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BIOTECH FEVER:

MARKET OVERREACTION TO FDA CLINICAL TRIALS

A Thesis Submitted

in Partial Fulfillment

of the Requirements for the Designation

University Honors

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May 2019

This Study by: Ethan Hugstad

Entitled: Biotech Fever: Market Overreaction to FDA Clinical Trials

has been approved as meeting the thesis or project requirement for the Designation

University Honors

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Date	Dr. Jessica Moon, Director, University Honors Program

Introduction

Picture this: someone buys the stock of a firm that is about to announce the results of a drug's FDA clinical trial the next day. They go to bed that night, imagining the potential of their newly owned business to finally cure a disease that has impacted so many families. They wake up the next morning to find that the firm has lost half of its market value because the drug failed. This is the stark reality that many small investors face: the unpredictability of price movements in response to nonfinancial information being released to the public.

In this thesis, I will examine the effects of FDA clinical trial announcements on the stock prices of small capitalization biotechnology stocks. Literature has shown that markets can overreact to releases of information (DeBondt & Thaler, 1985; Fischer, 2012), but that negative information releases garner a greater magnitude of overreaction and correction than their positive counterparts (Atkins & Dyl, 1990). These effects are important for us to understand because of the massive shifts in stock price that are caused by these test results, no matter the level of materiality. In addition, biotech stocks are especially susceptible to market overreaction (Golec & Vernon, 2009), and their FDA announcements are critical in their valuation (Fan, 2010). This study will contribute to the literature on investor irrationality by examining market overreaction to FDA clinical trial announcements.

I focus on small cap biotech stocks in this study because they are especially susceptible to wild swings in stock price. Being a small cap firm does not necessarily mean that the stock price is low, but low-priced biotech firms tend to be of a small capitalization. That being said, the trading of these firms takes place in a much different setting than their larger counterparts. Plenty of smaller investors rely on biotech firms for capital gains. To benefit these investors and the biotech firms themselves, research has been conducted to determine if the market overreacts

to FDA clinical trial announcements and subsequently corrects in the days after for small cap biotechnology stocks. In addition, the relationship between positive or negative news and the subsequent price movement is thoroughly explored, and possible explanations for investor behavior are examined.

Previous studies on investor attention find that increased investor attention has a significant impact on stock price movements (Chen, 2019; Gervais et al., 2001), with this effect concentrating on smaller and less visible stocks. Because small biotech companies are less visible relative to larger companies, increases in investor attention should theoretically have a significant impact on small biotech firms' stock price. I investigate the possible effects of increased investor attention on market overreaction to FDA clinical trial announcements. Following the literature, the increase in investor attention is depicted by the increase in trading volume relative to the stock's average trading volume in the period immediately before the announcements.

In this study, I employ a sample of 78 announcements released by 50 different small cap biotech companies in the period from January 2011 to October 2018. I classify announcements as positive if the firm's tested drug has passed Phase I, II, or III, or has been approved for deployment in Phase IV. I classify announcements as negative if the firm's drug has failed any phase or is discontinued for any reason. I measure market reaction to those announcements with buy-and-hold returns over 1-day, 2-day, and 5-day windows immediately following the announcements.

This study finds that the market does not overreact to positive announcements of FDA clinical trial results, but overreacts to negative announcements. The empirical results show that 1-day and 5-day buy-and-hold returns are negatively related to returns on days of negative

announcement, indicating market overreaction on announcements and subsequent correction. This relationship does not hold for positive announcements. This is consistent with the findings in the previous literature that negative overreaction was more significant than positive overreaction. In addition, the empirical results show that increased investor attention significant impacts subsequent corrections for negative announcements. With increased investor attention, 1-day and 5-day buy-and-hold returns are 8.30% and 15.85% lower, respectively. This is consistent with the findings in Chen (2019) where increased investor attention helps spread the news, reducing information asymmetry among investors. However, this relationship does not hold for positive results.

Definitions

For the purposes of this study, the term "small cap" refers to a firm with a total market value of less than $2 billion. Small cap stocks can often be found in a state of financial struggle. Hence, the stock prices of these firms can be low because of the dire financial straits of the companies, though this is not always true. Small cap firms are much more volatile than larger firms for a variety of reasons: intense speculation, number of shares available, and large percentage of shares sold short, to name a few.

