. Cramer's recommendations on stock and option markets for day +1, +2, +3, +5, +10, +15, and +30 for the entire sample period. We study the price effect beginning day +1 (the day after the recommendation) because Mr. Cramer makes his recommendations after the market closes.

Column 3 shows the price pressure effect for stock portfolios. Consistent with the findings in Balcarcel and Chen (2007) and Engelberg et al (2009), we detect a price pressure effect, and the effect is strongest on small-cap stocks. We also find the smaller the size, the longer the price effect and the stronger the price reversal.

On day +1, the cumulative abnormal return, CAR, is 3.33%, 1.19%, and 0.54%, for small-, mid-, and large-cap stocks respectively. The small-cap stock portfolio has the strongest and most significant price pressure among all portfolios. The price effect for the small-cap lasts longer than five days and peaks around day 3. Z-test and generalized sign test results are consistent. The price appreciation, however, fades away rapidly and becomes negative by day +30. The sharp price reversal for the small-cap stocks from day +3 through day +30 suggests that small stocks are particularly vulnerable to noisy information. Although mid-cap stocks also experience the price pressure effect for the first three days, they exhibit a smaller price reversal from day +3 to day +30, or -0.64% (1.06% minus 1.70%). Large-cap stocks appear fairly insensitive to the noisy information, hence there is little price pressure effect.

Column 4 reports the cumulative abnormal price differences based on the implied stock prices derived from call options (*CA_Diff* for *SDC*). Although the *CA_Diff* for the small-cap stocks are negative for the first three days, Z-test statistics are insignificant. The sign test reveals that the negative *CA_Diff* are statistically significant up to day +5, meaning that the fraction of negative *CA_Diff* is much larger after the recommendation. Therefore, there is some evidence in the call options that support Hypothesis 1, i.e., call option traders do not respond, or respond less to Cramer's buy recommendations than stock traders.

We observe from the put option results in Column 5 that the cumulative abnormal implied stock price differences derived from put options (*CA_Diff* for *SDP*) are much stronger than *CA_Diff* for *SDC*. For all firm sizes, *CA_Diff* for *SDP* carry negative signs.

In particular, the parameters of *CA_Diff* for the small-caps are negative and significant at less than the 1% level for days +1 through +3 in Z-test, and significant for days +1 through day +15 in the generalized sign-test. In contrast to the strong price pressure effect on the small-cap stocks for the first three trading days following Mr. Cramer's recommendations, the small-cap put options yield abnormally low implied prices. For example, for the small-caps, *CA_Diff* of *SDP* estimates are -0.29% (with a z-statistic of -3.80), -0.30% (a z-statistic, -4.28), and -0.26% (a z-statistic, -3.15), for day +1 through day +3, respectively. Thus, the transitory price pressure effect in the stock market is not fully transmitted to put premiums in the option market. In contrast to the stock market, implied stock prices derived from put options are generally lower during the event window due to higher option premiums. The stronger results for puts may also suggest that put traders may actually bet against naïve investors in the stock market who follow Cramer's recommendations. A put option is a better instrument to bet against Cramer's buy recommendations than a call option. Although the option boundary conditions could restrict the dissimilarity between calls and puts, the bid-ask spread of option quotes may still yield the discrepancy without violating the boundary conditions. Given this evidence, rationality discrepancy between option and stock markets does exist, because the option market does not react to Cramer's recommendations the same way as the stock market.

Test results for the cumulative abnormal divergence, *CA_Diff* for *Divergence*, are reported in the last column of Table 3. During the entire sample period, results for *CA_Diff* for *Divergence* are consistent with the findings from *CA_Diff* for puts. Z-tests for the small-cap stocks show negative and significant *CA_Diff* for *Divergence* over the first two days following the event date, while generalized sign-tests are significant through day +10. For instance, *CA_Diff* estimates of *Divergence* are -0.14% (with a z-statistic of -2.43; a sign-test statistic of -4.01) and -0.18% (a t-statistic, -2.78; a sign-test -3.36) for day +1 and day +2, respectively. *CA_Diff* estimates for *Divergence* for the mid-caps are also negative and significant up to day +5 based upon sign-tests.

These results support Hypothesis 1 that option traders do not react the same way to the Cramer's buy recommendations as stock traders. The strong evidence from puts may suggest option traders purchase puts to exploit the trading behavior of naïve stock market traders.

<<Insert Table 3 about here>>

Figure 2 displays the *CAR*, and *CA_Diff*s for *SDC*, *SDP*, and *Divergence* for the entire sample period. Figure 2(A) shows the existence of the price pressure effect and return reversal for small-cap stocks. The *CAR* for small-caps jumps immediately following the recommendations. They remain positive for seventeen days, although they begin to decline after day +3 and eventually become negative. On the other hand, the price pressure effect and return reversal for mid-cap and large-cap stocks are less evident. Figure 2(B) displays the *CA_Diff* estimates for call options; the cumulative abnormal price differences for the small-cap and mid-cap stocks are negative for the first several days. The *CA_Diff*s for puts are depicted in Figure 2(C). For small-cap put options, the cumulative abnormal price difference drops to -0.29% on day +1, remaining negative and significant for the first few trading days. Although mid-cap and large-cap put options also show negative *CA_Diff*s, they are smaller and less significant. A similar pattern is also observed in Figure 2(D) for *CA_Diff* for *Divergence*. These figures reinforce the results reported in Table 3.

<<Insert Figure 2 about here>>

2. Abnormal Trading Activities

In this subsection, we examine the abnormal trading activities following Cramer's recommendations. The test results on bid-ask spreads and turnover for stocks and options for day +1, +2, +3, +5, +10, +15, and +30 are reported in Table 4. *ATS, ATC, and ATP* represent abnormal stock turnover, abnormal call option turnover, and abnormal put option turnover, respectively. *ASS, ASC*, and *ASP* refer to abnormal bid-ask spreads for stocks, call options, and put options, respectively. Abnormal turnover and bid-ask spread calculations are illustrated in Appendix C.

Table 4 shows that both markets experience abnormally higher trading volume across all stock sizes. For day +1, *ATS*s for small, mid, and large-caps are 3.39, 0.73 and 0.35, respectively, and all are significant at the one percent level or less. This suggests

some investors follow Mr. Cramer's recommendations, buying stocks across the board. Although large- and mid-cap stocks are more heavily traded than normal, trading occurs with little price effect. Small-cap stocks exhibit the strongest and most persistent abnormal trading activity. The *ATS*s for small-caps are positive and significant more than five trading days following the event day.

In the option market, the small-cap *ATC* is also positive and significant, but lasting only two days. *ATP* for small-caps is stronger than *ATC*, and it lasts more than five days. This suggests puts are more heavily traded than calls, which differs Table 2 regarding option turnover. This is consistent with the abnormal short-sale volume found in Engelberg et al. (2009). As informed traders anticipate the price pressure effect, they may exploit the opportunity by either short-selling the small-caps in the stock market and/or purchasing puts.

Table 4 also presents the abnormal bid-ask spreads for stocks and options. Large- and mid-cap stocks do not show significant spread changes in either market, while small-caps reveal significant results. First, the abnormal stock spread decreases significantly on day +1 — *ASS* is -26.61% with a z-statistic of -2.69. The abnormal option spread for calls, *ASC*, also decreases marginally on day +1. Furthermore, for small-cap puts, the abnormal option spread, *ASP*, exhibits a significant bid-ask spread narrowing lasting more than three consecutive days. We conjecture that market makers, like informed traders, have knowledge about the noisy information provided by Cramer's recommendations. Facing less information asymmetry, option market makers experience a significantly lower adverse selection risk, reducing bid-ask spreads.

<<Insert Table 4 about here>>

Figure 3 depicts the trading behavior of stocks and options for the entire sample. The stock abnormal trading volumes and spreads are displayed in Figures 3(A) and 3(B). *ATS* shows spikes appearing the first several trading days across the board, most notably for small-cap stocks. The stock spread, *ASS*, behaves normally in general, except for the small-caps on day +1. Abnormal trading and bid-ask spreads for call options are shown in Figures 3(C) and 3(D). Call options for small-caps exhibit an increase in *ATC* on days

+1 and +2. Excepting small-cap calls on day +1, the call options show no significant changes in *ASC*. The abnormal trading volumes and spreads for put options are presented in Figures 3(E) and 3(F). *ATP* for mid-caps and large-caps behave normally during the event window. Small-cap puts experience significant *ATP* surges during the first three days, with significance lasting five days. Moreover, the abnormal spreads, *ASP*, decrease significantly from days +1 to +3. This strengthens the validity of the informed trading habitat hypothesis.

<<Insert Figure 3 about here>>

C. Sub-period Results

1. Price Pressure Effects

We also test two sub-periods to examine whether the uninformed remain so over period of time. This is particularly interesting given the controversy regarding the information content of Cramer's picks.[15] The test results for the price pressure effect and trading activities for sub-period analyses are reported in Tables 5 and 6. Table 5 reports the price pressure effect of *Mad Money* recommendations for the two sub-periods. The results for the first sub-period (July 2005 ~ May 2006) are exhibited in Panel A of Table 5. The findings in this panel are similar to those in Table 3 for the entire sample period. Small-cap stocks experience the strongest and longest price pressure. They also exhibit the most dramatic price reversals. *CAR* drops from the peak of 6.61% on day +3 to -3.18% on day +30. *CA_Diff* for call options (*SDC*) is not significant in the Z-test (day +1 is marginally significant at the 10% level), but statistically significant in the sign test up to day +5. Hypothesis 1 is thus mildly supported by the call trading. *CA_Diff* for put options (*SDP*) and *Divergence* of small-caps are negative and significant for the first three trading days following Cramer's recommendations in the Z-test. The significance lasts for 15 days in the sign test. Although mid-caps also show some price pressure effects, they are milder than for small-caps. The negative and significant *CA_Diff* for put options suggests that some informed investors may in fact trade in the option markets against Cramer's recommendations. Put options appear to be a more desirable trading

[15] The first Mad Money show was aired on July 20, 2005.

venue than calls. Such findings support the existence of a rationality discrepancy between stock and option markets.

Panel B of Table 5 reports the test results for the second sub-period from June 2006 through April 2007. Comparing to Panel A, we find that the results in Panel B are weaker than those found in the first sub-period. The price pressure and reversals for all stock portfolios lessen. Although *CAR* peaks on day +5 at 3.98% for the small-caps, reversing (-5.87%) on day +30, only *CAR* on day +2 is statistically significant at the 5% level in the Z-test.[16] None of the sign tests are significant. The cumulative abnormal price differences for puts and *Divergence* also weaken substantially. *CAR_Diff* for put options is significant on days +1 and +5 in the Z-test while the significant sign-test results last five days. Moreover, none of the *CAR_Diff* for *Divergence* is statistically significant. Reduced abnormal returns in the option market in response to Cramer's picks correspond to the weakened abnormal returns found in the stock market. It is possible that stock market investors are more aware of the price pressure effect from the first sub-period, and they learn from the past and adjust their trading behavior accordingly. This finding echoes the argument made in Engelberg et al. (2009).

