

# The Impact of Electronic Message Board Takeover Rumors on the US Equity Market

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## Abstract

We provide the first empirical investigation into the impact of Internet Stock Message Board takeover rumors on the price discovery process in the United States equity market. Our investigation involves using a five-stage filtering process, that employs computational linguistics methods, to derive a final sample of 1,087 Message Board takeover rumors disseminated during the period January 2003 to December 2006, inclusive. Overall, our analysis, utilizing intraday Trade and Quote (TAQ) data, reveals that Message Board takeover rumors generate significant positive abnormal returns and trading volumes. Finally, while we verify the robustness of these results to the influence of sample selection bias and an alternative matched control firm abnormal returns metric, we find that Message Board takeover rumors do not represent an economically exploitable opportunity for investors.

*Keywords:* Internet Stock Message Boards; Price Discovery Process; Takeover; Rumor; Computational Linguistics.

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## I. Introduction

One important part of the price discovery process is the release of new value-relevant information into the market. As such, in order to maintain a complete information set, investors wish to promptly obtain value-relevant company information. With the ongoing advancement in information technology, equity market participants are increasingly using the Internet and, more specifically, Internet Stock Message Boards<sup>1</sup> (Message Boards) as a medium to disseminate and collect this information. Indeed, current extant literature demonstrates that Message Boards play an important role in the price discovery process (see, for example, Le Vallée, 1997; Das and Chen, 2001; and, Tumarkin and Whitelaw, 2001). Specifically, Das and Chen (2001) argue that Message Boards assist the price discovery process and market efficiency by enhancing the speed and accessibility of information to a wider range of market participants. As such, market participants have an incentive to create and access Message Board posts due to the potential impact this information may have on shaping financial markets.

However, some studies argue that, apart from increasing stock return volatility, Message Board information may simply be noise that does not provide any new or price-predictive information to the market (see, for example, Dewally, 2003; and, Antweiler and Frank, 2004). Further, Bagnoli *et al* (1999) criticize the credibility of information provided on Message Boards, noting that they can contain bias, and frequent lack of justification for the rumours posted on the sites examined.

In summation, despite the general agreement in the literature that Message Boards are an important means of disseminating information, there is limited empirical evidence examining the impact of these rumors on the price discovery process. In light of this, we present the first study to empirically test the impact of Message Boards on the price discovery process in the United States (US). Specifically, we examine a particular class of information disseminated on Message Boards referred to as rumors. ‘Rumors’ are a class of public information that is unable to be accurately and objectively verified (Banerjee, 1993), and as such, may provide market participants with new value-relevant information. Furthermore, dispersion of rumors via Message Boards is particularly attractive given the capacity to expedite widespread dissemination of posted information in a largely anonymous and unregulated environment (Clarkson *et al*, 2006).

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<sup>1</sup> Message Boards are organised online forums that enable users to read and post information on specific firms and investment-related topics (Tumarkin and Whitelaw, 2001).

To gain further insight, the rumor information category of Message Board content can be disaggregated by the type of rumor posted. These rumor information types include: ‘whispers’;<sup>2</sup> dividend forecasts; Chief Executive Officer (CEO) succession hearsay; operation expansion anticipation; and, takeover activity speculation. We investigate the latter rumor type, namely takeover activity speculation.

While Clarkson *et al* (2006) examine Message Board takeover rumors, they investigate Australian Securities Exchange (ASX) listed companies, and their intraday analysis is limited to 10 minutes intervals. They identify the existence of abnormal returns on the day-of and day-prior to the rumor postings. Other studies examining takeover rumors investigate the share price reaction to print media takeover rumors (see, for example, Pound and Zeckhauser, 1990; and, Zivney *et al*, 1996). Specifically, Pound and Zeckhauser (1990) identify insignificant abnormal returns generated on the day-of-publication of takeover rumors in the *Wall Street Journal’s* (*WSJ’s*) ‘Heard on the Street’ column. However, Zivney *et al* (1996) contest the validity of the Pound and Zeckhauser (1990) study on the basis that their use of *WSJ* takeover rumors may be diluted due to a substantial proportion of these rumors appearing in the *WSJ’s* ‘Abreast of the Market’ column in the preceding weeks. Subsequent investigation of takeover rumors appearing in the *WSJ’s* ‘Abreast of the Market’ column, reveals that abnormal returns exist in the twenty-day period prior to the rumor and on-the-day-of publication. Based on this evidence, Zivney *et al* (1996) conclude that the *WSJ* rumors cause significant market reaction.

As such, in addition to providing a comprehensive analysis of Message Board takeover rumor impacts on the price discovery process, we offer several innovations to the extant literature. Specifically, we compile our data set from a unique and contemporaneous sample of Message Board takeover rumors by developing specially designed collection and filtering software that employs computational linguistics methods. We also develop methodologies influenced by the Barber and Lyon (1997) matched sample control firm framework to examine intraday trading volume and bid-ask spread effects in the period surrounding the release of the takeover rumor information. Furthermore, we employ multivariate analysis to gauge how specific explanatory variables impact upon Message Board takeover rumors. We also verify the robustness of our results to sample selection bias, and additionally, utilize an alternate abnormal return metric, which is calculated using an approach influenced by Barber and Lyon’s (1997) matched sample methodology. Finally, to account for liquidity and transaction cost characteristics not addressed

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<sup>2</sup> ‘Whispers’ are defined as consensus rumour forecasts of future corporate earnings figures that are primarily disseminated via electronic communication channels such as email and Message Boards (Bagnoli *et al*, 1999).

in the preceding analysis, we explicitly examine the economic significance of tradable opportunities.

Our results from the aforementioned analysis identifies that Message Board takeover rumors substantially impact the US equity market during the observation period January 2003 to December 2006, inclusive. Most notably, significant positive shareholder wealth and volume effects are identified in pre, post and surrounding-rumor periods. Furthermore, multivariate analysis reveals significant negative firm size and significant positive technology industry effects; inferring small firms and technology sector firms are most affected by Message Board takeover rumors. Finally, our results are robust to sample selection bias and the return metric employed. However, our inspection of the economic exploitability of Message Board takeover rumors concludes that a feasibly tradable opportunity does not exist for investors.

The remainder of the paper proceeds on to discuss our methodological approach in Section II, outlining the sample identification process and data utilized in Section III. Section IV presents the primary results of our investigation, and Section V concludes.

## **II. Methodology**

We utilize the Event Study Methodology (Fama *et al*, 1969) to examine the impact of Message Board takeover rumors on target firm returns, trading volume and transaction costs over a range of intraday event windows detailed in Table I. Investigation of intraday intervals minimizes distortions induced by confounding events, and provides a more precise insight into pre, post and surrounding-rumour equity market impacts.

Furthermore, to facilitate the control firm benchmark methodologies we utilize, we ascertain matched sample control firms by initially revealing all firms with the same North American Industry Classification System (NAICS) two-digit economic sector code. Subsequently, we apply the Barber and Lyon (1997) matching criteria by further identifying all remaining firms with a market value of equity between 70 to 130 percent of each rumored takeover target sample firm. From this subset, the firms with the closest book-to-market ratio to the rumored target sample firms are ultimately selected as the control firms.

**TABLE I: Description of Event Windows**

Table I outlines the intraday observation periods examined in this paper. The intraday windows are presented in minutes relative to the time the intraday Message Board rumor is disseminated (time 0), unless otherwise stated.<sup>3</sup> Correspondingly, the various windows we utilize are classified into *Pre-Rumor Windows (Panel A)*, *Post-Rumor Windows (Panel B)*, or *Surrounding-Rumor Windows (Panel C)*.

Event Window	Description
<b>PANEL A: Pre-Rumor Windows</b>	
[-24 hrs, 0]	The pre-24-hour period: 24 hours before the takeover rumor
[-60, 0]	The pre-60-minute period: 60 minutes before the takeover rumor
[-30, 0]	The pre-30-minute period: 30 minutes before the takeover rumor
[-10, 0]	The pre-10-minute period: 10 minutes before the takeover rumor
[-5, 0]	The pre-5-minute period: 5 minutes before the takeover rumor
[-1, 0]	The pre-1-minute period: 1 minute before the takeover rumor
<b>PANEL B: Post-Rumor Windows</b>	
[0, +1]	The post-1-minute period: 1 minute after the takeover rumor
[0, +5]	The post-5-minute period: 5 minutes after the takeover rumor
[0, +10]	The post-10-minute period: 10 minutes after the takeover rumor
[0, +30]	The post-30-minute period: 30 minutes after the takeover rumor
[0, +60]	The post-60-minute period: 60 minutes after the takeover rumor
[0, +24 hrs]	The post-24-hour period: 24 hours after the takeover rumor
<b>PANEL C: Surrounding-Rumor Windows</b>	
[-1, +1]	The 2-minute period: 1 minute before to 1 minute after the takeover rumor
[-5, +5]	The 10-minute period: 5 minutes before to 5 minutes after the takeover rumor
[-10, +10]	The 20-minute period: 10 minutes before to 10 minutes after the takeover rumor
[-30, +30]	The 60-minute period: 30 minutes before to 30 minutes after the takeover rumor
[-60, +60]	The 120-minute period: 60 minutes before to 60 minutes after the takeover rumor
[-24 hrs, +24 hrs]	The 48-hour period: 24 hours before to 24 hours after the takeover rumor

### A. Abnormal Price Return Calculations

To examine target shareholder wealth effects, we consider buy-and-hold average abnormal returns using the traditional 0/1 Market Model approach to evaluate how the sample stock returns perform relative to the market benchmark. Using this approach, we determine abnormal returns as the average excess return of the rumored target firms over the market portfolio. Specifically, we calculate the 0/1 Market Model Buy-and-Hold Average Abnormal Returns (BHAARs) as follows:

$$BHAAR_{[q,r]} = \frac{1}{n} \sum_{i=1}^n BHAR_{i,[q,r]} = \frac{1}{n} \sum_{i=1}^n [R_{i,[q,r]} - R_{m,[q,r]}] \quad (1)$$

Where:

$BHAAR_{[q,r]}$  = The Buy-and-Hold Average Abnormal Return of all sample firms over the event window  $[q, r]$ ;

$BHAR_{i,[q,r]}$  = The Buy-and-Hold Abnormal Return for sample firm  $i$  over the event window  $[q, r]$ ;

$R_{i,[q,r]}$  = The buy-and-hold return for sample firm  $i$  over the event window  $[q, r]$ ;

$R_{m,[q,r]}$  = The buy-and-hold return for the market portfolio over the event window  $[q, r]$ ; and,

$n$  = The number of firms in the sample.