Biotechnology is the use of biological means for the production of antibiotics, hormones, and other medicinal products. A publicly-traded biotechnology firm relies on the production of drugs and subsequent sale to conduct business. Thus, many biotech firms have net losses in their first several years in operation. However, if drugs pass all required tests and make it to the market, they have huge potential because they are often for conditions that do not have a current treatment or whose treatment is astronomically expensive.

Market overreaction is the mispricing of a security because of a news announcement. One explanation for this phenomenon is investors' desire to ride the initial wave of the stock price. Subsequently, a stock price that shows evidence of overreaction will correct in time afterwards. Thus, the subsequent correction in stock price shows that the overreaction was present in the first place. The theory of market overreaction contends that investors respond too strongly to the initial announcement, causing a sizable price change in a direction determined by the announcement. In theory, this price change causes a discrepancy between the intrinsic value and the stock price. For market overreaction to be evident, this discrepancy between intrinsic value and price will be corrected in a period of time following the initial reaction.

Buy-and-hold return, or BHR, is the return of a stock when it is bought and held for a specific period of time. On the other hand, abnormal return is the return achieved by a stock that is different from the expected rate of return. In this case, the expected rate of return is the return of a market index. Abnormal return gives a better idea of the effect of firm-specific news on the stock price of a firm because it accounts for the direction of the market in the time period used.

Literature Review

To examine the background of the market surrounding this study, a thorough analysis of existing literature must be conducted. In this manner, I observe the evidence of market overreaction that has stood the test time. Second, I consider information about investor attention and the effects of its increase on stocks. Lastly, I delve into the uniqueness of biotech stocks and what makes them different from others. This information should afford the reader a greater understanding of the topics at hand and how they relate to biotech stocks and FDA clinical trial announcements.

Market Overreaction

According to the NASDAQ, the overreaction hypothesis is "the supposition that investors overreact to unanticipated news, resulting in exaggerated movements in stock prices followed by corrections." In line with this theory, stocks that have large movements in price have been shown to reverse those movements as time passes. DeBondt and Thaler (1985) found that "consistent with the predictions of the overreaction hypothesis, portfolios of prior 'losers' are found to outperform prior 'winners'" (p. 804). This study shows that stocks with large initial decreases in price generated much higher returns over time than those with large initial increases. After large changes, the stock price will eventually return to the intrinsic value of the firm as perceived by investors.

Other studies have come to similar conclusions as to DeBondt and Thaler. Howe (1986) found that "stocks that experienced large positive returns (good news) performed poorly in the 50-week period following that event, with returns averaging about 30% below the market" (p. 76). The same pattern can found in numerous times in history, whether that be the tulip bulb craze in the Netherlands, or the credit bubble of 2008. Prices will go up or down, and many investors will mistakenly think that they will keep in the same direction forever. As always, the price falls and leaves many investors holding the bag.

Not surprisingly, market overreaction is well documented in the pharmaceutical industry. Fischer (2012) observed that "investors overreacted to product news but then preceded to 'overcorrect' their initial overreaction" (p. 88). However, this type of correction to the initial price movement is common throughout the market. Chen (2019) found that daily winner and loser stocks are followed by immediate price reversals, and increased investor attention, proxied by positive volume shocks, increases buy-and-hold returns of daily winner and loser stocks in the

following period. This means that not only is the market overreaction hypothesis documented in the long-term time horizon, but also in the short-term.

For positive announcements, especially in the market for small cap stocks, short-selling can play a major factor in the following days' price movements. Diether et. al (2009) found that "short sellers in both NYSE and Nasdaq stocks increase their short-selling activity after periods of positive returns, on days with significant buying pressure, and on days with high levels of asymmetric information" (p. 604). The authors also note that a strategy of said short-sellers is based on short-term market overreaction. In addition, they observed "[short sellers'] trades correspond to 31% and 24% of share volume on Nasdaq and the NYSE, respectively. This suggests that the costs of borrowing stocks for short sales are not constraining US short sellers significantly" (p. 604). This is significant for biotech stocks and especially for those with small market capitalizations because of their hard-to-borrow rates. This rate is the annual interest rate that a short seller is subject to upon borrowing a share with the intent to sell. For small cap stocks, this rate is typically very high. So, investors do not care much about the interest rate they pay for shorting a small cap stock because it is likely a short-term position.