<<Insert Tables 5 about here>>

2. Abnormal Trading Activities

Table 6 shows the effect of Cramer's recommendations on trading activities in the two sub-periods. Panel A shows the results for the first sub-period, while Panel B presents the results for the second sub-period. Results shown in Panel A are very similar to that reported in Table 4 for the whole period. Panel A shows that stock market experiences abnormally higher trading volumes across all stock sizes, with the largest trading volume occurring in small-cap stocks where abnormal trading lasts up for 5 days. This suggests investors who follow Mr. Cramer's recommendations purchased stocks across the board. Large- and mid-cap stocks are more heavily traded than usual, but trading occurs with little price effect.

[16] Results for days +3 and +5 are significant at the 10% level.

In the option market, the small-cap *ATC* is also positive and significant for two days, while a significant *ATP* for small-caps lasts for more than ten days, implying that put options are more heavily traded than call options. As informed traders expect the price pressure effect in the stock market, they exploit the opportunity by either short selling the small-caps in the stock market and/or purchasing puts.

Table 6 Panel A shows the abnormal bid-ask spreads for stocks and options. The large-cap and mid-cap stocks do not show significant abnormal spread changes for both stocks and options, while the small-caps exhibit significant changes. The abnormal stock spread decreases significantly on day +1 (*ASS* is -27.21%). This can be interpreted as stock market makers, aware of the noisy information, reduce spreads when they face less adverse selection risk. The abnormal option spread for calls, *ASC*, also decreases marginally on day +1. The put options show the most significant results. For small-cap put options, the abnormal option spread, *ASP*, exhibits a significant decrease that lasts for more than three days.

Table 6 Panel B reports trading activities for sub-period two. The trading activities in sub-period two are much weaker than those of period one. The only significant activity is found in the stock market, albeit at a much weaker level compared to the first sub-period. We conclude from the sub-period analyses many investors learned from past experience, adjusting trading strategies accordingly.[17]

<<Insert Table 6 about here>>

V. Robustness Tests

In Section III, we discard options with delta less than 0.2 or greater than 0.8 to mitigate the options thin trading or low liquidity problems. We further reduce liquidity concerns by including only options with a minimum trading volume of 20 contracts. We re-test the price pressure effect, and the results are in Tables 7 and 8.

[17] Bloggers have long discussed Cramer's stock picks over the internet before any academic research. Academic research and professional financial magazines began the scrutiny during the period of 2006 and 2007. In addition to the research cited in this paper, see a Barron editorial "Shorting Cramer" (August 20, 2007 by Bill Alpert).

Table 7 presents full sample results. These are similar to Table 3. A strong price pressure effect for the small-cap and mid-cap stock portfolios is evident in Column 3. In Column 4, *CA_Diff* for *SDC* are mostly negative but insignificant at the 5% level for the Z-test. Sign test statistics are significant, indicating abnormal price effect in the calls. Compared to Table 3, the abnormal price effect for calls is stronger, and the signs of the parameters are more consistently negative. Results from both liquidity constraint assumptions provide evidence favoring the informed trading habitat hypothesis. *CA_Diff* for *SDP* in Column 5 are significant in both the Z-test and sign test through day +4 and day +10 respectively, suggesting abnormal price effects in the put. *CA_Diff* for *Divergence* in Column 6 confirms put results. These findings reaffirm support for Hypothesis 1, that option traders behave more rationally than stock traders.

Sub-period results are reported in Table 8. Panel A shows the results for the first sub-period while Panel B for the second sub-period. Again, these sub-period results mirror the evidence presented in Table 5. That is, the stock price pressure effect and the "rationality gap" between stock and option markets are stronger in the first sub-period than the second. The price pressure effect in the stock market is significantly weakened in the second sub-period; so is the abnormal return difference in the option market.

VI. Conclusions

This paper explores the "rationality gap" between the stock and option markets in response to the arrival of noisy information in the form of buy recommendations from a popular television show host. Extant literature has dealt extensively with lead-lag relations and the price discovery process between these two markets. An unexplored issue is whether stock and option markets behave equally rationally. Very little attention has been given to the unusual situation in which two markets diverge. If the stock and

option markets are out of sync with each other occasionally, it is important to discover why, and which market behaves more rationally. Our results have implications for the hypothesis of preferred habitat of informed trading. We find that a short-lived price pressure effect associated with the recommendations of *Mad Money* show host Jim Cramer provides an ideal experimental environment.

We conduct event studies to examine the effect of Mr. Cramer's recommendations on stock and option markets. For stock prices, small-cap stocks show a strong short-lived price run-up followed by a price reversal, consistent with Engelberg et al. (2009). We assert this behavior may represent an irrational reaction of naïve investors to Mr. Cramer's recommendations. However, if as past research suggests (see, e.g., Black (1975), Cox and Rubinstein (1985), Easley et al. (1998), and Chakravarty et al. (2004)), the option market is the preferred habitat for informed traders, option implied stock prices should be less responsive to noisy information, hence a divergence from the actual stock prices occurs, especially when short sale constraints and the absence of arbitrage are present.[18] If informed investors anticipate the price pressure effect, they may even trade against the stock investors, causing the option implied stock price to be significantly lower than the actual stock price.

Our empirical results show that the implied stock prices are significantly smaller than actual stock prices around the window of Mr. Cramer's recommendations, especially for the put options. Hence the price pressure effect observed in the stock market is lacking in the option market. We conclude that the option market behaves more rationally in response to noisy information than the stock market. In addition to the lower implied stock prices, we also find higher trading volumes and narrower bid-ask spreads. The increased trading volumes and narrower option spreads imply some option trades, in particular put option trades, are bets against stock trades. These results are consistent with Engelberg et al. (2009) which shows that short sale activities increase following Cramer's recommendations. Nevertheless, markets are relatively efficient in learning the short-lived price pressure effect, incorporating such knowledge in the second half of our

[18] The large bid-ask spread in the option market may reduce the arbitrage opportunity. See also argument about the short sale constraint on put-call parity in Ofek et al. (2004).

sample period. The abnormal trading behavior in the option market, along with the price pressure effect in the stock market, has weakened substantially in the second sub-period.

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Appendix A: The Sequential Approach to Option-Implied Stock Prices (Barone-Adesi-Whaley (1986))

$$C = c + A_2 (S/S^*)^{q2} \quad \text{if } S<S^*$$
$$= S-X \quad \text{if } S \geq S^*$$

c = European Call Options $= e^{-rq \times \tau} S \cdot N(d_1) - e^{-rd \times \tau} X \cdot N(d_2)$

$$d_1 = [\ln(S/X) + (r_d - rq + \sigma^2/2) \times \tau] / \sigma\sqrt{\tau}$$
$$d_2 = [\ln(S/X) + (r_d - rq - \sigma^2/2) \times \tau] / \sigma\sqrt{\tau} = d_1 - \sigma\sqrt{\tau}$$

$$A_2 = S^* / q2 \times \{ 1- e^{-rq \times \tau} N[d_1(S^*)]\}$$

$$q_2 = \{-(N-1)+[(N-1)^2 + 4M/k]^{1/2}\}/2$$

$$M=2r_d/\sigma^2$$

$$N= 2(r_d-rq) /\sigma^2$$

$$k=1-e^{-rd \times \tau}$$

$$P = p + A_1 (S/S^{**})^{q1} \quad \text{if } S>S^{**}$$
$$= X-S \quad \text{if } S \leq S^{**}$$

p = European Put Options $= e^{-rd \times \tau} X \cdot N(-d_2) - e^{-rq \times \tau} S \cdot N(-d_1)$

$$A_1 = -S^{**} / q1 \times \{ 1- e^{-rq \times \tau} N[-d_1(S^{**})]\}$$

$$q_1 = \{-(N-1)-[(N-1)^2 + 4M/k]^{1/2}\}/2$$

where C (P) is the American option premium for a call (put) option; S* (S**) refers to the critical spot price that triggers early exercise of a call (put) option. S is the stock price; r_d and r_q are the risk-free rate and dividend yield, respectively; X stands for the strike price of an option; $N(\cdot)$ is the standard cumulative normal distribution function, σ^2 is annualized variance of the continuously compounded return; and τ is time to maturity.

Appendix B:

Description for applying the Generalized Newton Method to derive implied stock prices

The basic idea in the Generalized Newton Method is to choose a group of starting values of the estimated parameters, and continually improves the estimates based on an inverse Jacobian matrix until the error sum of squares falls into a pre-specified acceptable tolerance level.

In order to solve *n* unknown parameters among *n* nonlinear equations, the solution procedure can be setup as:

$$\left.\begin{array}{l} X_1(v_1, v_2,\ldots,v_n) \\ X_2(v_1, v_2,\ldots,v_n) \\ \vdots \\ \vdots \\ X_n(v_1, v_2,\ldots,v_n) \end{array}\right\} \qquad \text{(B-1)},$$

where X's are the functions of parameters $v_1, v_2,\ldots,v_n$. v_i is the ith parameter in X.
By setting a group of starting values ($v_{1.0}, v_{2.0},\ldots,v_{n.0}$) to initiate the generalized Newton procedure, the subsequent values are calculated repeatedly as follows:

$$\begin{pmatrix} v_{1.i} \\ v_{2.i} \\ \vdots \\ v_{n.i} \end{pmatrix} = \begin{pmatrix} v_{1.i-1} \\ v_{2.i-1} \\ \vdots \\ v_{n.i-1} \end{pmatrix} - \begin{pmatrix} \partial X_1/\partial v_1 & \partial X_1/\partial v_2 \ldots . \partial X_1/\partial v_n \\ \partial X_2/\partial v_1 & \partial X_2/\partial v_2 \ldots . \partial X_2/\partial v_n \\ \vdots & \vdots \quad \vdots \quad \vdots \\ \partial X_n/\partial v_1 & \partial X_n/\partial v_2 \ldots . \partial X_n/\partial v_n \end{pmatrix}^{-1} \times \begin{pmatrix} X_1(v_{1.i-1}, v_{2..i-1},\ldots,v_{n..i-1}) \\ X_2(v_{1.i-1}, v_{2..i-1},\ldots,v_{n..i-1}) \\ \vdots \quad \vdots \quad \vdots \\ X_n(v_{1.i-1}, v_{2..i-1},\ldots,v_{n..i-1}) \end{pmatrix} \quad \text{(B-2)}$$

where j in equation (B-2) refers to the jth iteration. Based on the generalized Newton model, one may solve *n* unknown parameters according to *n* nonlinear equations (functions). In this study, the function is the Barone-Adesi-Whaley (1986) model given in Appendix A, and the unknown parameter is the implied volatility or implied stock price.

Appendix C: Calculation of Abnormal Trading and Bid-Ask Spread

We compute the abnormal trading volume, ATO_t, on day t and its standard deviation as follows. The stock turnover ratio is specified as:

$$TO_{it} = \frac{VOL_{it}}{SHROUT_{it}}, \qquad \text{(C.1)}$$

where VOL_{it} and $SHROUT_{it}$ are the daily trading volume and share outstanding for stock i on day t, respectively. The average daily turnover for stock i is calculated using the daily turnover in days -154 to -5:

$$\overline{TO_i} = \sum_{t=-154}^{t=-5} \frac{TO_{it}}{L}. \qquad \text{(C.2)}$$

The daily turnover for day t is the simple average turnover for all stocks in the sample:

$$TO_t = \frac{1}{N} \sum_{i=1}^{N} \frac{TO_{it}}{\overline{TO_i}}, \qquad \text{(C.3)}$$

where N is the number of stocks for day t. The abnormal trading volume, ATO_t, is then computed as:

$$ATO_t = TO_t - 1, \qquad \text{(C.4)}$$

The standard deviation of the abnormal volume is:

$$\sqrt{Var(ATO_t)} = \frac{1}{L-1} \sum_{t=-154}^{-5} (ATO_t - \overline{ATO})^2, \qquad \text{(C.5)}$$

where $\overline{ATO} = \frac{1}{L} \sum_{t=1}^{L} ATO_t$.