<sup>3</sup> It is important to note that we examine 24-hour intraday event windows rather than one-day closing windows. This ensures that the observation periods are equally distributed on both sides of the intraday rumour release.

## B. Abnormal Trading Volume Calculations

To evaluate the impact of Message Board takeover rumors on target firms' trading volumes, we implement a matched sample control firm framework for measuring abnormal trading volumes. Subsequent to constructing the corresponding control firm sample, we are unable to directly compare the raw number of shares traded within each event window due to the differing stock prices and number of shares on issue between the rumored target and control firms. To overcome this issue, we employ an adjustment factor that is the ratio of the historic average daily trading volume of the control firm to the historic average daily trading volume of the rumored target firm.<sup>4</sup> This adjustment factor is constructed as follows:

$$VOLADJ_i = \frac{\sum_{t=t-a}^{t-b} V_{C_i,t}}{\sum_{t=t-a}^{t-b} V_{i,t}} \quad (2)$$

Where:

- $VOLADJ_i$  = The trading volume adjustment factor for sample firm  $i$ ;
- $V_{i,t}$  = The daily trading volume of firm  $i$  on day  $t$ ;
- $V_{C_i,t}$  = The daily trading volume of the control firm corresponding to sample firm  $i$  on day  $t$ ;
- $t_{-a}$  = The number of days prior to takeover rumor dissemination on the trading day corresponding to the six weeks prior historical period start date; and,
- $t_{-b}$  = The number of days prior to takeover rumor dissemination on the trading day corresponding to the two weeks prior historical period end date.

We then calculate the Control Average Abnormal Trading Volumes (CAATVs) as follows:

$$CAATV_{[q,r]} = \frac{1}{n} \sum_{i=1}^n CATV_{i,[q,r]} = \frac{1}{n} \sum_{i=1}^n \left\{ \left( VOLADJ_i \sum_{\tau=\tau_q}^{\tau_r} V_{i,\tau} \right) - \sum_{\tau'=\tau'_q}^{\tau'_r} V_{C_i,\tau'} \right\} \quad (3)$$

Where:

- $CAATV_{[q,r]}$  = The Control Average Abnormal Trading Volume of all sample firms over the event window  $[q, r]$ ;
- $CATV_{i,[q,r]}$  = The Control Abnormal Trading Volume for sample firm  $i$  over event window  $[q, r]$ ;
- $VOLADJ_i$  = The trading volume adjustment factor for sample firm  $i$ ;
- $V_{i,\tau}$  = The single trade volume for sample firm  $i$  at trade  $\tau$ ;
- $V_{C_i,\tau'}$  = The single trade volume for the control firm at trade  $\tau'$ ;

<sup>4</sup> The historic average daily trading volume encompasses a one-month period, six to two weeks prior to the takeover rumour dissemination date.

$\tau$	=	A trade of the sample firm $i$ stock;
$\tau_q$	=	The first trade of the sample firm $i$ stock within the event window $[q, r]$ ;
$\tau_r$	=	The last trade of the sample firm $i$ stock within the event window $[q, r]$ ;
$\tau'$	=	A trade of the control firm stock;
$\tau'_q$	=	The first trade of the control firm stock within the event window $[q, r]$ ;
$\tau'_r$	=	The last trade of the control firm stock within the event window $[q, r]$ ; and,
$n$	=	The number of firms in the sample.

### C. Abnormal Bid-Ask Spread Calculations

Bid-ask spreads capture a variety of information that is useful for many applications.<sup>5</sup> In an efficient market, a firm's bid-ask spread is competitively set at the margin by market makers to generate the minimum compensation they require for transacting in a specific security (Ho and Stoll, 1981; and, Copeland *et al* 1983). Correspondingly, we utilize the bid-ask spread as a proxy for assessing the transaction costs involved in trading a security.

To facilitate an isolated comparison of the impact of takeover rumor dissemination on bid-ask spreads, we employ an adjusted matched sample control firm framework. Specifically, our adjustment factor reflects the ratio of the historic average daily closing proportional bid-ask spread of the control firm to the historic average daily closing proportional bid-ask spread of the rumored takeover target firm.<sup>6</sup> This adjustment factor allows us to more precisely isolate the relative bid-ask spread difference that is uniquely attributable to Message Board takeover rumor dissemination and is constructed as follows:

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<sup>5</sup> Kyle (1985) demonstrates that information asymmetries are a key component of risk reflected in bid-ask spreads. Specifically, they find a positive relationship between information asymmetry and bid-ask spreads. Further, Chung and Charoenwong (1998) show bid-ask spreads are positively related to insider trading risk and price volatility risk, while simultaneously being negatively related to volume (i.e. liquidity risk).

<sup>6</sup> The historic average proportional bid-ask spread encompasses the one-month period, six to two weeks prior to the takeover rumour dissemination date.

$$BASADJ_i = \frac{\sum_{t=t-a}^{t-b} \left[ \frac{ASK_{C_i,t} - BID_{C_i,t}}{(ASK_{C_i,t} + BID_{C_i,t})/2} \right]}{\sum_{t=t-a}^{t-b} \left[ \frac{ASK_{i,t} - BID_{i,t}}{(ASK_{i,t} + BID_{i,t})/2} \right]} \quad (4)$$

Where:

- $BASADJ_i$  = The bid-ask spread adjustment factor for sample firm  $i$  ;
- $ASK_{i,t}$  = The end of day ask price of firm  $i$  on day  $t$  ;
- $BID_{i,t}$  = The end of day bid price of firm  $i$  on day  $t$  ;
- $ASK_{C_i,t}$  = The end of day ask price of the control firm on day  $t$  ;
- $BID_{C_i,t}$  = The end of day bid price of the control firm on day  $t$  ;
- $t-a$  = The number of days prior to takeover rumor dissemination on the trading day corresponding to the six weeks prior historical period start date; and,
- $t-b$  = The number of days prior to takeover rumor dissemination on the trading day corresponding to the two weeks prior historical period end date.

Subsequently, the Adjusted Control Average Abnormal Bid-Ask Spread ( $CAABAS^{adj}$ ) is calculated for each event window as follows:

$$CAABAS_{[q,r]}^{adj} = \frac{1}{n} \sum_{i=1}^n CABAS_{i,[q,r]}^{adj} = \frac{1}{n} \sum_{i=1}^n \left[ BASADJ_i \overline{BAS}_{i,[q,r]} - \overline{BAS}_{C_i,[q,r]} \right] \quad (5)$$

Where:

- $CAABAS_{[q,r]}^{adj}$  = The Adjusted Control Average Abnormal Bid-Ask Spread of all sample firms over the event window  $[q,r]$  ;
- $CABAS_{i,[q,r]}^{adj}$  = The Adjusted Control Abnormal Bid-Ask Spread for sample firm  $i$  over the event window  $[q,r]$  ;
- $BASADJ_i$  = The bid-ask spread adjustment factor for sample firm  $i$  ;
- $\overline{BAS}_{i,[q,r]}$  = The average proportionate bid-ask spread for sample firm  $i$  over the event window  $[q,r]$  ;
- $\overline{BAS}_{C_i,[q,r]}$  = The average proportionate bid-ask spread for the control firm over the event window  $[q,r]$  ; and,
- $n$  = The number of firms in the sample.

#### D. Multivariate Analysis

We argue that the impact of Message Board takeover rumors on a firm's stock varies depending on the interaction of industry-specific, firm-specific and rumor-specific variables. We utilize multivariate regressions to analyze the combined influence of these variables on abnormal returns, trading volumes and bid-ask spreads. Specifically, we employ the following three-model

framework<sup>7</sup> to investigate the cross-sectional variation of abnormal returns, trading volumes, and bid-ask spreads in our takeover rumor sample for each event window and calculation methodology:

#### Abnormal Return Multivariate Model

$$AR_{i,[q,r]} = \beta_0 + \beta_1 LN(SIZE)_i + \beta_2 PERIOD_i + \beta_3 RAGE_i + \beta_4 TECH_i + \beta_5 MANU_i + \beta_6 TA_i + \varepsilon_i \quad (6)$$

#### Abnormal Trading Volume Multivariate Model

$$ATV_{i,[q,r]} = \gamma_0 + \gamma_1 LN(SIZE)_i + \gamma_2 PERIOD_i + \gamma_3 RAGE_i + \gamma_4 TECH_i + \gamma_5 MANU_i + \gamma_6 TA_i + \varepsilon'_i \quad (7)$$

#### Abnormal Bid-Ask Spread Multivariate Model

$$ABAS_{i,[q,r]} = \eta_0 + \eta_1 LN(SIZE)_i + \eta_2 PERIOD_i + \eta_3 RAGE_i + \eta_4 TECH_i + \eta_5 MANU_i + \eta_6 TA_i + \varepsilon''_i \quad (8)$$

Where:

- $AR_{i,[q,r]}$  = The Abnormal Return for sample firm  $i$  over the event window  $[q, r]$ ;
- $ATV_{i,[q,r]}$  = The Abnormal Trading Volume for sample firm  $i$  over the event window  $[q, r]$ ;
- $ABAS_{i,[q,r]}$  = The Abnormal Bid-Ask Spread for sample firm  $i$  over the event window  $[q, r]$ ;
- $LN(SIZE)_i$  = The natural logarithm of the market capitalization of firm  $i$ ;
- $PERIOD_i$  = Dummy variable equal to 1 if rumor is disseminated during the period 2005 to 2006, and 0 otherwise;
- $RAGE_i$  = Dummy variable equal to 1 if rumor originates on the RagingBull.com Message Board for firm  $i$ , and 0 otherwise;
- $TECH_i$  = Dummy variable equal to 1 if sample firm  $i$  belongs to the technology industry sector, and 0 otherwise;
- $MANU_i$  = Dummy variable equal to 1 if sample firm  $i$  belongs to the manufacturing industry sector, and 0 otherwise;
- $TA_i$  = Dummy variable equal to 1 if sample firm  $i$  is subject to actual takeover activity in the six months following rumor dissemination, and 0 otherwise; and,
- $\varepsilon_i, \varepsilon'_i, \text{ and } \varepsilon''_i$  = The error terms.