In addition to positive news garnering an overreaction from the market, other studies have pointed out that negative overreactions are just as if not more common than positive overreactions. Atkins and Dyl (1990) observed this in their study of NYSE stocks from 1975 to 1984:

> We find that stocks that exhibit a large price decline (losers) subsequently earn significant abnormal returns. Our interpretation is that the initial price change was an overreaction. We also find evidence that stocks that exhibit a large price increase

(winners) subsequently earn negative abnormal returns, but that the magnitude of the overreaction is much smaller for winners (p. 546).

These findings have large implications for small cap biotech firms. If it applies, it would mean that firms that announce negative clinical trial results would gain some value back in the days following the announcement. On the other hand, positive announcements would still produce overreactions, but to a lesser extent, thus making the price movement more permanent.

The Attention Effect

There exists in the stock market a concept of investor attention, the level of which is interpreted by the trading volume of a stock. The amount of trading volume for a particular stock can greatly affect the price of that stock. As Gervais et al. (2001) found, "Periods of extremely high volume tend to be followed by positive excess returns, whereas periods of extremely low volume tend to be followed by negative excess returns" (p. 915). Thus, the periods of high volume that tend to correspond with important announcements like FDA clinical trial results should be expected to push the stock price higher than normal, as long as the announcement provides good news. On the other hand, the negative excess returns would occur when trading volume is well below its average for the stock, as most of the trading done when volume is low is selling. In addition, Chen (2019) found that "with a positive volume shock, extreme daily returns are positively related to subsequent [buy-and-hold returns] of daily winner and loser stocks, leading to economically less significant price reversals for both daily winner stocks and daily loser stocks" (p. 24). By and large, extreme trading volume can have a huge impact on the price movement of stocks.

The Biotech Difference

Biotechnology firms are especially susceptible to investor overreaction because they have few drugs under their umbrella and are naturally volatile due to their size. Golec and Vernon (2009) explain that "compared with pharmaceutical firms, biotech firms have even higher financial risks and are even more vulnerable to policy shocks" (p. 164). Pharmaceutical firms can typically finance the development of new drugs with debt or earnings from established drugs, whereas biotechnology firms are limited to financing research and development with external equity. Thus, when short on cash, biotech firms will have to issue shares, thereby diluting their stock price. Their limited access to capital makes them more reliant on the success of their drugs. This results in more volatility around FDA clinical trial announcements.

Because of limited financing opportunities, biotech companies can have plenty of trouble in getting their drugs through FDA trials. Delays, setbacks, and outright failures are common with small biotech firms. Czerepak and Ryser (2008) found in their study that of the firms that had drug failures in Phase III, most (95%) were biotech companies. In addition they found that many drugs from biotech firms suffered three-month delays and other serious setbacks, such as poor-quality NDA (New Drug Application) submissions. Setbacks and delays could seriously impact the price of a biotech firm whose value relies solely on its few drugs.

Announcements like the setbacks, failures, and approvals are shown to have an impact of the stock prices of the respective biotech firms. Fan (2010) found that "the evidence proves that the announcements are likely significantly determining reasons for the particular actions" (p. 30-31). The impact of these announcements may be determined by investor behavior, but it is not only felt by investors. These announcements can have serious effects on the valuation of the

firm, and those effects are often felt within the company. In Dobson's (2000) article, one biotech executive put it like this after a 67% dive in their stock price:

> It is a very unforgiving environment. The downside is the vast swings in fortunes it can engender. We lost two thirds of our share price, but only one out of seven products in the clinic. That seemed to us to be a vast overreaction. We were hammered (p. 1039).

While these announcements are known to have serious consequences for the stock prices of biotech firms, the extent of their impact is largely unknown. The purpose of this paper is to find the extent to which these announcements affect stock prices.

Hypothesis

The literature discussed shows that announcements have an impact on biotech firms' valuation (Fan, 2010) and that biotech companies are especially susceptible to market overreaction (Golec & Vernon, 2009). In addition, there is a large amount of evidence in support of the concept of market overreaction (DeBondt & Thaler, 1985; Fischer, 2012; Chen, 2019). Based on this literature, the FDA clinical trial announcements should have a significant impact on the stock prices of the firms studied. In the days to follow, stock prices should move significantly in the opposite direction compared to the announcement day. This movement will illustrate an overreaction to the news by investors on announcement days. However, for positive announcements, the overreaction will not be as definitive as that for negative announcements, as prior studies (Atkins & Dyl, 1990) have shown that positive announcements do not produce as large an overreaction as negative announcements. Therefore, I test the following two hypotheses in this study:

H1: Subsequent correction for positive announcements is statistically insignificant.