The abnormal bid-ask spread, $ASPREAD_t$, on day t and its standard deviation are estimated in the same manner as the procedure described for the abnormal trading volume, We first define the spread as:

$$Spread_{it} = \frac{Ask_{it} - Bid_{it}}{(\frac{Ask_{it} + Bid_{it}}{2})}. \qquad \text{(C.6)}$$

where $Spread_{it}$, Ask_{it}, and Bid_{it} are the daily spread, ask, and bid for stock *i* for day *t*. The average daily spread for stock *i* is calculated using the daily spread from days -154 through -5:

$$\overline{Spread_i} = \sum_{t=-154}^{t=-5} \frac{Spread_{it}}{L}. \qquad \text{(C.7)}$$

The daily spread for day *t* is the simple average spread for all stocks in the sample:

$$Spread_t = \frac{1}{N} \sum_{i=1}^{N} \frac{Spread_{it}}{\overline{Spread_i}}, \qquad \text{(C.8)}$$

where *N* is the number of stocks for day *t*. The abnormal spread, $ASPREAD_t$, is specified as:

$$ASPREAD_t = Spread_t - 1, \qquad \text{(C.9)}$$

The standard deviation of the abnormal spread is:

$$\sqrt{Var(Spread_t)} = \frac{1}{L-1} \sum_{t=-154}^{-5} (Spread_t - \overline{Spread})^2, \qquad \text{(C.10)}$$

where $\overline{Spread} = \frac{1}{L} \sum_{t=1}^{L} Spread_t$.

Table 1: Descriptive statistics for stocks

This table reports descriptive statistics for our stock sample. Size (in $thousand) is calculated based upon the average market value of equity from day -5 through day -1; Return is the log price ratio; Spread is the bid-ask spread; Beta measures the systematic risk.

Entire Sample period (July 28, 2005 ~ April 30, 2007)					
	Obs.	Size	Return	Spread	Beta
Small-Cap	385	$904,686	0.17%	0.16%	1.41
Mid-Cap	387	$4,435,905	0.16%	0.09%	1.26
Large Cap	385	$39,878,596	0.12%	0.06%	1.08
Sub-period 1 (July 28, 2005 ~ May 31, 2006)					
Small-Cap	317	$882,150	0.19%	0.16%	1.39
Mid-Cap	318	$4,437,932	0.18%	0.09%	1.23
Large Cap	317	$39,427,601	0.13%	0.06%	1.07
Sub-period 2 (June 01, 2006 ~ April 31, 2007)					
Small-Cap	68	$1,009,743	0.08%	0.13%	1.5
Mid-Cap	69	$4,426,561	0.10%	0.08%	1.41
Large Cap	68	$41,981,027	0.09%	0.06%	1.13

Table 2: Descriptive Statistics for Options

This table reports descriptive statistics for the options sample. IV is the implied volatility ratio calculated by dividing the implied volatility by the CBOE's VIX; Spread is the bid-ask spread; Turnover is calculated by dividing daily trading options trading volume by the stock trading volume. *SDC* (*SDP*) is the weighted difference between call (put) options implied stock price and actual stock price, as shown in Equation (12).; Divergence measures the degree of divergence between option-implied and actual stock prices as in Equation (7).

Entire Sample Period (July 28, 2005 ~ April 30, 2007)									
	Call Options				Put Options				Divergence
	IV	Spread	Turnover	SDC	IV	Spread	Turnover	SDP	
Small-Cap	3.55	26.69%	0.09%	-0.09%	3.69	22.50%	0.04%	-0.04%	-0.07%
Mid-Cap	2.79	15.33%	0.11%	-0.15%	2.87	14.04%	0.06%	-0.04%	-0.13%
Large Cap	2.21	9.17%	0.13%	-0.20%	2.26	8.60%	0.08%	-0.09%	-0.06%
Sub-period 1 (July 28, 2005 ~ May 31, 2006)									
Small-Cap	3.61	26.72%	0.10%	-0.09%	3.75	22.65%	0.05%	-0.05%	-0.06%
Mid-Cap	2.76	15.65%	0.11%	-0.15%	2.84	14.42%	0.06%	-0.02%	-0.14%
Large Cap	2.19	9.26%	0.13%	-0.20%	2.24	8.72%	0.08%	-0.09%	-0.05%
Sub-period 2 (June 01, 2006 ~ April 31, 2007)									
Small-Cap	3.26	26.56%	0.07%	-0.11%	3.37	21.81%	0.04%	-0.02%	-0.07%
Mid-Cap	2.91	13.86%	0.11%	-0.14%	3.03	12.33%	0.07%	-0.13%	-0.08%
Large Cap	2.3	8.76%	0.13%	-0.19%	2.37	8.04%	0.09%	-0.10%	-0.07%

Table 3: Price Pressure Effect of Mad Money Recommendations during the Entire Sample Period (July 28, 2005 ~ April 30, 2007)

This table reports the price effect of Mad Money recommendations. *CAR* is the cumulative abnormal stock returns as calculated in Equation (10). *CA_Diff* for *SDC* (*SDP*) is the cumulative abnormal price difference between implied stock price for call (put) options and actual stock price, as shown in Equation (14). *CA_Diff* for *Divergence* is the cumulative abnormal price difference for *Divergence* as estimated in Equation (14). ** and * denote significant at the 1% and 5% level, respectively.

Column 1 Stocks	**Column 2 Days**	**Column 3 for CAR**			**Column 4 for SDC**			**Column 5 for SDP**			**Column 6 for Divergence**		
	Day	***CAR***	**Z-test test**	**Sign-**	***CA_Diff***	**Z-test for *SDC***	**Sign-test**	***CA_Diff***	**Z-test for *SDP***	**Sign-test**	***CA_Diff* for *Divergence***	**Z-test**	**Sign-test**
Small-Cap (N=385)	1	3.33%	6.82**	3.90**	-0.09%	-1.25	-3.67**	-0.29%	-3.8**	-6.63**	-0.14%	-2.43*	-4.01**
	2	3.97%	5.61**	2.78**	-0.06%	-1.15	-3.97**	-0.30%	-4.28**	-5.67**	-0.18%	-2.78**	-3.36**
	3	6.19%	9.6**	2.85**	-0.01%	-1.21	-2.54*	-0.26%	-3.15**	-7.43**	-0.10%	-1.71	-2.60**
	5	4.66%	4.85**	2.22*	0.04%	1.55	-2.24*	-0.20%	-1.77	-5.39**	-0.08%	-1.66	-2.72**
	10	3.08%	1.94	0.21	-0.03%	-1.15	-1.90	-0.10%	-1.94	-3.94**	-0.03%	-1.34	-3.19**
	15	1.12%	0.13	-0.90	0.02%	0.62	-0.75	-0.05%	-1.47	-2.39*	0.01%	1.18	-1.58
	30	-2.93%	-2.75**	-3.76**	0.01%	0.23	-1.84	-0.05%	-1.29	-0.98	0.04%	0.67	-0.80
Mid-Cap (N=387)	1	1.19%	3.38**	3.11**	-0.02%	-1.16	-2.20*	-0.10%	-3.53	-2.96**	-0.04%	-1.04	-3.00**
	2	1.37%	3.98**	3.38**	0.00%	1.7	-1.83	-0.09%	-3.16	-2.71**	-0.06%	-1.62	-2.18*
	3	1.70%	4.01**	2.57*	0.03%	0.64	-1.57	-0.07%	-1.94	-2.46*	-0.02%	-1.13	-2.18*
	5	1.46%	1.86	-0.45	0.00%	0.42	-1.84	-0.08%	-1.6	-1.63	-0.02%	-0.85	-2.06*
	10	1.12%	1.35	-1.97*	0.03%	0.65	-0.88	-0.09%	-1.88	-1.98*	0.05%	0.71	-0.76
	15	1.31%	0.34	-1.31	0.03%	0.15	-1.79	-0.06%	-1.52	-1.87	0.05%	0.69	-0.95
	30	1.06%	0.9	-1.75	0.04%	1.37	-1.72	-0.05%	-1.78	-1.56	0.06%	0.64	0.04
Large-Cap (N=385)	1	0.54%	1.44	1.09	0.06%	1.06	-1.32	-0.13%	-0.96	-2.84**	0.03%	1.82	-1.48
	2	0.73%	1.89	-0.18	0.06%	1.9	-2.05*	-0.13%	-1.99	-2.80**	0.04%	1.79	-1.07
	3	0.75%	1.93	0.58	0.06%	1.54	-1.85	-0.12%	-1.76	-2.07*	0.03%	1.84	-0.66
	5	0.48%	0.04	-0.91	0.07%	1.87	-1.70	-0.10%	-1.49	-1.73	0.04%	1.64	0.21
	10	0.21%	0.6	-1.03	0.06%	0.85	-1.72	-0.07%	-1.49	-1.79	0.04%	1.2	1.11
	15	0.18%	0.16	-1.46	0.08%	0.62	-1.45	-0.05%	-1.58	-1.91	0.05%	1.22	1.08
	30	-0.23%	-0.78	-1.51	-0.03%	-1.05	-1.90	-0.04%	-1.21	-1.60	0.04%	0.86	1.52

Table 4: The Effect of Mad Money Recommendations on Trading Activities during the Entire Sample Period (July 28, 2005 ~ April 30, 2007)

This table reports the effect of Mad Money recommendations on the trading activities of stocks and options. ATS is the abnormal turnover for stocks; ATC is the abnormal turnover for call options; ATP is the abnormal turnover for put options; ASS is the abnormal bid-ask spread for stocks; ASC is the abnormal bid-ask spread for call options; and ASP is the abnormal bid-ask spread for put options. Appendix C details the estimation procedures. ** and * denote significant at the 1% and 5% level, respectively.