## E. Robustness Measures

Barber and Lyon (1997) criticize the standard 0/1 Market Model event study methodology by highlighting that this method inherently mis-specifies test statistics and therefore produces biased

<sup>7</sup> To address potential heteroskedasticity in the data, we estimate the regressions using the heteroskedasticity-consistent standard errors method prescribed by White (1980).

results. To address this shortcoming, we employ an alternative abnormal returns event study approach influenced by the Barber and Lyon (1997) Matched Sample Control Firm methodology. We argue that this Matched Sample Control Firm methodology more accurately accounts for intervening factors, firm characteristics and risk by examining affected sample firms' comparative performance against a control sample. Specifically, we calculate the Barber and Lyon (1997) influenced Control Buy-and-Hold Average Abnormal Returns (CBHAARs) as follows:

$$CBHAAR_{[q,r]} = \frac{1}{n} \sum_{i=1}^n CBHAR_{i,[q,r]} = \frac{1}{n} \sum_{i=1}^n [R_{i,[q,r]} - R_{C_i,[q,r]}] \quad (9)$$

Where:

$CBHAAR_{[q,r]}$  = The matched sample Control Buy-and-Hold Average Abnormal Return of all sample firms over the event window  $[q, r]$ ;

$CBHAR_{i,[q,r]}$  = The matched sample Control Buy-and-Hold Abnormal Return for sample firm  $i$  over the event window  $[q, r]$ ;

$R_{i,[q,r]}$  = The buy-and-hold return for sample firm  $i$  over the event window  $[q, r]$ ;

$R_{C_i,[q,r]}$  = The buy-and-hold return for the control firm corresponding to sample firm  $i$  over the event window  $[q, r]$ ; and,

$n$  = The number of firms in the sample.

Furthermore, analysis of our rumored target firm sample may be subject to sample selection bias in the event that non-random characteristics of these firms, relative to the general population of firms, increase their predisposition to takeover rumor dissemination (Heckman, 1979). This sample selection issue potentially hinders the transferability of inferences deduced from our findings to the broader US equity market. Consequently, we employ the Heckman (1979) two-stage method to test and correct for potential sample selection bias in our univariate and multivariate analysis.

Finally, we investigate the feasibility and economic significance of exploitable trading opportunities induced by the dissemination of Message Board takeover rumors. We extend upon Bradley *et al's* (1988) examination of the wealth effects from announced takeovers to the market, by calculating the actual dollar profit attainable by purchasing the volume of shares traded within each event window at the ask price available at the beginning of the window, and subsequently selling these shares at the bid price available at the end of the window. Furthermore, we

determine the relative economic significance of the rumored target firm opportunities compared to the matched sample control firms. Correspondingly, we calculate the Average Economic Profit Opportunity (AEPO) and Relative Average Economic Profit Opportunity (RAEPO) as follows:

$$AEPO_{[q,r]} = \frac{1}{n} \sum_{i=1}^n \left[ VOL_{i,[q,r]} \left( BID_{i,\theta_r} - ASK_{i,\theta_q} \right) \right] \quad (10)$$

and, 
$$RAEPO_{[q,r]} = \frac{1}{n} \sum_{i=1}^n \left[ VOL_{i,[q,r]} \left( BID_{i,\theta_r} - ASK_{i,\theta_q} \right) - VOL_{C_i,[q,r]} \left( BID_{C_i,\theta_r} - ASK_{C_i,\theta_q} \right) \right] \quad (11)$$

Where:

- $AEPO_{[q,r]}$  = The Average Economic Profit Opportunity of all sample firms over the event window  $[q, r]$ ;
- $RAEPO_{[q,r]}$  = The Relative Average Economic Profit Opportunity of sample firms relative to control firms over the event window  $[q, r]$ ;
- $VOL_{i,[q,r]}$  = The number of firm  $i$  shares traded during the event window  $[q, r]$ ;
- $VOL_{C_i,[q,r]}$  = The number of shares traded during the event window  $[q, r]$  for the control firm corresponding to sample firm  $i$ ;
- $BID_{i,\theta_r}$  = The bid price corresponding to the quote available for sample firm  $i$  at the end of the event window  $[q, r]$ ;
- $ASK_{i,\theta_q}$  = The ask price corresponding to the quote available for sample firm  $i$  at the beginning of the event window  $[q, r]$ ;
- $BID_{C_i,\theta_r}$  = The bid price corresponding to the quote available for the control firm corresponding to sample firm  $i$  at the end of the event window  $[q, r]$ ;
- $ASK_{C_i,\theta_q}$  = The ask price corresponding to the quote available for the control firm corresponding to sample firm  $i$  at the beginning of the event window  $[q, r]$ ; and,
- $n$  = The number of firms in the sample.

### III. Takeover Rumor Acquisition and Data

#### A. Takeover Rumor Acquisition and Filtering Process

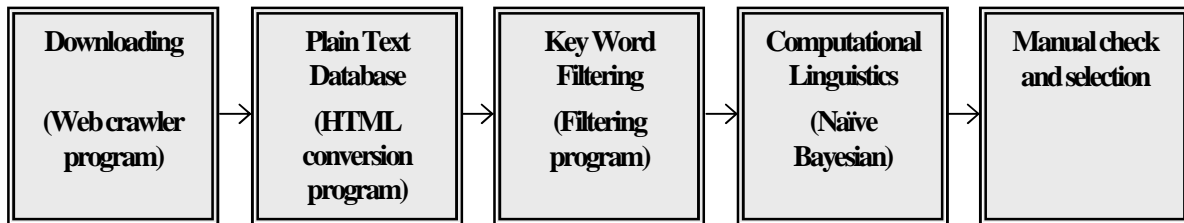
To investigate the impact of Message Board takeover rumors on the price discovery process in the US equity market, we construct a unique sample of takeover rumors disseminated on the RagingBull.com and Yahoo! Finance<sup>8</sup> public Message Boards between January 2003 and December 2006, inclusive.<sup>9</sup> In order to isolate the initial sample of takeover rumors from these sites, we employ a five-stage process, which is graphically depicted in Figure 1 (below).

<sup>8</sup> [http://messages.yahoo.com/yahoo/Business\\_%26\\_Finance/Investments/index.html](http://messages.yahoo.com/yahoo/Business_%26_Finance/Investments/index.html).

<sup>9</sup> Yahoo! Finance and RagingBull.com are widely considered to be among the largest and most prominent US Message Boards (see, for example, Antweiler and Frank, 2004; Das and Chen, 2001; and, Clarkson *et al*, 2006).

## FIGURE 1: Five-Stage Initial Event Sample Selection Process

Figure 1 diagrammatically depicts the five-stage process we employ to acquire the Message Board takeover rumor sample.



To expedite acquisition of the extensive volume of message posts archived on the RagingBull.com and Yahoo! Finance Message Boards, we design a web crawler software program to automate the Message Board first-post downloading stage. A first-post message instigates a string of related subsequent message posts, thereby representing the most accurate point-in-time when a new takeover rumor is publicly disseminated on a Message Board (see, for example, Zhang and Swanson, 2007). In total, we obtain a combined 6,214,834 Hypertext Markup Language (HTML) message posts.

While the aforementioned 6,214,834 messages are downloaded in HTML, we convert all message posts into a plain text database to facilitate filtering and assessment procedures. The plain text database contains key information relating to each message post including: the Message Board; forum name; date; posting time (accurate to the minute); author; message post title; and, message post body text.

Following the plain text conversion of first-post messages, we initially commence the process of isolating appropriate takeover rumors by electronically filtering the plain text database using key words associated with takeover rumors, and date/time criteria. Specifically, we develop a program that filters these message posts based on key words such as ‘takeover’, ‘acquisition’, ‘buyout’, ‘merger’, ‘target’, ‘bid’ and/or ‘rumor’. In addition, we only consider message posts between January 2003<sup>10</sup> and December 2006 that are disseminated during the trading hours 10.30am to 3.00pm on trading days.<sup>11</sup> This process ultimately results in the identification of 114,392 message postings containing words associated with takeover rumors between these specified dates and times.

<sup>10</sup> The RagingBull.com Message Board archives prior to January 2003 are no longer publicly available; consequently, we set January 2003 as our observation start date.

<sup>11</sup> Restricting the observation time periods of takeover rumours ensures no intraday event windows are split over more than a single trading day, thereby minimizing problems associated with both compounding confounding events accruing during market close periods and characteristic abnormal market behaviour typically witnessed at market open and close.

Given the overwhelming volume of electronically filtered message posts, additional and more precise automation of the takeover rumor classification process is desirable. To address this requirement, we employ computational linguistics methods to statistically identify takeover rumors. Computational linguistics techniques employ natural language algorithms to statistically classify text and its use in facilitating wide scale Message Board studies is increasing in popularity in the extant literature (Zelikovitz and Hirsh, 2005).<sup>12</sup>

We construct a computational linguistics classification program based on Support Vector Machine (SVM) techniques. SVMs have the advantage of being able to classify message posts via a combination of multiple features due to their use of polynomial kernel functions. Thus, SVMs are generally more accurate in classifying information than methods which employ Naïve Bayesian, K-Nearest neighbor and Maximum Entropy computational techniques. We create a training set for our SVMs by manually reading and classifying all message posts made in 2003 as either positive (indicating the message post is a valid takeover rumor) or negative (indicating an invalid takeover rumor message post). To address any issues of look ahead bias, this training set is then used to train the algorithm to classify all subsequent postings.