	Day	ATS	z-stat	ATC	z-stat	ATP	z-stat	ASS	z-stat	ASC	z-stat	ASP	z-stat
Small-Cap	+1	3.39	34.87**	1.59	4.64**	1.34	3.04**	-26.61%	-2.69**	-13.66%	-2.07*	-17.69%	-3.13**
	+2	0.56	5.79**	1.01	2.95**	2.31	5.25**	4.54%	0.46	-10.77%	-1.63	-17.07%	-3.02**
	+3	1.22	12.58**	0.51	1.48	2.84	6.46**	-10.35%	-1.05	-10.99%	-1.66	-15.81%	-2.80**
	+5	0.21	2.18*	0.55	1.61	1.26	2.87**	-17.37%	-1.76	-11.08%	-1.68	-7.78%	-1.38
	+10	0.04	0.43	0.31	0.91	0.80	1.82	-4.24%	-0.43	-10.72%	-1.62	-8.54%	-1.51
	+15	0.01	0.09	0.45	1.30	0.23	0.53	7.44%	0.75	-9.77%	-1.48	-10.45%	-1.85
	+30	-0.13	-1.38	0.13	0.38	-0.00	-0.01	-6.82%	-0.69	-12.07%	-1.83	-9.15%	-1.62
Mid-Cap	+1	0.73	10.38**	1.71	4.45**	0.13	1.53	6.73%	1.33	-12.68%	-1.37	-9.60%	-1.93
	+2	0.16	2.27*	0.16	0.41	-0.09	-1.03	3.83%	0.75	-11.47%	-1.24	-8.22%	-1.65
	+3	0.14	1.95	0.43	1.12	0.16	1.87	-0.80%	-0.16	-13.10%	-1.42	-8.14%	-1.64
	+5	0.10	1.47	0.28	0.73	0.14	1.58	-4.84%	-0.95	-3.72%	-0.40	-8.14%	-1.64
	+10	-0.02	-0.28	-0.04	-0.11	-0.05	-0.53	3.56%	0.70	-6.80%	-0.74	-9.47%	-1.90
	+15	0.10	1.40	-0.23	-0.60	-0.05	-0.62	-0.08%	-0.02	-5.04%	-0.55	-8.51%	-1.71
	+30	0.09	1.32	-0.09	-0.22	-0.09	-1.04	-4.18%	-0.82	-7.55%	-0.82	-5.67%	-1.14
Large-Cap	+1	0.35	6.51**	0.11	0.91	0.08	0.48	-4.60%	-0.10	-3.56%	-1.21	-4.31%	-1.60
	+2	0.14	2.52*	0.05	0.40	0.06	0.39	-16.03%	-0.35	-3.31%	-1.13	-4.27%	-1.59
	+3	0.14	2.52*	0.12	0.94	0.01	0.05	13.75%	0.30	-3.82%	-1.30	-4.95%	-1.84
	+5	0.04	0.71	0.05	0.39	0.08	0.48	17.33%	0.37	-4.88%	-1.66	-2.39%	-0.89
	+10	0.03	0.47	-0.15	-1.21	-0.02	-0.14	11.74%	0.25	-0.03%	-0.01	-2.85%	-1.06
	+15	0.06	1.04	-0.08	-0.67	-0.10	-0.65	18.52%	0.40	-0.29%	-0.10	-1.74%	-0.64
	+30	0.04	0.75	-0.20	-1.60	-0.02	-0.10	13.52%	0.29	-0.11%	-0.04	-4.11%	-1.53

Table 5: Price Pressure Effect of Mad Money Recommendations – Sub-period Analysis

This table reports the price effect of Mad Money recommendations for two sub-periods. *CAR* is the cumulative abnormal stock returns; *CA_Diff* for *SDC* is the cumulative abnormal price difference between actual stock price and implied stock price for call options; *CA_Diff* for *SDP* is the cumulative abnormal price difference between actual stock price and implied stock price for put options; *CA_Diff* for *Divergence* is the cumulative abnormal price difference for *Divergence*. ** and * denote significant at the 1% and 5% level, respectively.

Panel A: Sub-period 1 (July 28, 2005 ~ May 31, 2006)												
	Day	***CAR***	**Z-test**	**sign test**	***CA_Diff for SDC***	**Z-test**	**sign test**	***CA_Diff for SDP***	**Z-test**	**sign test**	***CA_Diff for Divergence***	**Z-test**	**sign test**
Small-Cap (N=317)	+1	3.51%	6.75**	3.79**	-0.13%	-1.92	-4.09**	-0.31%	-4.76**	-5.46**	-0.13%	-2.18*	-3.71**
	+2	4.12%	5.48**	2.66**	-0.08%	-1.57	-4.24**	-0.32%	-2.79**	-4.87**	-0.18%	-2.39*	-3.27**
	+3	6.61%	9.01**	2.41*	-0.02%	-0.45	-2.80**	-0.29%	-2.95**	-6.58**	-0.14%	-2.07*	-2.68**
	+5	4.61%	3.6**	1.94	0.05%	1.16	-2.23*	-0.21%	-1.41	-4.85**	-0.03%	-1.82	-2.39*
	+10	3.26%	1.84	0.14	-0.03%	-0.86	-1.58	-0.11%	-1.08	-3.73**	-0.02%	-1.4	-2.73**
	+15	1.93%	0.36	-0.95	0.03%	0.78	-0.27	-0.06%	-1.4	-1.98*	0.04%	1.29	-1.56
	+30	-3.18%	-2.54*	-3.38**	0.02%	1.07	-1.50	-0.05%	-1.32	-0.63	0.07%	0.87	-0.69
Mid-Cap (N=318)	+1	1.15%	3.02**	2.75**	-0.04%	-1.03	-2.23*	-0.13%	-2.34*	-2.27*	-0.05%	-1.46	-2.66**
	+2	1.33%	3.61**	3.13**	-0.01%	-0.9	-1.37	-0.12%	-2.16*	-2.08*	-0.08%	-1.03	-1.80
	+3	1.61%	3.67**	2.07*	0.02%	1.16	-1.08	-0.10%	-1.99*	-1.89	-0.04%	-1.84	-1.66
	+5	1.37%	1.72	-0.41	-0.01%	-0.83	-1.65	-0.10%	-0.3	-1.07	-0.03%	-1.35	-1.65
	+10	1.30%	1.18	-1.83	0.02%	0.96	-1.14	-0.10%	-1.42	-1.27	0.06%	1.74	0.00
	+15	1.87%	0.59	-1.02	0.03%	1.83	-1.46	-0.08%	-1.37	-1.20	0.06%	1.68	-0.35
	+30	1.91%	0.19	-1.38	0.03%	1.92	-1.07	-0.07%	-1.04	-1.55	0.07%	1.83	0.69
Large-Cap (N=317)	+1	0.54%	1.28	0.94	0.09%	1.61	-1.00	-0.16%	-1.61	-2.05*	0.04%	1.23	-0.74
	+2	0.74%	1.92	0.13	0.09%	1.31	-1.81	-0.16%	-2.05*	-2.11*	0.04%	1.29	-0.74
	+3	0.79%	1.85	0.94	0.07%	1.66	-1.41	-0.14%	-1.96	-1.38	0.03%	1.18	-0.47
	+5	0.80%	1.38	-0.33	0.07%	1.32	-1.41	-0.12%	-1.5	-1.22	0.05%	1.07	0.27

	+10	0.61%	0.37	-0.47	0.07%	1.01	-1.34	-0.09%	-1.36	-1.48	0.04%	0.9	1.34
	+15	0.82%	0.3	-0.93	0.10%	0.03	-1.00	-0.08%	-1.46	-1.40	0.05%	1.12	1.27
	+30	0.48%	0.57	-1.13	-0.06%	-0.88	-1.60	-0.05%	-1.04	-1.19	0.04%	0.94	0.86

Panel B: Sub-period 2 (June 01, 2006 ~ April 31, 2007)

	Day	***CAR***	**Z-test**	**sign test**	***CA_Diff for SDC***	**Z-test**	**sign test**	***CA_Diff for SDP***	**Z-test**	**sign test**	***CA_Diff for Divergence***	**Z-test**	**sign test**
Small-Cap (N=68)	+1	2.25%	1.9	1.08	0.06%	1.47	0.10	-0.21%	-2.23*	-4.00**	-0.05%	-1.26	-1.54
	+2	2.86%	2.03*	0.89	0.04%	0.49	-0.31	-0.16%	-1.3	-2.98**	-0.07%	-1.06	-0.92
	+3	3.73%	1.94	1.57	0.04%	0.87	0.00	-0.15%	-1.36	-3.47**	-0.07%	-1.53	-0.41
	+5	3.98%	1.83	1.07	-0.01%	-0.03	-0.51	-0.10%	-1.98*	-2.37*	-0.05%	-1.65	-1.32
	+10	1.96%	1.44	0.19	0.02%	0.14	-1.11	-0.08%	-1.64	-1.32	-0.09%	-1.22	-1.71
	+15	-2.50%	-0.13	-0.10	-0.01%	-0.19	-1.20	-0.02%	-0.12	-1.40	-0.09%	-1.88	-0.40
	+30	-5.87%	-1.18	-1.63	-0.05%	-1.61	-1.16	-0.02%	-0.18	-0.97	-0.07%	-1.18	-0.40
Mid-Cap (N=69)	+1	1.17%	1.87	1.46	0.06%	1.48	-0.20	0.05%	0.91	-1.95	0.01%	1.58	-1.18
	+2	1.46%	1.92	1.28	0.05%	0.29	-1.19	0.07%	0.35	-1.75	0.03%	1.38	-1.10
	+3	2.21%	1.63	1.64	0.06%	1.15	-1.19	0.03%	0.69	-1.55	0.07%	1.59	-1.40
	+5	1.89%	1.76	-0.18	0.06%	0.55	-0.59	-0.01%	-0.16	-1.37	0.02%	1.1	-1.12
	+10	-0.59%	-0.26	-0.73	0.09%	1.17	0.59	-0.05%	-0.48	-1.76	0.02%	1.95	-1.58
	+15	-1.27%	-0.88	-0.91	0.06%	1.69	-0.89	0.04%	1.39	-1.66	0.03%	1.85	-1.27
	+30	-4.02%	-2.07*	-1.18	0.07%	1.78	-1.57	0.03%	0.89	-0.14	0.02%	1.29	-1.18
Large-Cap (N=68)	+1	0.54%	1.4	0.56	-0.09%	-1.33	-0.97	0.01%	0.99	-2.32	-0.01%	-0.12	-1.93
	+2	0.55%	1.28	-0.72	-0.07%	-1.68	-0.97	0.01%	0.34	-2.11	0.02%	0.29	-0.97
	+3	0.65%	1.85	-0.64	0.03%	0.27	-1.37	-0.04%	-0.56	-1.95	0.02%	0.23	-0.56
	+5	-0.26%	-1.18	-1.44	0.03%	0.05	-1.01	0.01%	0.2	-1.47	0.00%	0.44	-0.08
	+10	-0.57%	-0.81	-1.44	0.00%	0.35	-1.20	0.02%	0.2	-1.06	0.03%	1.88	-0.24
	+15	-0.71%	-0.36	-1.47	0.04%	0.33	-1.28	0.06%	0.46	-1.52	0.03%	1.55	-0.16
	+30	-2.21%	-0.88	-1.15	0.09%	0.71	-1.08	0.02%	0.3	-1.25	0.05%	1.56	1.76

Table 6: The Effect of Mad Money Recommendations on Trading Activities – Sub-period Analysis

This table reports the effect of Mad Money recommendations on the trading activities of stocks and options during two sub-periods. ATS is the abnormal turnover for stocks; ATC is the abnormal turnover for call options; ATP is the abnormal turnover for put options; ASS is the abnormal bid-ask spread for stocks; ASC is the abnormal bid-ask spread for call options; and ASP is the abnormal bid-ask spread for put options. ** and * denote significant at the 1% and 5% level, respectively.