We further use this training set to compare SVMs, Naïve Bayesian, K-Nearest Neighbor and Maximum Entropy computational techniques. By stratifying the training set into 65 percent in-sample for parameter estimation and 35 percent out-of-sample for performance evaluation, we find that SVMs perform much better than all other comparative techniques we consider. Indeed, when we examine the 103,138 message posts that have been excluded via our computational linguistics approach, we find that the SVM technique we employ has a 99.73 percent overall classification accuracy and 98.13 percent accuracy in identifying positive takeover rumors. This observation justifies the selection of the SVM computational linguistics approach we employ to automatically classify the remaining filtered message posts. This process further refines the 114,392 electronically filtered message posts resulting in the generation of a sample of 11,254 takeover rumor message posts.

We then manually read all of these message posts identified in the computational linguistics stage to ensure they only consider takeover rumors that provide unambiguous predictions of pending takeover activity. Furthermore, so that Message Board takeover rumors represent the introduction of new information to the market, we ensure the rumored takeover target firm is not

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<sup>12</sup> While a large body of literature has developed computational linguistics techniques for text classification over the past 40 years (see, for example, Vapnik and Chervonenkis, 1964; and, Chakrabarti *et al*, 1998), it is Chen *et al* (1999) who are first to formally apply computational linguistics techniques to ascertain the sentiment of messages posted on Message Boards. Subsequently, Das and Chen (2001) extensively develop a number of computational linguistics techniques for direct application to Message Board text classification.

the subject of either a media report or company announcement relating to takeover activity in the six months prior to rumor dissemination. Also, in the week immediately prior to takeover rumor dissemination, we verify that the rumored target firm is not identified in value-relevant confounding press or company announcements of any description.<sup>13</sup>

Subsequent to the selection of the initial sample which results in 2,074 takeover rumors, further filtering is necessary to ensure several additional requirements are satisfied. To facilitate data collection, we only include takeover rumors pertaining to publicly listed target firms in the final sample. Moreover, in accordance with the matched firm methodology we employ, the final sample only contains rumored target firms for which a suitably matched control firm exists. Finally, for each rumored target and control firm we require a complete data set to allow calculation of our abnormal return, trading volume and bid-ask spread measures.

Based on the sample identification and filtering procedures outlined above, we obtain a final sample of 1,087 takeover rumors pertaining to 535 unique US publicly listed firms during the period January 2003 to December 2006, inclusive. Table II summarizes the sample identification and filtering process:

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<sup>13</sup> We search titles and lead paragraphs of key financial information channels (e.g. 'PR Newswire (U.S.)', 'Reuters News' and 'The Wall Street Journal') for the rumored target firm's name and/or ticker symbol using Factiva.

**TABLE II: Summary of Sample Identification and Filtering Process**

Table II summarizes the takeover rumor sample acquisition and filtering process we employ to construct the final sample of takeover rumors utilized to investigate the impact of Message Board takeover rumors on the US equity market. *Panel A* summarizes the message posts identified at each stage of the *initial sample acquisition process*. *Panel B* outlines the *sample filtering process* employed to filter the *Initial Sample* obtained in the initial sample acquisition process to construct the *Final Sample* utilized in the remainder of this paper. Both the initial and final samples contain Message Board takeover rumors during the period January 2003 to December 2006, inclusive.

	<b>Message Posts</b>
<b>PANEL A: Initial Sample Acquisition Process</b>	
Total Downloaded Sample	6,214,834
Total Electronically Filtered Sample	114,392
Total Computational Linguistics Filtered Sample	11,254
Total Manually Selected Sample	2,074
<b>PANEL B: Sample Filtering Process</b>	
<b>Initial Sample</b>	<b>2,074</b>
Less: Non-publicly listed firms	254
Less: Inadequate accounting data	249
Less: Unmatched firms	124
Less: Inadequate share price and trading volume data	196
Less: Inadequate bid-ask spread data	92
Less: Inadequate historic daily trading volume and bid-ask spread data	72
<b>Final Sample</b>	<b>1,087</b>

## **B. Data Collection**

To investigate the impact of Message Board takeover rumors on the US equity market, we examine intraday TAQ data. We obtain the reference date and time (to the minute) of takeover rumor message posts from the original HTML message posts incorporated in our plain text database. A summary of the abnormal return, trading volume and bid-ask spread data we analyze in this paper is presented in Table III as follows:

**TABLE III: Message Board Takeover Rumor Analysis Data Sources**

Table III reports the *data sources* utilized in the *calculation* of abnormal return, trading volume and bid-ask spread impacts of Message Board takeover rumors.

Calculation	Description	Data Source
Abnormal Returns	We obtain intraday trade-by-trade share price data for affected sample firms, matched sample control firms and the S&P 500 market index proxy (ticker: SPY). We ensure the data we collect covers the 48-hour trading period surrounding each corresponding takeover rumor between January 2003 and December 2006, inclusive.	NYSE TAQ database
Abnormal Trading Volumes	We obtain intraday trade-by-trade volume data for affected and matched sample firms. We ensure the data we collect cover the 48-hour trading period surrounding each corresponding takeover rumor between January 2003 and December 2006, inclusive.	NYSE TAQ database
Abnormal Bid-Ask Spreads	We obtain intraday quote-by-quote bid price and ask price data for affected and matched sample firms. We ensure the data we collect cover the 48-hour trading period surrounding each corresponding takeover rumor between January 2003 and December 2006, inclusive.	NYSE TAQ database
Historic Adjustment Factors	To determine the historic matched sample control firm's to the rumored takeover target firm's average daily trading volume and average bid-ask spread adjustment factors, as described in Chapter Four, requires the collection of daily trading volume and closing bid price and ask price data for each rumored takeover target firm and its comparative control firm. We obtain this daily data for the two to six week period prior to each corresponding takeover rumor between January 2003 and December 2006, inclusive.	CRSP Daily Stock database

To construct the matched control firm sample, we collect NAICS, market capitalization adjusted for option dilution and book-to-market values for all publicly listed US firms covered by the Centre for Research in Security Prices (CRSP)/COMPUSTAT Merged Industrial Annual database. Furthermore, the Standard and Poor's 500 (S&P 500) market index is selected as the appropriate market proxy to compare sample firm returns. Consistent with Antweiler and Frank (2004), we proxy trade-by-trade returns on the market portfolio using the exchange-traded fund that mimics the S&P 500 US market index that is available on the New York Stock Exchange Trade-And-Quote (NYSE TAQ) database (ticker: SPY).

Finally, Table IV outlines the data we use to construct the explanatory variables we employ in our multivariate analysis methodology:

**TABLE IV: Cross-Sectional Explanatory Variables Data Sources**

Table IV reports the *data sources* utilized in the calculation and identification of cross-sectional explanatory variables employed in the multivariate analysis of the impact of Message Board takeover rumors.

Variable	Description	Data Source
$LN(SIZE)$	To facilitate construction of the natural logarithm of firm size series, we measure ‘firm size’ as the firm’s market capitalization (data25, data199) adjusted for capitalization changes (data27).	CRSP/COMPUSTAT Merged Industrial Annual database
$PERIOD$	The date and time of each sample takeover rumor is recorded directly from the source takeover rumor message post in our plain text database. We construct the time period dummy variable using this plain text database to identify sample takeover rumors that are disseminated during the periods 2003 to 2004 and 2005 to 2006.	Message Board Takeover Rumor Plain Text database
$RAGE$	The specific Message Board website each takeover rumor originates in is recorded directly from the source takeover rumor message post in our plain text database. We construct the $RAGE$ dummy variable using this plain text database to identify takeover rumors sourced from either the RagingBull.com or Yahoo! Finance Message Boards.	Message Board Takeover Rumor Plain Text database
$TECH$	We classify sample firms into economic sector industry groups based on their first two-digit NAICS codes. There are 20 economic industry sectors under the NAICS. In order to construct the Technology ( $TECH$ ) industry group dummy variable, we identify all firms in the final sample that belong to the Information (technology) NAICS economic sector industry group.	CRSP/COMPUSTAT Merged Industrial Annual database
$MANU$	Similarly to the construction of the $TECH$ dummy variable, to construct the Manufacturing ( $MANU$ ) industry group dummy variable, we identify all firms in the final sample that belong to the Manufacturing NAICS economic sector industry group.	CRSP/COMPUSTAT Merged Industrial Annual database
$TA$	We determine whether a sample firm experiences confirmation of actual takeover activity subsequent to takeover rumor dissemination by identifying press articles, firm announcements and evidence of delisting due to a takeover occurring in the six months subsequent to rumor dissemination. Using Factiva, we search titles and lead paragraphs of key financial information channels (e.g. ‘ <i>PR Newswire (U.S.)</i> ’, ‘ <i>Reuters News</i> ’ and ‘ <i>The Wall Street Journal</i> ’) for the rumored target company’s name and/or ticker listings. Furthermore, we identify all firms with a three-digit integer delisting code beginning with the number two in the CRSP Daily Stock database. <sup>14</sup>	CRSP Daily Stock database & Factiva

### C. Descriptive Statistics

Characteristics pertaining to the 535 unique rumored takeover target firms and 660 unique control firms are reported in Table V. Sample firms are subject to 2.0280 first-post Message Board takeover rumors on average and 1.0000 on median during the period January 2003 to December 2006, inclusive. With over three-quarters of the sample firms subject to 2.0000 or less first-post takeover rumors, it appears to be rare for a particular firm to be consistently the subject of new Message Board takeover rumors. Furthermore, with rumored takeover firms’ market capitalizations ranging between US\$3.45 million to US\$250.3 billion, our sample covers the entire size spectrum of rumored takeover targets.

<sup>14</sup> A three-digit integer delisting code beginning with the number two indicates the reason for delisting of the firm is due to merger and acquisition activity.

**TABLE V: Rumored Takeover Target and Control Firm Descriptive Statistics**

Table V summarizes firm characteristics pertaining to the 535 unique *rumored takeover target sample firms* and the 660 unique *matched sample control firms*. Specifically, *Panel A* and *Panel B* present descriptive statistics associated with the rumored takeover target sample and matched sample control firms pertaining to: the *number of Message Board takeover rumors* associated with each unique rumored target sample firm; market capitalization; book-to-market ratios; pre-rumor average daily dollar trading volume; and, pre-rumor average daily closing bid-ask spreads. We calculate *Market Capitalization* as each firm's number of shares outstanding multiplied by the closing share price (adjusted for dilution) at fiscal year end immediately prior to takeover rumor dissemination. We calculate *Book-to-Market* ratios as the accounting book value of equity over the market value of equity, on an adjusted basis. We construct *Pre-Rumor Average Daily Dollar Volume* as the average daily trading volume in the six weeks prior to two weeks prior to takeover rumor dissemination multiplied by the average closing share price during this period. We calculate *Pre-Rumor Average Bid-Ask Spreads* as the average daily closing bid-ask spreads in the six weeks prior to two weeks prior to takeover rumor dissemination.

Measure	Mean	Standard Deviation	Minimum	25 <sup>th</sup> Percentile	Median	75 <sup>th</sup> Percentile	Maximum
<b>PANEL A: Rumored Takeover Target Sample Firms</b>							
Number of Rumors	2.0280	1.8485	1.0000	1.0000	1.0000	2.0000	17.0000
Market Capitalization (US\$ mil)	4,538.0215	16,382.0472	3.4509	117.6674	481.8764	1,762.2868	250,318.3045
Book-to-Market	0.4721	0.8533	-7.7344	0.2568	0.4457	0.7330	3.2092
Pre-Rumor Avg Daily Dollar Volume (US\$ mil)	36.2494	89.9966	0.0011	0.9358	5.3773	27.1047	1,338.8235
Pre-Rumor Avg Bid-Ask Spread (%)	0.6116	1.0403	0.0006	0.1060	0.2512	0.6266	11.0853
<b>PANEL B: Matched Sample Control Firms</b>							
Market Capitalization (US\$ mil)	4,373.1143	16,164.7431	3.4692	124.6185	465.1200	1,932.5426	311,755.4576
Book-to-Market	0.4261	0.5431	-4.6345	0.1922	0.3282	0.5927	3.4417
Pre-Rumor Avg Daily Dollar Volume (US\$ mil)	23.3465	65.7129	0.0001	0.3382	2.5790	11.6246	750.5333
Pre-Rumor Avg Bid-Ask Spread (%)	0.7306	1.2133	0.0001	0.1095	0.2845	0.7887	12.2516

Table VI reports summary statistics for the dummy and continuous variables we employ in our multivariate analysis. Notably, there is an approximately even distribution of takeover rumors during the periods 2003 to 2004 and 2005 to 2006. Also, there are more takeover rumors originating from the Yahoo! Finance Message Board, which is logical given the considerably greater posting activity on the Yahoo! Finance Message Board. We observe a substantial proportion of takeover rumor Message Board activity relates to the technology and manufacturing NAICS industry sectors. Finally, approximately 20 percent of Message Board takeover rumors are subsequently confirmed by actual takeover activity.

**TABLE VI: Descriptive Statistics for Cross-Sectional Explanatory Variables**

Table VI presents the descriptive statistics for the dummy and discrete cross-sectional explanatory variables we employ in our multivariate analysis of the impact of Message Board takeover rumors. *Panel A* reports the *number of takeover rumor observations* pertaining to each *dummy variable value* and the corresponding *proportion of the total sample* this represents. *Panel B* outlines descriptive statistics pertaining to the *continuous variable* we employ in the multivariate analysis. With regard to reported explanatory variables: *LN(SIZE)* is the natural logarithm of the rumored takeover target firm's market capitalization; *PERIOD* is a dummy variable equal to 1 if the takeover rumor is disseminated in either 2005 or 2006, and 0 otherwise; *RAGE* is a dummy variable equal to 1 if the takeover rumor is disseminated via the RagingBull.com Message Board, and 0 otherwise; *TECH* is a dummy variable equal to 1 if the rumored takeover target firm operates within the technology industry sector, and 0 otherwise; *MANU* is a dummy variable equal to 1 if the rumored takeover target firm operates within the manufacturing industry sector, and 0 otherwise; and, *TA* is a dummy variable equal to 1 if activity involving the actual takeover of the rumored takeover target firm is confirmed in the six months subsequent to Message Board takeover rumor dissemination, and 0 otherwise.

<b>PANEL A: Dummy Variables</b>						
<b>Variable</b>	<b>Variable Value</b>		<b>Number of Observations</b>	<b>Proportion of Sample</b>		
<i>PERIOD</i>	1		648	59.61%		
	0		439	40.39%		
<i>RAGE</i>	1		160	14.72%		
	0		927	85.28%		
<i>TECH</i>	1		226	20.79%		
	0		861	79.21%		
<i>MANU</i>	1		436	40.11%		
	0		651	59.89%		
<i>TA</i>	1		210	19.32%		
	0		877	80.68%		

<b>PANEL B: Continuous Variable</b>						
<b>Variable</b>	<b>Sample Size</b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>25<sup>th</sup> Percentile</b>	<b>Median</b>	<b>75<sup>th</sup> Percentile</b>
<i>LN(SIZE)</i>	1,087	6.3052	2.0405	4.7679	6.1777	7.4744

## **IV. Results**

### **A. The Aggregate Shareholder Wealth Effects**

We commence our analysis by documenting the shareholder wealth effects of US Message Board takeover rumors. Overall, the abnormal return results documented in Table VII provide strong evidence that Message Board takeover rumors generate significant positive abnormal returns in comparison to the market portfolio. Explicitly, abnormal returns relative to the market portfolio are significant in all event intervals observed; with the exception of the one, five and ten-minute prior and sixty-minute post-rumor intervals. In particular, abnormal returns relative to the market portfolio of 1.7 percent are observed in the twenty-four-hour period surrounding the initial dissemination of Message Board takeover rumors.

These results indicate that, while minimal share price appreciation occurs within the ten to one-minute period before the rumor dissemination, substantially positive responses occur in the one to thirty-minute period after dissemination. Significant share price appreciation in the twenty-four hours to thirty minutes prior to rumor dissemination offers anecdotal evidence of Message Board participants acting on the rumor information prior to dissemination (consistent with, Van Bommel, 2003; and, Clarkson *et al*, 2006) and/or takeover rumor messages being disseminated reactively to share price appreciation (consistent with, Tumarkin and Whitelaw, 2001).

**TABLE VII: The Aggregate Effects of Message Board Takeover Rumor Dissemination**

Table VII reports the shareholder wealth, trading volume and bid-ask spread effects of Message Board takeover rumors for the period January 2003 to December 2006, inclusive. *Panels A, B and C* present *pre*, *post* and *surrounding-rumor* event *windows*, respectively. *BHAARs* are constructed as the average of the aggregate sample (1,087 observations) individual rumored takeover target Buy-and-Hold Abnormal Returns (*BHARs*) over the specified event window (one-tailed t-statistics are presented in parentheses), where:  $BHAR_{i,[q,r]} = R_{i,[q,r]} - R_{m,[q,r]}$ . *CAATVs* are calculated as the average of the total sample individual rumored target firm Control Abnormal Trading Volumes (*CATVs*) over the specified event window (one-tailed t-statistics are presented in parentheses), where:  $CATV_{i,[q,r]} = \left[ VOLADJ_i \sum_{\tau=\tau_q}^{\tau_r} V_{i,\tau} \right] - \sum_{\tau'=\tau'_q}^{\tau'_r} V_{C_i,\tau'}$ . *VOLADJ* is the Trading Volume Adjustment factor calculated as the ratio of the historic average daily trading volume of the matched sample control firm to the rumored target firm over the period six weeks prior to two weeks prior to takeover rumor dissemination. *CAABAS<sup>adj</sup>* is calculated as the average of the individual rumored target firm Control Firm Adjusted Abnormal Bid-Ask Spreads (*CABAS<sup>adj</sup>*) over the specified event window (two-tailed t-statistics are presented in parentheses), where:  $CABAS_{i,[q,r]}^{adj} = \left\{ BASADJ_i \frac{1}{\theta_{T,[q,r]}} \sum_{\theta=\theta_q}^{\theta_r} [BAS_{\theta}] \right\} - \frac{1}{\theta'_{T,[q,r]}} \sum_{\theta'=\theta'_q}^{\theta'_r} [BAS_{\theta'}]$ .

*BASADJ* is the Bid-Ask Spread Adjustment factor calculated as the ratio of the historic average daily closing bid-ask spread of the matched sample control firm to the rumored target firm over the period six weeks prior to two weeks prior to takeover rumor dissemination.

Window	Abnormal Returns	Abnormal Volume	Abnormal Spread
	BHAAR	CAATV	CAABAS <sup>adj</sup>
<b>PANEL A: Pre-Rumor Windows</b>			
[-24 hrs, 0]	0.0133 (5.6030)**	924,709.3167 (4.5266)**	0.1377 (1.1885)
[-60, 0]	0.0021 (3.6009)**	207,894.1012 (4.0099)**	0.1467 (1.3122)
[-30, 0]	0.0017 (3.0414)**	100,316.7061 (4.4250)**	0.1505 (1.3203)
[-10, 0]	0.0003 (1.2289)	33,350.5872 (4.9156)**	0.1058 (0.9825)
[-5, 0]	0.0001 (0.1186)	17,370.1173 (5.2475)**	0.0913 (0.8428)
[-1, 0]	0.0001 (0.6021)	3,207.9309 (4.3458)**	0.0492 (0.4418)
<b>PANEL B: Post-Rumor Windows</b>			
[0, +1]	0.0002 (3.2874)**	2,591.0298 (4.5483)**	-0.0096 (-0.0772)
[0, +5]	0.0008 (3.2057)**	13,975.6786 (5.9484)**	0.0005 (0.0046)
[0, +10]	0.0005 (2.2781)*	26,163.8087 (5.3094)**	0.0352 (0.3158)
[0, +30]	0.0008 (2.6027)**	73,504.6144 (4.6425)**	0.0898 (0.8392)
[0, +60]	0.0007 (1.5906)	138,524.5359 (4.7498)**	0.0764 (0.6974)
[0, +24 hrs]	0.0038 (3.1256)**	831,190.1508 (4.5904)**	0.1060 (0.9424)
<b>PANEL C: Surrounding-Rumor Windows</b>			
[-1, +1]	0.0003 (2.3458)**	5,798.9608 (4.9340)**	0.0315 (0.2770)
[-5, +5]	0.0009 (2.7095)**	31,345.7960 (6.0938)**	0.0503 (0.4616)
[-10, +10]	0.0009 (2.3117)*	59,514.3959 (5.2971)**	0.0726 (0.6823)
[-30, +30]	0.0025 (3.8541)**	173,821.3205 (4.6207)**	0.1090 (1.0030)
[-60, +60]	0.0028 (3.8605)**	346,418.6370 (4.4089)**	0.1030 (0.9565)
[-24 hrs, +24 hrs]	0.0171 (6.5760)**	1,755,899.4675 (4.6700)**	0.1144 (1.0030)

\*Significant at the 5% level; \*\*Significant at the 1% level.