Panel A: Sub-period 1 (July 28, 2005 ~ May 31, 2006)												
	Day	ATS	Z-test	ATC	Z-test	ATP	Z-test	ASS	Z-test	ASC	Z-test	ASP	Z-test
Small-Cap	+1	3.60	33.55**	1.82	3.91**	1.39	3.37**	-27.21%	-2.24*	-14.39%	-2.18*	-21.87%	-3.41**
	+2	0.63	5.91**	1.28	2.75**	2.79	6.76**	5.28%	0.44	-11.66%	-1.76	-18.53%	-2.89**
	+3	1.34	12.48**	0.61	1.32	3.41	8.26**	-15.32%	-1.26	-11.40%	-1.73	-18.53%	-2.89**
	+5	0.24	2.25*	0.59	1.27	1.28	3.11**	-18.40%	-1.52	-10.37%	-1.57	-9.80%	-1.53
	+10	0.02	0.16	0.41	0.88	1.02	2.47*	-7.04%	-0.58	-11.80%	-1.78	-10.02%	-1.56
	+15	-0.05	-0.49	0.43	0.92	0.35	0.84	7.53%	0.62	-9.16%	-1.39	-11.43%	-1.78
	+30	-0.17	-1.63	0.01	0.03	0.05	0.11	-9.38%	-0.77	-12.07%	-1.83	-11.25%	-1.75
Mid-Cap	+1	0.82	10.61**	1.95	4.55**	0.01	0.05	8.77%	1.32	-13.62%	-1.27	-10.70%	-1.83
	+2	0.19	2.41*	0.25	0.58	0.01	0.03	-3.30%	-0.50	-13.00%	-1.21	-8.29%	-1.42
	+3	0.14	1.86	0.40	0.92	0.28	1.07	1.57%	0.24	-13.17%	-1.22	-9.23%	-1.58
	+5	0.12	1.54	0.36	0.84	0.14	0.55	-3.13%	-0.47	-4.92%	-0.46	-8.66%	-1.48
	+10	0.00	0.06	-0.04	-0.09	-0.21	-0.81	1.03%	0.15	-6.93%	-0.64	-10.76%	-1.84
	+15	0.08	1.04	-0.22	-0.52	-0.02	-0.07	3.51%	0.53	-5.75%	-0.53	-8.79%	-1.50
	+30	0.12	1.57	-0.05	-0.12	-0.08	-0.31	-1.74%	-0.26	-8.33%	-0.77	-5.97%	-1.02
Large-Cap	+1	0.37	7.01**	0.14	1.30	0.10	0.69	-3.65%	-0.03	-3.96%	-1.21	-5.79%	-1.73
	+2	0.11	2.15*	0.07	0.63	0.15	1.00	-16.67%	-0.12	-4.11%	-1.26	-4.06%	-1.22
	+3	0.12	2.21*	0.12	1.07	0.05	0.33	15.89%	0.12	-3.96%	-1.21	-5.40%	-1.62
	+5	0.02	0.30	0.06	0.57	0.03	0.20	19.22%	0.14	-6.28%	-1.92	-4.64%	-1.39
	+10	0.04	0.76	-0.12	-1.11	-0.01	-0.05	12.86%	0.10	-0.30%	-0.09	-3.98%	-1.19
	+15	0.08	1.52	-0.02	-0.20	-0.15	-0.99	23.46%	0.18	-0.23%	-0.07	-2.67%	-0.80
	+30	0.04	0.66	-0.16	-1.43	0.02	0.13	19.62%	0.15	-1.88%	-0.57	-6.32%	-1.89

Panel B: Sub-period 2 (June 01, 2006 ~ April 31, 2007)												
	Day	ATS	Z-test	ATC	Z-test	ATP	Z-test	ASS	Z-test	ASC	Z-test	ASP	Z-test
Small-Cap	+1	2.43	14.09**	0.55	0.97	1.07	1.49	-23.82%	-0.92	-10.24%	-1.02	1.80%	0.20
	+2	0.24	1.37	-0.23	-0.40	0.05	0.07	1.06%	0.04	-6.61%	-0.66	-10.28%	-1.14
	+3	0.68	3.97**	0.02	0.04	0.17	0.23	12.81%	0.49	-9.06%	-0.90	-3.10%	-0.34
	+5	0.07	0.43	0.38	0.67	1.16	1.62	-12.56%	-0.48	-14.42%	-1.43	1.60%	0.18
	+10	0.15	0.89	-0.15	-0.26	-0.24	-0.34	8.84%	0.34	-5.72%	-0.57	-1.65%	-0.18
	+15	0.29	1.69	0.53	0.94	-0.30	-0.42	7.06%	0.27	-12.61%	-1.25	-5.89%	-0.65
	+30	0.05	0.30	0.68	1.19	-0.24	-0.33	5.09%	0.20	-12.08%	-1.20	0.66%	0.07
Mid-Cap	+1	0.34	2.26*	0.64	1.58	0.69	0.15	-2.41%	-0.10	-8.72%	-1.20	-4.80%	-0.67
	+2	0.04	0.28	-0.26	-0.63	-0.54	-0.12	36.57%	1.51	-4.76%	-0.65	-8.17%	-1.14
	+3	0.11	0.75	0.61	1.50	-0.36	-0.08	-11.66%	-0.48	-13.18%	-1.81	-3.39%	-0.47
	+5	0.03	0.23	-0.08	-0.20	0.12	0.03	-12.81%	-0.53	1.67%	0.23	-5.99%	-0.84
	+10	-0.13	-0.87	-0.07	-0.18	0.70	0.15	15.23%	0.63	-6.39%	-0.88	-3.82%	-0.53
	+15	0.18	1.21	-0.26	-0.63	-0.22	-0.05	-16.51%	-0.68	-1.98%	-0.27	-7.48%	-1.05
	+30	-0.04	-0.23	-0.25	-0.61	-0.14	-0.03	-15.48%	-0.64	-4.19%	-0.57	-4.43%	-0.62
Large-Cap	+1	0.26	2.27*	-0.02	-0.08	-0.05	-0.19	-9.00%	-0.29	-1.71%	-0.37	2.56%	0.57
	+2	0.24	2.11*	-0.04	-0.15	-0.33	-1.37	-13.06%	-0.42	0.39%	0.08	-5.26%	-1.18
	+3	0.22	1.97	0.12	0.46	-0.18	-0.73	3.77%	0.12	-3.16%	-0.69	-2.88%	-0.64
	+5	0.15	1.28	-0.02	-0.08	0.30	1.22	8.52%	0.28	1.65%	0.36	8.09%	1.81
	+10	-0.04	-0.39	-0.30	-1.18	-0.09	-0.36	6.51%	0.21	1.19%	0.26	2.46%	0.55
	+15	-0.06	-0.51	-0.37	-1.49	0.10	0.40	-4.51%	-0.15	-0.60%	-0.13	2.62%	0.58
	+30	0.07	0.57	-0.41	-1.61	-0.18	-0.75	-14.96%	-0.48	8.12%	1.77	6.17%	1.38

Table 7: Price Pressure Effect of Mad Money Recommendations during the Entire Sample Period (July 28, 2005 ~ April 30, 2007) when the Minimum Trading Volume is 20 Contracts

This table reports the price effect of Mad Money recommendations on options when the trading volume is 20 contracts or more. *CAR* is the cumulative abnormal stock returns; *CA_Diff* for *SDC* is the cumulative abnormal price difference between actual stock price and implied stock price for call options; *CA_Diff* for *SDP* is the cumulative abnormal price difference between actual stock price and implied stock price for put options; *CA_Diff* for *Divergence* is the cumulative abnormal price difference for *Divergence*. ** and * denote significant at the 1% and 5% level, respectively.

	Day	*CAR*	Z-test	Sign-test	*CA_Diff for SDC*	Z-test	Sign-test	*CA_Diff for SDP*	Z-test	Sign-test	*CA_Diff for Divergence*	Z-test	Sign-test
Small-Cap (N=385)	+1	3.33%	6.82**	3.90**	-0.29%	-1.86	-2.62**	-0.55%	-3.21**	-6.97**	-0.09%	-2.76**	-3.80**
	+2	3.97%	5.61**	2.78**	-0.38%	-1.64	-2.27*	-0.71%	-3.71**	-6.02**	-0.15%	-3.92**	-3.58**
	+3	6.19%	9.60**	2.85**	-0.42%	-1.77	-2.40*	-0.86%	-2.82**	-5.60**	-0.24%	-3.62**	-3.57**
	+5	4.66%	4.85**	2.22*	-0.43%	-1.26	-1.08	-0.62%	-1.98*	-4.46**	-0.20%	-2.75**	-2.40**
	+10	3.08%	1.94	0.21	-0.05%	-0.30	-0.78	-0.17%	-1.55	-2.09*	0.00%	0.27	-2.61**
	+15	1.12%	0.13	-0.90	-0.08%	-0.68	-1.52	-0.20%	-0.97	-1.43	0.09%	0.94	-0.31
	+30	-2.93%	-2.75**	-3.76**	0.20%	0.18	-0.16	-0.05%	-0.17	-1.82	0.01%	0.03	-0.02
Mid-Cap (N=387)	+1	1.19%	3.38**	3.11**	-0.14%	-1.23	-2.30*	-0.38%	-2.17*	-3.80**	-0.07%	-1.64	-3.37**
	+2	1.37%	3.98**	3.38**	-0.09%	-0.49	-2.36*	-0.34%	-1.88	-2.67**	-0.09%	-1.63	-3.17**
	+3	1.70%	4.01**	2.57*	0.08%	0.07	-2.05*	-0.18%	-1.38	-0.98	-0.02%	-0.17	-2.48*
	+5	1.46%	1.86	-0.45	-0.08%	-0.40	-1.92	-0.15%	-1.26	-1.06	-0.01%	-0.05	-1.45
	+10	1.12%	1.35	-1.97	0.03%	0.33	-1.41	-0.03%	-0.17	-1.46	-0.04%	-1.10	-1.76
	+15	1.31%	0.34	-1.31	0.14%	1.05	-0.62	-0.05%	-0.40	-1.55	0.08%	0.83	-1.08
	+30	1.06%	0.90	-1.75	0.10%	0.91	-0.88	-0.04%	-0.20	-0.58	-0.04%	-0.40	-1.55
Large-Cap (N=385)	+1	0.54%	1.44	1.09	-0.13%	-0.06	-1.99*	-0.06%	-0.17	-2.26*	-0.07%	-0.89	0.03
	+2	0.73%	1.89	-0.18	-0.17%	-0.05	-2.23*	-0.06%	-0.15	-1.78	-0.04%	-0.17	-0.32
	+3	0.75%	1.93	0.58	-0.08%	-0.25	-1.32	-0.14%	-1.51	-1.43	-0.06%	-0.47	1.08
	+5	0.48%	0.04	-0.91	-0.05%	-0.02	-1.75	-0.06%	-0.62	-1.83	-0.04%	-0.08	1.73
	+10	0.21%	0.60	-1.03	0.05%	0.11	-0.73	-0.07%	-0.22	-1.85	0.08%	0.20	1.89
	+15	0.18%	0.16	-1.46	-0.02%	-0.12	-1.42	-0.04%	-0.24	-1.70	0.06%	0.24	1.73
	+30	-0.23%	-0.78	-1.51	0.11%	0.71	-1.32	-0.04%	-0.58	-1.35	0.08%	0.46	1.62

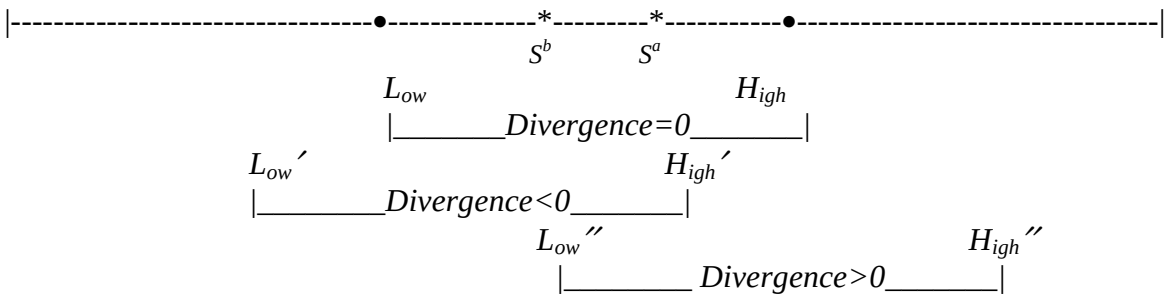
Table 8: Price Pressure Effect of Mad Money Recommendations – Sub-period Analysis when the Minimum Trading Volume is 20 Contracts

This table reports the price effect of Mad Money recommendations on options for the two sub-periods when the trading volume is 20 contracts or more. *CAR* is the cumulative abnormal stock returns; *CA_Diff* for *SDC* is the cumulative abnormal price difference between actual stock price and implied stock price for call options; *CA_Diff* for *SDP* is the cumulative abnormal price difference between actual stock price and implied stock price for put options; *CA_Diff* for *Divergence* is the cumulative abnormal price difference for *Divergence*. ** and * denote significant at the 1% and 5% level, respectively.

Panel A: Sub-period 1 (July 28, 2005 ~ May 31, 2006)													
	Day	***CAR***	**Z-test**	**Sign-test**	***CA_Diff for SDC***	**Z-test**	**Sign-test**	***CA_Diff for SDP***	**Z-test**	**Sign-test**	***CA_Diff for Divergence***	**Z-test**	**Sign-test**
Small-Cap (N=317)	+1	3.51%	6.75**	3.79**	-0.35%	-1.90	-2.39*	-0.66%	-3.12**	-6.51**	-0.10%	-2.10*	-2.56*
	+2	4.12%	5.48**	2.66**	-0.43%	-1.76	-2.12*	-0.84%	-2.73**	-5.92**	-0.16%	-2.61**	-2.41*
	+3	6.61%	9.01**	2.41*	-0.53%	-1.14	-2.03*	-1.08%	-3.09**	-5.51**	-0.29%	-3.07**	-2.74**
	+5	4.61%	3.60**	1.94	-0.49%	-1.75	-1.19	-0.74%	-0.25	-5.22**	-0.22%	-3.05**	-1.89
	+10	3.26%	1.84	0.14	-0.08%	-1.31	-1.24	-0.19%	-0.03	-1.54	-0.01%	-0.11	-1.94
	+15	1.93%	0.36	-0.95	-0.11%	-1.56	-1.63	-0.26%	-0.38	-1.34	0.09%	1.09	0.64
	+30	-3.18%	-2.54*	-3.38**	0.23%	0.94	-0.13	-0.07%	-0.56	-1.93	0.03%	0.46	0.57
Mid-Cap (N=318)	+1	1.15%	3.02**	2.75**	-0.15%	-1.22	-2.17*	-0.45%	-2.18	-3.22**	-0.07%	-1.60	-2.60*
	+2	1.33%	3.61**	3.13**	-0.10%	-0.60	-2.23*	-0.38%	-2.48	-2.44*	-0.10%	-1.33	-2.66**
	+3	1.61%	3.67**	2.07*	0.12%	0.13	-1.51	-0.21%	-1.17	-1.01	-0.02%	-1.30	-2.09*
	+5	1.37%	1.72	-0.41	-0.09%	-0.61	-1.65	-0.16%	-0.39	-0.66	-0.02%	-1.10	-1.50
	+10	1.30%	1.18	-1.83	0.04%	0.24	-1.27	-0.03%	-0.87	-1.03	-0.04%	-1.19	-1.85
	+15	1.87%	0.59	-1.02	0.19%	0.48	-0.18	-0.09%	-1.69	-1.20	0.09%	0.47	-1.05
	+30	1.91%	0.19	-1.38	0.12%	0.26	-0.94	-0.04%	-1.33	-0.27	-0.06%	-1.00	-1.39
Large-Cap (N=317)	+1	0.54%	1.28	0.94	-0.15%	-1.57	-1.67	-0.06%	-0.89	-2.02*	-0.08%	-1.28	-0.47
	+2	0.74%	1.92	0.13	-0.20%	-1.53	-2.61*	-0.05%	-0.21	-1.45	-0.04%	-0.42	0.47
	+3	0.79%	1.85	0.94	-0.09%	-1.41	-1.27	-0.17%	-0.24	-1.03	-0.08%	-1.06	1.67
	+5	0.80%	1.38	-0.33	-0.05%	-1.45	-1.54	-0.06%	-0.44	-1.69	-0.06%	-1.18	1.87
	+10	0.61%	0.37	-0.47	0.08%	1.21	-0.80	-0.06%	-0.99	-1.63	0.09%	1.66	1.60
	+15	0.82%	0.30	-0.93	-0.02%	-1.29	-1.13	-0.04%	-1.22	-1.73	0.05%	0.06	1.53
	+30	0.48%	0.57	-1.13	0.14%	1.27	-0.93	-0.04%	-0.64	-1.24	0.08%	1.16	1.26

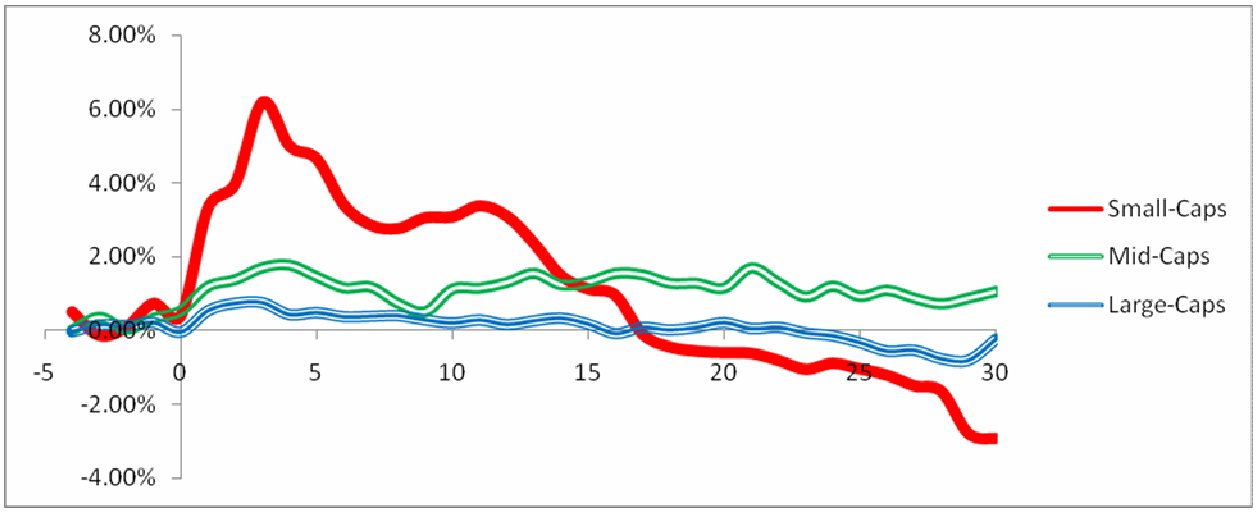
Panel B: Sub-period 2 (June 01, 2006 ~ April 31, 2007)													
	Day	***CAR***	**Z-test**	**Sign-test**	***CA_Diff for SDC***	**Z-test**	**Sign-test**	***CA_Diff for SDP***	**Z-test**	**Sign-test**	***CA_Diff for Divergence***	**Z-test**	**Sign-test**
Small-Cap (N=68)	+1	2.25%	1.90	1.08	-0.03%	-0.75	-1.07	-0.10%	-3.06**	-2.54*	-0.08%	-2.36*	-3.51**
	+2	2.86%	2.03*	0.89	-0.10%	-1.20	-0.83	-0.09%	-2.29*	-1.54	-0.07%	-2.48*	-3.30**
	+3	3.73%	1.94	1.57	-0.02%	-1.22	-1.33	-0.04%	-1.09	-1.41	-0.05%	-1.27	-2.56*
	+5	3.98%	1.83	1.07	-0.10%	-1.59	0.00	0.01%	0.03	0.67	-0.08%	-1.58	-1.63
	+10	1.96%	1.44	0.19	0.07%	1.42	0.81	-0.08%	-0.43	-1.64	0.04%	1.02	-2.02*
	+15	-2.50%	-0.13	-0.10	0.08%	0.74	-0.10	0.05%	1.23	-0.51	0.13%	1.13	-2.11*
	+30	-5.87%	-1.18	-1.63	0.04%	0.51	-0.10	0.03%	1.17	-0.15	-0.07%	-1.16	-1.29
Mid-Cap (N=69)	+1	1.17%	1.87	1.46	-0.09%	-1.20	-0.80	-0.07%	-1.40	-2.09	-0.06%	-0.26	-2.40*
	+2	1.46%	1.92	1.28	-0.05%	-1.42	-0.80	-0.17%	-1.87	-1.09	-0.03%	-0.08	-1.80
	+3	2.21%	1.63	1.64	-0.10%	-1.71	-1.60	-0.04%	-1.24	-0.15	-0.04%	-0.93	-1.40
	+5	1.89%	1.76	-0.18	-0.01%	-0.07	-1.00	-0.08%	-1.27	-1.10	0.02%	0.78	-0.20
	+10	-0.59%	-0.26	-0.73	-0.02%	-1.51	-0.60	-0.05%	-1.20	-1.25	-0.03%	-1.20	-0.20
	+15	-1.27%	-0.88	-0.91	-0.08%	-1.18	-1.09	0.13%	0.06	-1.09	0.01%	1.30	-0.30
	+30	-4.02%	-2.07	-1.18	-0.03%	-1.07	-0.07	-0.06%	-0.05	-0.80	0.06%	1.29	-0.69
Large-Cap (N=68)	+1	0.54%	1.40	0.56	-0.09%	-1.09	-1.13	-0.11%	-1.09	-1.01	0.00%	0.13	1.10
	+2	0.55%	1.28	-0.72	-0.01%	-1.05	0.32	-0.09%	-1.08	-1.11	-0.03%	-0.62	-1.77
	+3	0.65%	1.85	-0.64	-0.06%	-1.10	-0.40	-0.04%	-1.05	-1.18	0.03%	0.56	-1.04
	+5	-0.26%	-1.18	-1.44	-0.04%	-1.26	-0.84	-0.04%	-1.05	-0.69	0.03%	1.03	0.08
	+10	-0.57%	-0.81	-1.44	-0.06%	-1.29	-0.01	-0.10%	-0.93	-0.89	0.05%	1.28	1.04
	+15	-0.71%	-0.36	-1.47	-0.01%	-1.61	-0.92	-0.04%	-0.89	-0.33	0.09%	1.26	0.80
	+30	-2.21%	-0.88	-1.15	-0.04%	-1.25	-1.12	-0.05%	-0.99	-0.51	0.07%	0.74	1.12

Figure 1. The divergence between the implied and observed stock prices.