## B. The Aggregate Trading Volume Effects

Table VII also details our findings relating to the trading volume impact of US Message Board takeover rumors. Each of the eighteen event windows we observe indicate highly significant increases in trading volumes in excess of those the corresponding matched sample control firms experience. This outcome is largely consistent with the extant takeover rumor

studies (see, for example, Pound and Zeckhauser, 1990; and, Clarkson *et al*, 2006) and also broader Message Board studies (see, for example, Tumarkin and Whitelaw, 2001; and, Antweiler and Frank, 2004). However, in general, we observe a comparatively more uniform and persistently significant positive post-rumor period impact than the studies by Pound and Zeckhauser (1990) and Clarkson *et al* (2006). This discrepancy may be partially attributable to the more recent time period, country, and sample selection procedures we employ.

### **C. The Aggregate Bid-Ask Spread Effects**

Finally, Table VII presents evidence relating to the bid-ask spread impact of US Message Board takeover rumors. Notably, we uniformly identify rumored takeover target firm bid-ask spreads do not significantly differ from matched sample control firms in all event windows observed. On this basis, we conclude that the dissemination of Message Board takeover rumors does not significantly alter bid-ask spreads and consequently, the inherent transaction costs associated with rumored target firms (see, for example, Glosten and Harris, 1988; and, Menyah and Paudyal, 2000).

### **D. Cross-Sectional Shareholder Wealth Analysis**

While the aforementioned results pertain to the overall impacts of Message Board takeover rumors, we now consider the combined influence of specific variables that potentially explain cross-sectional variations evident in these aggregated results.<sup>15</sup> For brevity, we present cross-sectional variation results for only the five-minute, thirty-minute and twenty-four-hour event windows with regard to the various methodologies we employ in calculating abnormal returns, trading volumes and bid-ask spreads, respectively.<sup>16</sup>

Abnormal returns multivariate analysis reveals significant firm size<sup>17</sup>, industry and subsequent takeover activity confirmation effects. Table VIII presents cross-sectional variation results for the 0/1 Market Model abnormal return approach we employ.

A significant negative firm size effect is apparent in all event windows that follow and surround rumor dissemination. This suggests the equity market response to Message Board takeover rumor dissemination is substantially stronger for smaller firms. The twenty-four-hour

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<sup>15</sup> For brevity, we do not report the results of our univariate stratification analysis. However, the qualitative findings are consistent with the multivariate analysis results.

<sup>16</sup> It is important to note that, for brevity, we do not present tables for all event windows. However, we do provide a discussion of the main findings, including results pertaining to event windows not reported.

<sup>17</sup> We considered the inclusion of analyst coverage as an additional explanatory variable. However, size and analyst coverage are highly correlated and as such we choose size as an explanatory variable to avoid potential multicollinearity issues. Nonetheless, we find testing using analyst coverage rather than size, results in no significant differences.

period prior to takeover rumour dissemination also demonstrates a significant negative firm size effect. These results are inconsistent with Australian findings by Clarkson *et al* (2006), who do not identify a significant firm size effect in response to Message Board takeover rumors. However, a negative firm size effect is consistent with general observations apparent in broader extant US Message Board studies (Bagnoli *et al*, 1999), highlighting that Message Boards provide an avenue of information dissemination for small companies, which suffer an inherent analysis coverage bias.

**TABLE VIII: Abnormal Returns Cross-Sectional Variation Results for Various Observation Periods**

Table VIII presents the results of our multivariate regression analysis of the abnormal returns associated with Message Board takeover rumours during the selected event windows examined. Specifically, we present the multivariate regression results for all *five-minute*, *thirty-minute* and *twenty-four-hour* event windows. In particular, we present multivariate regression estimates with respect to abnormal returns we calculate using the *0/1 Market Model* Buy-and-Hold *Abnormal Returns (BHAR)* methodology. With regard to reported explanatory variables: *LN(SIZE)* is the natural logarithm of the rumoured takeover target firm's market capitalisation; *PERIOD* is a dummy variable equal to 1 if the takeover rumour is disseminated in either 2005 or 2006, and 0 otherwise; *RAGE* is a dummy variable equal to 1 if the takeover rumour is disseminated via the RagingBull.com Message Board, and 0 otherwise; *TECH* is a dummy variable equal to 1 if the rumoured takeover target firm operates within the technology industry sector, and 0 otherwise; *MANU* is a dummy variable equal to 1 if the rumoured takeover target firm operates within the manufacturing industry sector, and 0 otherwise; and, *TA* is a dummy variable equal to 1 if activity involving the actual takeover of the rumoured takeover target firm is confirmed in the six months subsequent to Message Board takeover rumour dissemination, and 0 otherwise. Two-tailed t-statistics are reported in parentheses below the associated explanatory variable regression coefficient values, calculated using the heteroskedasticity-consistent standard errors method prescribed by White (1980).

Variable \ Window	5 Minutes			30 Minutes			24 Hours		
	[-5, +5]	[-5, 0]	[0, +5]	[-30, +30]	[-30, 0]	[0, +30]	[-24, +24]	[-24, 0]	[0, +24]
<b>PANEL A: 0/1 Market Model Abnormal Returns (BHAR)</b>									
<i>Constant</i>	0.0033 (2.5006)*	-0.0004 (-0.3673)	0.0036 (3.5890)**	0.0091 (2.6291)**	0.0040 (1.2990)	0.0036 (3.5890)**	0.0443 (3.9671)**	0.0285 (3.1102)**	0.0158 (2.7455)**
<i>LN (SIZE)</i>	-0.0005 (-2.7208)**	0.0001 (0.8938)	-0.0006 (-3.5128)**	-0.0010 (-2.2258)*	-0.0002 (-0.5769)	-0.0006 (-3.5128)**	-0.0055 (-3.9440)**	-0.0037 (-3.0204)**	-0.0018 (-2.6347)**
<i>PERIOD</i>	0.0007 (1.1575)	-0.0001 (-0.3064)	0.0008 (1.5623)	-0.0001 (-0.0638)	-0.0003 (-0.2712)	0.0008 (1.5623)	-0.0007 (-0.1223)	0.0016 (0.2787)	-0.0013 (-0.4853)
<i>RAGE</i>	-0.0004 (-0.5447)	-0.0005 (-0.7312.)	0.0001 (0.1409)	-0.0001 (-0.0231)	0.0010 (0.6284)	0.0001 (0.1409)	0.0115 (1.1834)	0.0140 (1.4220)	-0.0019 (-0.5128)
<i>TECH</i>	0.0019 (1.8549)	-0.0001 (-0.1287)	0.0019 (2.1209)*	-0.0021 (-1.0189)	-0.0029 (-1.8275)	0.0019 (2.1209)*	0.0014 (0.1971)	-0.0012 (-0.1973)	0.0018 (0.5031)
<i>MANU</i>	0.0001 (0.0020)	-0.0004 (-0.9792)	0.0004 (1.1121)	0.0005 (0.3367)	-0.0009 (-0.6894.)	0.0004 (1.1121)	0.0051 (0.9254)	0.0074 (1.3776)	-0.0025 (-0.9620)
<i>TA</i>	0.0002 (0.4266)	0.0001 (0.0420)	0.0002 (0.5210)	0.0014 (0.7522)	0.0002 (0.1478)	0.0002 (0.5210)	0.0194 (2.7608)**	0.0121 (1.9858)*	0.0067 (2.2002)*
<i>R<sup>2</sup></i>	0.0218	0.0030	0.0339	0.0089	0.0043	0.0339	0.0248	0.0166	0.0135
<i>Adjusted R<sup>2</sup></i>	0.0164	-0.0026	0.0286	0.0034	-0.0012	0.0286	0.0193	0.0112	0.0080
<i>F-Statistic</i>	4.0087**	0.5354	6.3245**	1.6115	0.7763	6.3245**	4.5701**	3.0476**	2.4582*

\*Significant at the 5% level; \*\*Significant at the 1% level.

Furthermore, we find that subsequent takeover activity confirmation has a significantly positive relationship with abnormal returns in the twenty-four-hour event windows. Consistent with Clarkson *et al* (2006), we observe that subsequent takeover activity confirmation has an insignificant relationship in the intraday windows that are less than twenty-four hours in length. However, we are able to identify that a significant positive subsequent takeover activity confirmation relationship does exist by examining the forty-eight-hour period surrounding takeover rumor dissemination. We suggest that this is consistent with the concept of market efficiency (Fama, 1970), in that market participants generally tend to accurately interpret, and appropriately act on, credible Message Board takeover rumors.

Finally, we document significant evidence of an industry effect, which partially explains the cross-sectional variation in abnormal returns. Specifically, we reveal a significant positive post-rumor event window response at five, ten and thirty-minute intervals for technology firms. However, a significant negative relationship is apparent in the sixty-minute interval prior to takeover rumor dissemination. This relationship is largely consistent with broader US Message Board studies that confirm firms within the technology sector are particularly susceptible to the influence of Message Board activity (see, for example, Das and Chen, 2001; and, Antweiler and Frank, 2004).