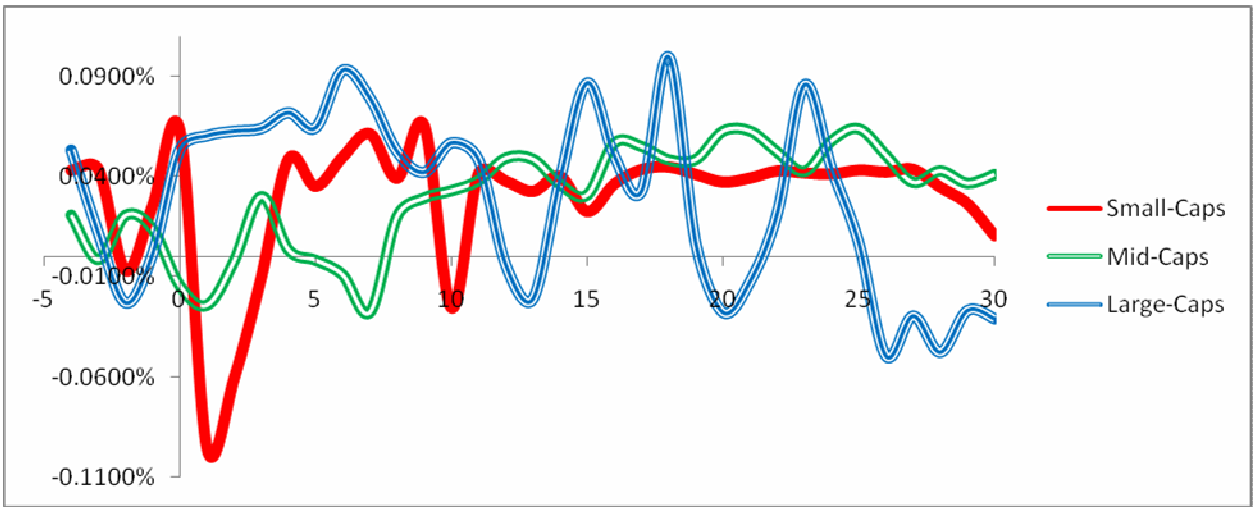


This figure shows the divergence between the implied and actual stock prices with the presence of market frictions. When the range of L to H is not biased to either side, *Divergence* is zero and the implied price is around the stock price. However, as the range of L′ (L″) to H′ (H″) is biased to the left (right) side of market price, *Divergence* is less (greater) than zero and the implied price is smaller (greater) than the stock price.

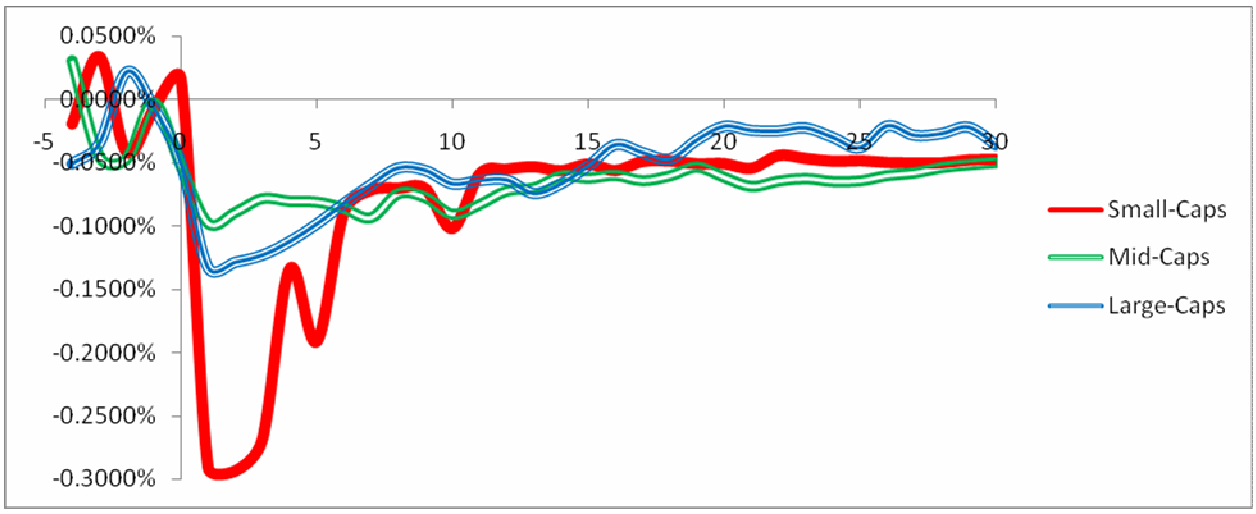
Figure 2. *CAR* and *CA_Diff* during the entire sample period (July 28, 2005 ~ April 30, 2007).