#### **E. Cross-Sectional Trading Volume Analysis**

Our multivariate analysis of abnormal trading volume impacts of Message Board takeover rumors reveals a strong and consistent positive relationship between abnormal trading volume and subsequent takeover activity confirmation. Table IX presents cross-sectional variation results for the five-minute, thirty-minute and twenty-four-hour event windows.

**TABLE IX: Abnormal Trading Volumes Cross-Sectional Variation Results for Various Observation Periods**

Table IX presents the results of our multivariate regression analysis of the abnormal trading volume associated with Message Board takeover rumors during the event windows selected for reporting. Specifically, we present the multivariate regression results for all *five-minute*, *thirty-minute* and *twenty-four-hour* event windows. Multivariate regression estimates are generated with respect to abnormal trading volumes we calculate using the Barber and Lyon (1997) influenced Matched Sample *Control Abnormal Trading Volumes (CATV)* methodology. With regard to reported explanatory variables: *LN(SIZE)* is the natural logarithm of the rumored takeover target firm's market capitalization; *PERIOD* is a dummy variable equal to 1 if the takeover rumor is disseminated in either 2005 or 2006, and 0 otherwise; *RAGE* is a dummy variable equal to 1 if the takeover rumor is disseminated via the RagingBull.com Message Board, and 0 otherwise; *TECH* is a dummy variable equal to 1 if the rumored takeover target firm operates within the technology industry sector, and 0 otherwise; *MANU* is a dummy variable equal to 1 if the rumored takeover target firm operates within the manufacturing industry sector, and 0 otherwise; and, *TA* is a dummy variable equal to 1 if factual takeover activity involving the actual takeover of the rumored takeover target firm is confirmed in the six months subsequent to Message Board takeover rumor dissemination, and 0 otherwise. Two-tailed t-statistics are reported in parentheses below the associated explanatory variable regression coefficient values, calculated using the heteroskedasticity-consistent standard errors method prescribed by White (1980).

Variable \ Window	5 Minutes			30 Minutes			24 Hours		
	[-5, +5]	[-5, 0]	[0, +5]	[-30, +30]	[-30, 0]	[0, +30]	[-24, +24]	[-24, 0]	[0, +24]
<b>Control Abnormal Trading Volumes (CATV)</b>									
<i>Constant</i>	-29,213 (-1.2349)	-22,215 (-1.4372)	-6,998 (-0.6517)	-113,702 (-0.5486)	-43,786 (-0.3591)	-69,916 (-0.7900)	86,358 (0.0464)	-33,624 (-0.0317)	119,982 (0.1435)
<i>LN (SIZE)</i>	6,324 (1.5177)	3,000 (1.6671)	1,324 (0.6483)	17,051 (0.4665)	5,875 (0.2684)	11,176 (0.7333)	-34,356 (-0.0958)	-14,274 (-0.0734)	-20,083 (-0.1180)
<i>PERIOD</i>	8,427 (0.6637)	-2,960 (-0.3912)	11,387 (1.7523)	155,698 (1.6713)	89,860 (1.4666)	65,838 (1.9460)	1,832,797 (1.5474)	1,070,031 (1.7996)	762,766 (1.2700)
<i>RAGE</i>	12,999 (0.6589)	3,121 (0.3197)	9,877 (0.8689)	121,784 (0.7099)	77,707 (0.6851)	44,077 (0.7172)	2,700,310 (1.2101)	1,543,106 (1.3558)	1,157,205 (1.0380)
<i>TECH</i>	3,963 (0.3954)	-484 (-0.0986)	4,447 (0.7480)	-50,935 (-0.7637)	-46,383 (-1.0889)	-4,552 (-0.1694)	-985,593 (-1.1126)	-572,618 (-1.3132)	-412,975 (-0.8911)
<i>MANU</i>	16,918 (1.3464)	15,907 (1.9457)	1,012 (0.1810)	61,680 (0.6380)	44,796 (0.7658)	16,884 (0.4195)	-48,219 (-0.0510)	46,702 (0.0884)	-94,920 (-0.2152)
<i>TA</i>	31,762 (1.9266)	15,952 (1.7536)	15,810 (1.8720)	285,312 (2.2634)*	174,589 (2.1682)*	110,723 (2.2893)*	3,211,076 (2.1331)*	1,468,133 (1.9931)*	1,742,943 (2.2839)*
<i>R<sup>2</sup></i>	0.0168	0.0186	0.0160	0.0159	0.0158	0.0154	0.0212	0.0193	0.0219
<i>Adjusted R<sup>2</sup></i>	0.0114	0.0131	0.0105	0.0105	0.0103	0.0099	0.0158	0.0139	0.0165
<i>F-Statistic</i>	3.0808**	3.4107**	2.9272**	2.9155**	2.8880**	2.8077*	3.9072**	3.5496**	4.0354**

\*Significant at the 5% level; \*\*Significant at the 1% level.

All event windows observed, with the exception of the one and five-minute rumor dissemination intervals, identify significantly higher trading volumes associated with Message Board takeover rumors that are subsequently confirmed by actual takeover activity within the six months following dissemination of the rumor. This relationship, combined with a similar relationship identified with respect to abnormal returns, suggests that market participants respond in a manner consistent with the concept of market efficiency when interpreting and acting on the information contained in Message Board takeover rumors (Fama, 1970). This finding is inconsistent with Clarkson *et al* (2006) who find that, within the Australian context, the incidence of subsequent takeover activity confirmation does not significantly explain cross-sectional variations in trading volume response. This inconsistency is potentially explained by differences in the US market microstructure, methodology, and/or sample selection procedures we employ.

#### **F. Cross-Sectional Bid-Ask Spread Analysis**

Table X presents cross-sectional variation results for the five-minute, thirty-minute and twenty-four-hour event windows with regard to adjusted abnormal bid-ask spread measures. Specifically, the adjusted abnormal bid-ask spread regressions exhibit significantly lower bid-ask spreads in the 2005 to 2006 period in the post twenty-four-hour and surrounding forty-eight-hour event windows. Consequently, we conclude that Message Board takeover rumor effects induce relatively lower equity market transaction costs in the 2005 to 2006 period relative to the 2003 to 2004 period (see, for example, Glosten and Harris, 1988; and, Atkins and Dyl, 1997).

**TABLE X: Abnormal Bid-Ask Spreads Cross-Sectional Variation Results for Various Observation Periods**

Table X presents the results of our multivariate regression analysis of the abnormal bid-ask spreads associated with Message Board takeover rumors during selected event windows. Specifically, we present the multivariate regression results for all *five-minute*, *thirty-minute* and *twenty-four-hour* event windows. We present regression estimates with respect to abnormal bid-ask spreads we calculate using the *Adjusted* Barber and Lyon (1997) influenced Matched Sample *Control Firm Abnormal Bid-Ask Spread (CABAS<sup>adj</sup>)* methodology, for which the rumored target firm's average bid-ask spread is adjusted by the ratio of the historic average daily closing bid-ask spread of the Matched Sample Control Firm to the rumored target firm over the period six weeks prior to two weeks prior to the Message Board takeover rumor dissemination. With regard to reported explanatory variables: *LN(SIZE)* is the natural logarithm of the rumored takeover target firm's market capitalization; *PERIOD* is a dummy variable equal to 1 if the takeover rumor is disseminated in either 2005 or 2006, and 0 otherwise; *RAGE* is a dummy variable equal to 1 if the takeover rumor is disseminated via the RagingBull.com Message Board, and 0 otherwise; *TECH* is a dummy variable equal to 1 if the rumored takeover target firm operates within the technology industry sector, and 0 otherwise; *MANU* is a dummy variable equal to 1 if the rumored takeover target firm operates within the manufacturing industry sector, and 0 otherwise; and, *TA* is a dummy variable equal to 1 if factual takeover activity involving the actual takeover of the rumored takeover target firm is confirmed in the six months subsequent to Message Board takeover rumor dissemination, and 0 otherwise. Two-tailed t-statistics are reported in parentheses below the associated explanatory variable regression coefficient values, calculated using the heteroskedasticity-consistent standard errors method prescribed by White (1980).

Variable \ Window	5 Minutes			30 Minutes			24 Hours		
	[-5, +5]	[-5, 0]	[0, +5]	[-30, +30]	[-30, 0]	[0, +30]	[-24, +24]	[-24, 0]	[0, +24]
<b>Control Firm Adjusted Abnormal Bid-Ask Spreads (CABAS<sup>adj</sup>)</b>									
<i>Constant</i>	0.2662 (0.6999)	0.3963 (0.9865)	0.1800 (0.4609)	0.6954 (1.8641)	0.8308 (2.1283)*	0.5752 (1.5629)	0.8322 (2.2510)*	0.9298 (2.4024)*	0.8039 (2.1902)*
<i>LN(SIZE)</i>	-0.0097 (-0.1935)	-0.0192 (-0.3731)	0.0016 (0.0310)	-0.0510 (-1.0280)	-0.0703 (-1.3883)	-0.0300 (-0.5987)	-0.0523 (-1.0486)	-0.0705 (-1.3920)	-0.0477 (-0.9412)
<i>PERIOD</i>	-0.3392 (-1.1407)	-0.4329 (-1.5217)	-0.3249 (-0.9919)	-0.4303 (-1.4389)	-0.4145 (-1.3240)	-0.4494 (-1.5309)	-0.6422 (-2.0118)*	-0.5883 (-1.8193)	-0.6420 (-2.0377)*
<i>RAGE</i>	-0.2492 (-0.8053)	-0.3060 (-0.9405)	-0.2355 (-0.7327)	-0.3042 (-1.0075)	-0.2051 (-0.6471)	-0.3181 (-1.0478)	-0.2753 (-0.8553)	-0.2745 (-0.8469)	-0.2589 (-0.8004)
<i>TECH</i>	-0.1189 (-0.5640)	-0.0321 (-0.1445)	-0.2061 (-0.9783)	-0.1596 (-0.7981)	-0.1833 (-0.8833)	-0.1396 (-0.6939)	-0.3034 (-1.4538)	-0.3252 (-1.5449)	-0.2739 (-1.3009)
<i>MANU</i>	0.2606 (0.9874)	0.3114 (1.2117)	0.2232 (0.7730)	0.1866 (0.7025)	0.2031 (0.7306)	0.1427 (0.5458)	0.2177 (0.7873)	0.2447 (0.8688)	0.1822 (0.6686)
<i>TA</i>	0.0213 (0.0785)	0.0059 (0.0217)	-0.0422 (-0.1483)	-0.0279 (-0.1077)	-0.0168 (-0.0627)	-0.0509 (-0.1939)	0.0561 (0.2158)	0.0683 (0.2516)	0.0402 (0.1585)
<i>R<sup>2</sup></i>	0.0041	0.0058	0.0035	0.0063	0.0064	0.0056	0.0107	0.0106	0.0101
<i>Adjusted R<sup>2</sup></i>	-0.0015	0.0003	-0.0021	0.0008	0.0009	0.0001	0.0052	0.0051	0.0046
<i>F-Statistic</i>	0.7369	1.0498	0.6282	1.1408	1.1604	1.0075	1.9458	1.9297	1.8359

\*Significant at the 5% level; \*\*Significant at the 1% level.