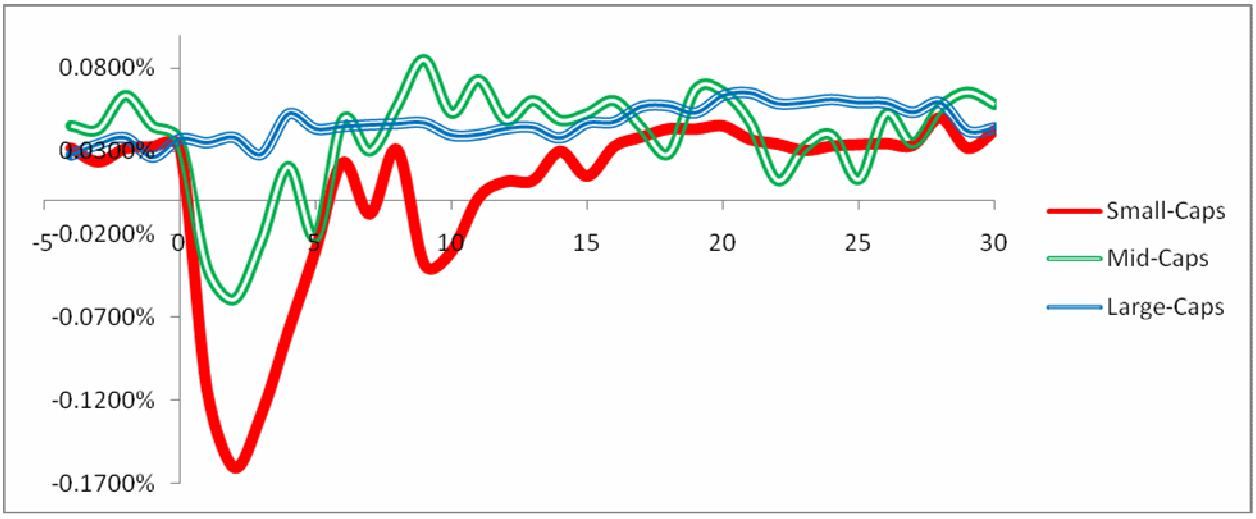
(A) *CAR* for Stocks



(B) *CA_Diff* for Calls

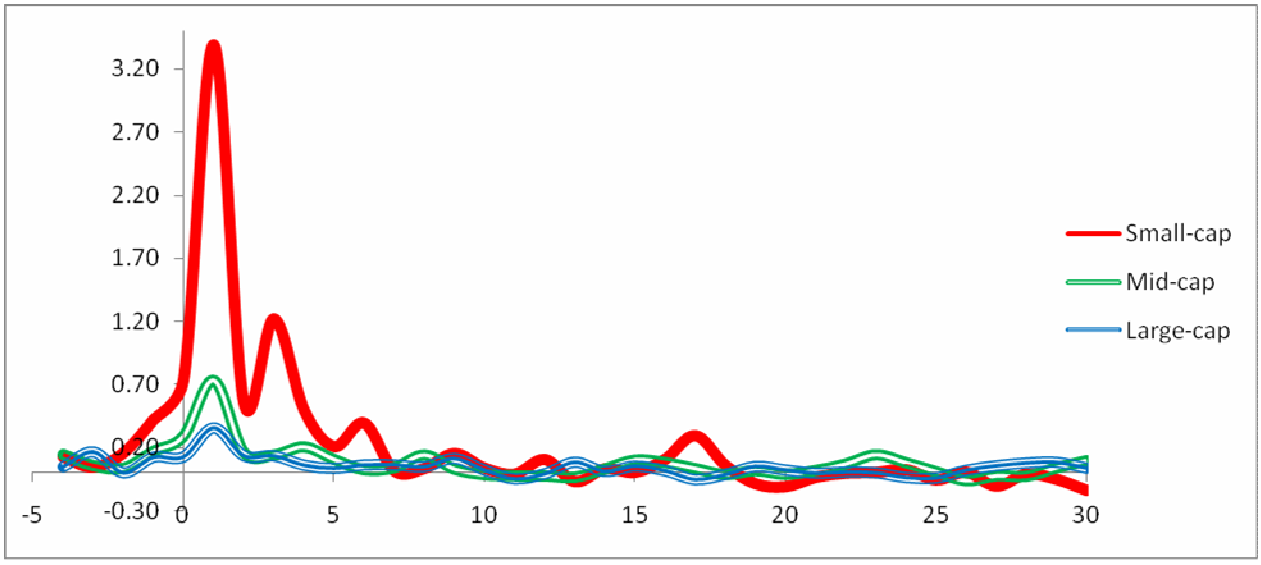


(C) *CA_Diff* for Puts

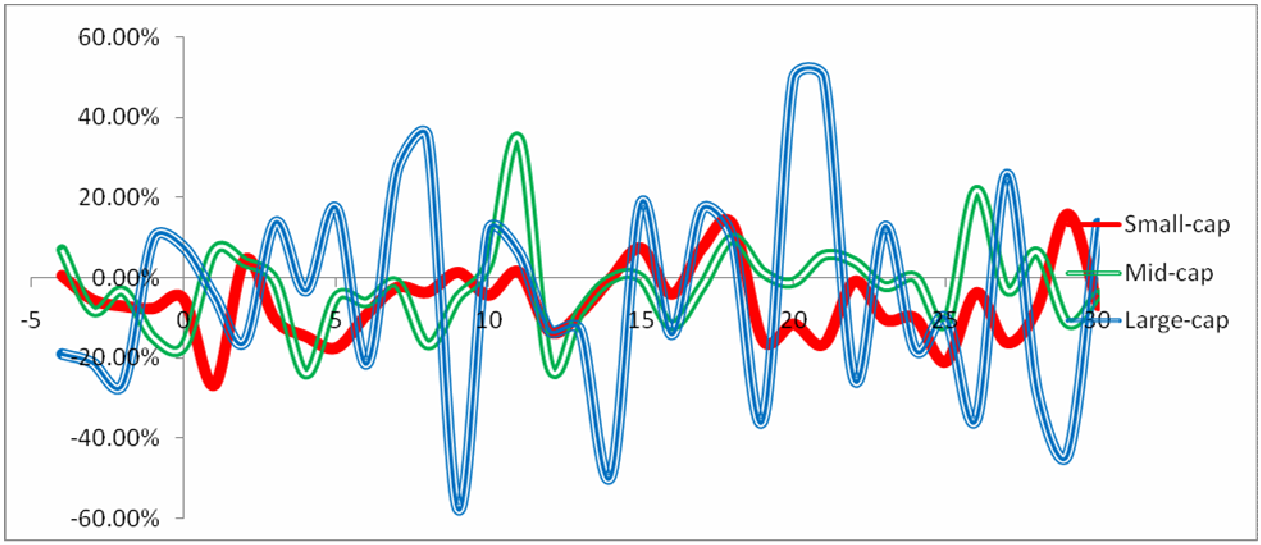


(D) *CA_Diff* for *Divergence*

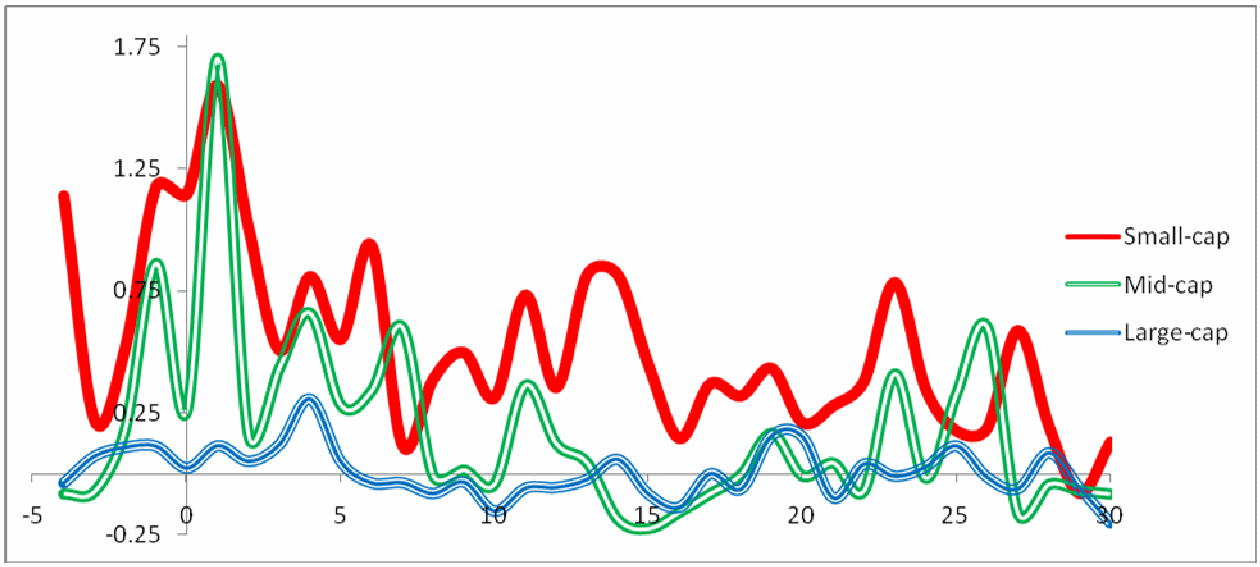
Figure 3. Abnormal trading behavior for stocks and options during the entire sample period (July 28, 2005 ~ April 30, 2007).



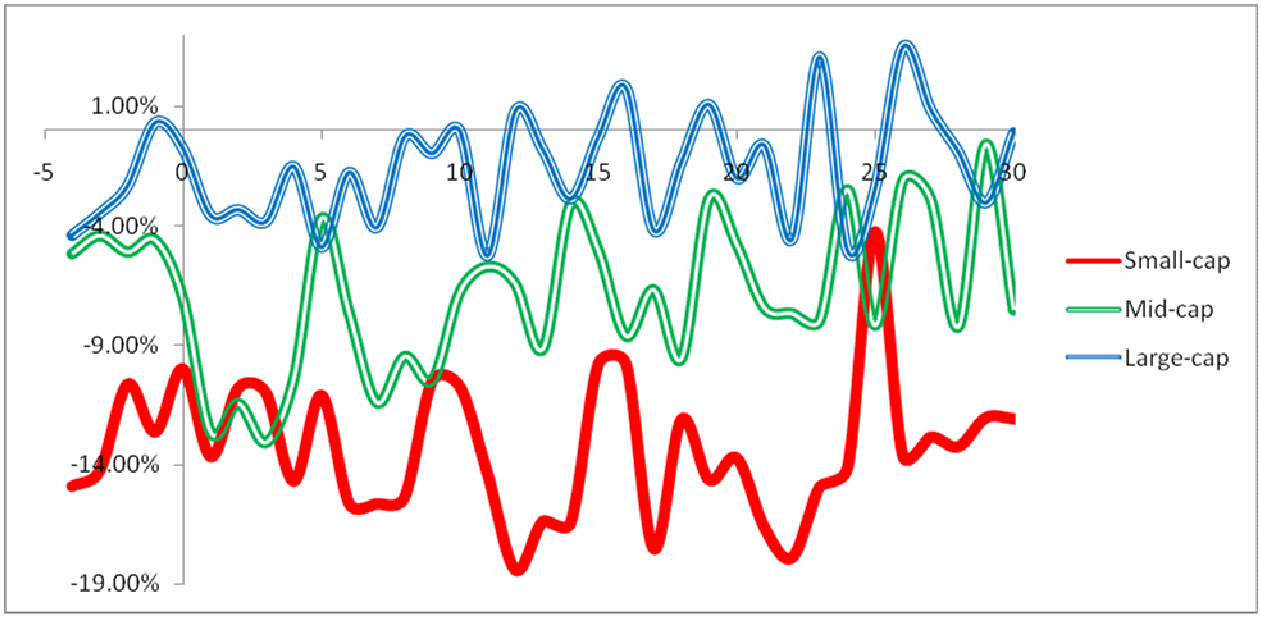
(A) Abnormal Trading Volumes for Stocks



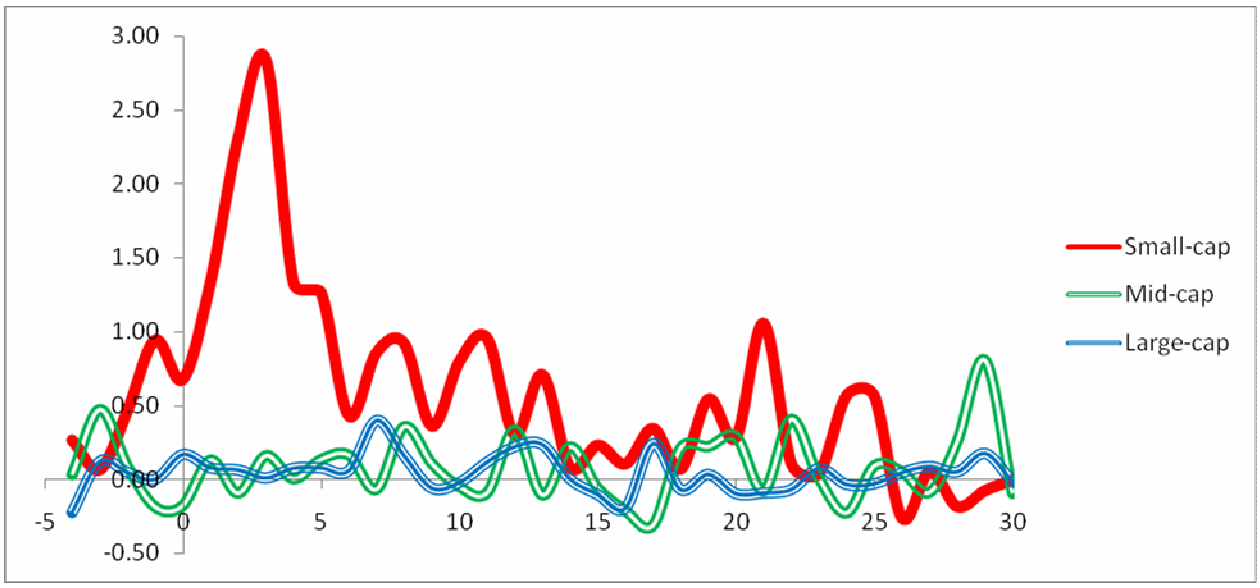
(B) Abnormal Bid-Asked Spreads for Stocks



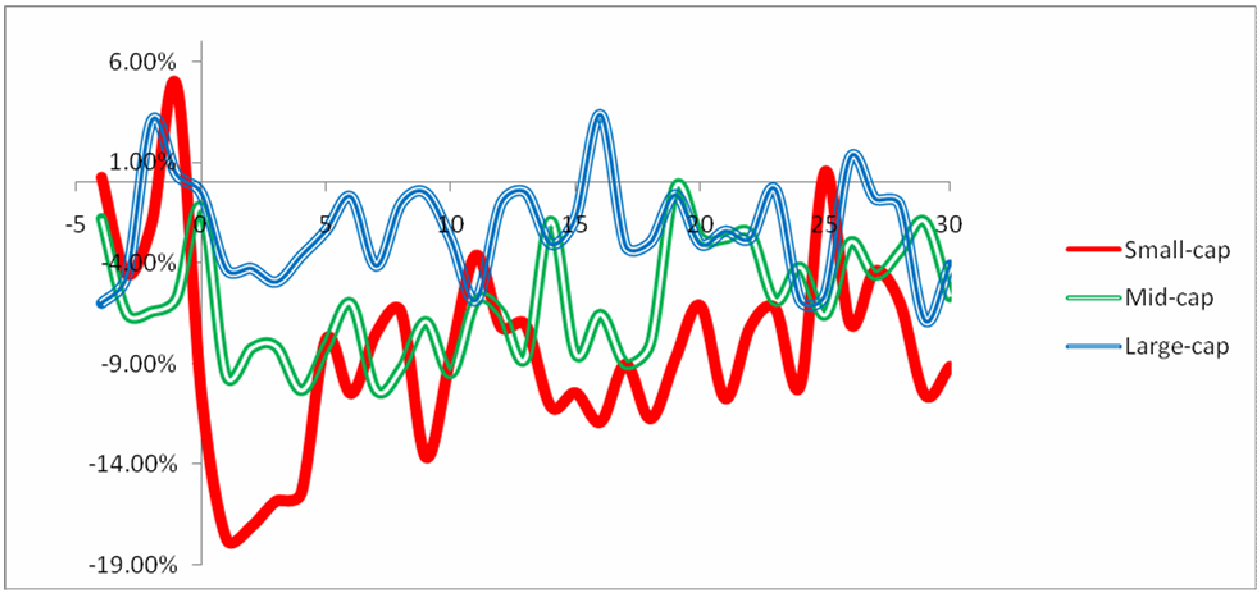
(C) Abnormal Trading Volumes for Call Options



(D) Abnormal Bid-Asked Spreads for Call Options



(E) Abnormal Trading Volumes for Put Options



(F) Abnormal Bid-Asked Spreads for Put Options

Figure 3 shows the abnormal trading behavior for stocks and options from day – 4 to day +30 during the entire sample period (July 28, 2005 ~ April 30, 2007). The calculation procedures for the trading activities are discussed in Appendix 3.