## **G. Robustness Analysis**

We perform three forms of robustness analysis. Namely, we: evaluate an alternative Matched Sample Control Firm abnormal returns methodology; investigate the robustness of our results to sample selection bias; and, explicitly account for both liquidity and transaction costs in evaluating the existence of exploitable trading opportunities. For brevity, we do not present all of our robustness results; however, we do discuss all significant and overall findings.

We argue that our Barber and Lyon (1997) influenced matched sample control firm abnormal returns framework provides a more robust methodological approach than the 0/1 Market Model method. However, the results derived from this alternate abnormal return metric are largely consistent with the 0/1 Market Model findings, providing strong evidence that Message Board takeover rumors generate significant positive abnormal returns in comparison to matched sample control firms. Specifically, all post-rumor intervals are significant with the exception of the sixty-minute post-rumor windows; all pre-rumor intervals greater than thirty minutes are highly significant; and, all surrounding intervals are significant. Finally, both the 0/1 Market Model and our Matched Sample Control Firm abnormal return multivariate regressions provide largely consistent cross-sectional findings.

Furthermore, we ensure the robustness of our aggregate and multivariate analysis results to sample selection bias by utilizing the Heckman (1979) two-stage sample selection test and adjustment procedure. Employing this procedure identifies the Inverse Mill's Ratio is statistically insignificant in all univariate and multivariate regressions capturing abnormal return, trading volume and bid-ask spread impacts during the eighteen event windows we examine. Furthermore, subsequent to inclusion of the Inverse Mill's Ratio, the statistical significance of all original multivariate explanatory variables are qualitatively consistent with the aforementioned findings after adjusting for potential sample selection bias. Consequently, we conclude all aggregate and cross-sectional results presented in this paper are robust to sample selection bias.

Finally, to account for liquidity and transaction cost characteristics, we explicitly investigate the economic profitability of feasible trading opportunities. Specifically, we examine the dollar profit attainable by purchasing the volume of shares traded within each event window at the ask price available at the beginning of the window, and subsequently selling these shares at the bid price available at the end of the window. Consequently, this approach inherently value-weights measurements towards profits associated with more liquid firms.

Economic significance analysis, presented in Table XI, reveals that Message Board takeover rumors do not present an exploitable trading opportunity within the event windows we examine. While Bradley *et al* (1988) demonstrate significant value-weighted dollar profit wealth changes to target shareholders resulting from successful takeover transactions, our results are not directly comparable due to our ex-ante framework; takeover rumour credibility issues; methodology differences; and, substantially shorter event windows. Specifically, while Bradley *et al* (1988) examine the period 5 trading days prior to the initial takeover bid to 5 trading days following announcement of the successful bid, our longest event window only examines the 48-hour period surrounding takeover rumour dissemination.

Notably, we argue that our inability to identify an exploitable trading opportunity is influenced by the profits being downward-biased due to an inherent large firm effect. Explicitly, a downward-bias is induced by substantially higher weightings that are attributable to larger, and correspondingly higher volume, firms for which our multivariate analysis identifies a significant negative abnormal return relationship. This feature of our economic significance calculations provides scope to improve these outcomes by weighting trading towards smaller firms. Finally, comparison of the economic profit opportunities of the rumored target sample firms relative to the matched sample control firms identifies insignificant differences in all event windows, with the exception that rumored target firms provide significantly higher economic profit in the forty-eight-hour period surrounding takeover rumor dissemination.

**TABLE XI: The Economic Significance of Message Board Takeover Rumour Trading Opportunities**

Table XI reports the economic significance of Message Board takeover rumours trading opportunities for eighteen event study *windows*. We report the Average Economic Profit Opportunity (*AEPO*) and the Relative Average Economic Profit Opportunity (*RAEPO*) measurement approaches for the period January 2003 to December 2006, inclusive. *Panels A, B* and *C* present *pre, post* and *surrounding-rumour event windows*, respectively. *AEPOs* are calculated as the average of the dollar profit attainable by purchasing the volume of rumoured takeover target shares traded within each event window at the ask price available at the beginning of the window, and subsequently selling these shares at the bid price available at the end of the window:

$$AEPO_{[q,r]} = \frac{1}{n} \sum_{i=1}^n \left[ VOL_{i,[q,r]} \left( BID_{i,\theta_r} - ASK_{i,\theta_q} \right) \right].$$

*RAEPOs* are calculated as the rumoured takeover target *AEPO* less the

corresponding control firm *AEPO*:  $RAEPO_{[q,r]} = \frac{1}{n} \sum_{i=1}^n \left[ VOL_{i,[q,r]} \left( BID_{i,\theta_r} - ASK_{i,\theta_q} \right) - VOL_{C_i,[q,r]} \left( BID_{C_i,\theta_r} - ASK_{C_i,\theta_q} \right) \right]$ . Two-tailed t-statistics, are presented in parentheses.

Window	Economic Significance Calculation Approach	
	AEPO	RAEPO
<b>PANEL A: Pre-Rumour Windows</b>		
[-24 hrs, 0]	328,624.0289 (0.8645)	764,228.6522 (1.8242)
[-60, 0]	2,724.1537 (0.1297)	24,405.6363 (1.1252)
[-30, 0]	12,424.4696 (0.8886)	21,870.7352 (1.5528)
[-10, 0]	11,187.2882 (0.8428)	14,237.1880 (1.0719)
[-5, 0]	-3,241.4283 (-1.4324)	-1,909.5170 (-0.8422)
[-1, 0]	-381.5347 (-2.7300)**	-24.6158 (-0.1634)
<b>PANEL B: Post-Rumour Windows</b>		
[0, +1]	-106.1135 (-1.6301)	181.9137 (1.9597)
[0, +5]	-902.6923 (-2.4665)*	191.1845 (0.4737)
[0, +10]	2,605.5623 (0.7588)	5,342.7121 (1.5399)
[0, +30]	5,432.5869 (0.4996)	12,055.3291 (1.0907)
[0, +60]	3,749.3899 (0.2276)	15,422.3881 (0.9144)
[0, +24 hrs]	189,520.4951 (0.9871)	256,098.9945 (1.3380)
<b>PANEL C: Surrounding-Rumour Windows</b>		
[-1, +1]	-369.9985 (-2.0231)*	249.0025 (1.2292)
[-5, +5]	-5,404.0737 (-1.1641)	-3,516.9724 (-0.7556)
[-10, +10]	35,376.2413 (0.9726)	40,308.4094 (1.1078)
[-30, +30]	63,767.3339 (0.9360)	76,975.4833 (1.1302)
[-60, +60]	61,397.0569 (0.6987)	87,615.8661 (0.9967)
[-24 hrs, +24 hrs]	198,365.1020 (1.4374)	335,038.7663 (2.2190)*

\*Significant at the 5% level; \*\*Significant at the 1% level.

## **V. Conclusion**

The impact of Message Board takeover rumors on the price discovery process presents a relatively new and highly dynamic facet to the publicly available information set. While the extant literature provides convincing evidence that aggregated Message Board information exerts a substantial influence on equity markets (see, for example, Antweiler and Frank, 2004), we provide a disaggregated analysis of this Message Board activity by investigating takeover rumor information to gain a more focused insight into the impact of this communication medium on equity market activity. Further, we consider a range of intraday event windows that allows us to more accurately isolate the takeover rumor impact by minimizing the potential for confounding events distorting equity market responses.

Overall, our findings suggest that Message Board takeover rumors impact on the US equity market in the period January 2003 to December 2006, inclusive. However, while we identify significant positive abnormal returns and trading volumes in pre and post-rumor dissemination periods, bid-ask spreads (a proxy for transaction costs) appear to be insignificantly affected by these rumors. In addition, we conduct multivariate analysis to examine the cross-sectional variations of the impact of Message Board takeover rumors on the US equity market. Most notably, we document evidence of significant: firm size; technology industry; time period; and, subsequent takeover activity confirmation effects. Furthermore, these aggregate and cross-sectional findings are robust to sample selection bias and an alternative Matched Sample Control Firm abnormal returns methodology. However, while we establish that Message Board takeover rumors impact on the US equity market, more precise inspection of the economic exploitability of this impact concludes that a feasibly tradable profit opportunity does not exist for investors.

Taken as a whole, our findings support the view that Message Board takeover rumors provide an interesting and useful insight into the impact of an increasingly influential channel of value-relevant information dissemination within contemporary financial markets. An understanding of

the shareholder wealth, trading volume and transaction cost effects of this type of takeover rumor highlights substantial implications that should be given due consideration by financial market participants, corporations and regulators when assessing and/or protecting the integrity and efficacy of equity markets.

Further, the results of this study may have implications in the field of empirical finance research. If events such as takeovers are anticipated, then announcement returns around actual events may be understated. Taking into account this anticipation would be important for future event studies. Also, Schwert (1996) documents substantial mark-up pricing in takeovers, which is usually a premium of the previous months trading prices. As such, if rumours do lead to an increase in the share price prior to the actual announcement of a takeover, do the eventual acquirers end up paying more for targets that were subject to these rumours?

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