H2: Subsequent correction for negative announcements is statistically significant.

In addition, based on the literature on investor attention, an increase in trading volume and therefore investor attention should have a significant impact on stock returns following the announcement day. However, knowing that positive announcements are likely to show less significance in terms of market overreaction, this statement may only prove to be true for stocks with negative announcements. Therefore, I test the following two hypotheses for the impact of increased investor attention.

H3: Increased investor attention has no significant impact on market overreaction for positive announcements.

H4: Increased investor attention has a significant impact on market overreaction for negative announcements.

Methodology

Research was conducted on this topic throughout 2018, as many drugs had results of clinical trials coming in during the later months of the year. The research involved gathering daily return data on many biotechnology firms, finding dates when announcements concerning FDA clinical trials were released, and corroborating the two to evaluate the effects. An announcement was labeled as positive if the firm's tested drug passed Phase I, II, or III, or was approved for deployment in Phase IV. Announcements were classified as negative if the firm's

drug failed any phase or was discontinued for any reason. An event study was conducted to assess the impact of FDA clinical trial announcements on the stock prices of small cap biotechnology firms.

The whole data set gathered included 78 announcements from many different biotechnology firms and the returns of their respective stocks from three days prior to the announcement date to ten days after. The S&P 500 returns for the same three days prior and ten days after the announcement date were also gathered for the purposes of this study. In addition to returns, other important financial information was gathered on the companies represented in the study. This information included market capitalization at the time of announcement, trading volume and daily trading volume for the previous 30 days, firm betas, and book values per share for each company. This data was necessary to determine if the nature of the market around of the time of announcements. However, more analysis of the data was required to determine the existence and/or extent of market overreaction and subsequent correction, so an event study was conducted.

The event study was used to determine the significance of several variables in regards to the return on the stock in the days following the announcement. The variables used were the return on Day 0, market return on Day 0, natural log of market capitalization, market-to-book ratio, beta, and volume shock. These variables were determined specifically for this case of small cap biotech stocks as the most critical pertaining to returns on stock price. To examine the relationships between the aforementioned variables and returns in the days following announcement, linear regressions were used. The returns for Day 1, Days 1 through 2, and Days 1 through 5 were used to represent the returns in the days following an announcement. These

returns were used to investigate possible correction in stock price in response to a market overreaction immediately after an announcement.

Day 0 return was used to represent the return immediately following an FDA clinical trial announcement. This factor is one of the central determinants of market overreaction in response to announcements, as the movement of the stock price shows the reaction of investors to whatever happened that day or the day before. This return was calculated as the difference in closing prices between Day 0 and Day -1 divided by the closing price on Day -1.

Another variable used in the regressions was the market return on Day 0. This was used to factor in the direction of the price movement in the stock market as a whole, as many firms' stock prices are dependent on the action in the broader market. The market return is usually a base for which the firm to build upon in regards to daily return. This is because of the differentiation between market and firm-specific risk. Market risk describes that which is not able to be eliminated through differentiation. Firm-specific risk, as its name implies, applies only to the firm and its own financial risks. The inclusion of market return in the analysis allows for the observation of the return achieved by the firm in excess of the market, or abnormal return.

In addition, the market capitalization of each firm at the time of announcement was included in the analysis. A firm's size is an important factor in the movement of its price, as the number of shares outstanding (a factor of market capitalization) determines in part the supply side of the stock. Thus, stocks with fewer shares outstanding are more volatile, meaning that they are susceptible to large movements in price. This volatility is often the case for many biotech stocks. So, in theory, small market capitalizations in biotech stocks should result in more volatility around the time of announcements.

Another variable used in the regressions that also relates to volatility is a firm's beta. This is the correlation between the firm's returns and the market as a whole over the previous three months. Using beta in the analysis helps to pinpoint the movement in price that is caused by the market and that which is caused by the firm, although it is much more of a long-term measure than short-term. This is also accomplished because beta is a measure of volatility for the individual stock in respect to the market as a whole.

To analyze the possibility of market overreaction and subsequent correction in the sample of biotech stocks, the following Ordinary Least Squares regression model was used:

$$BHR_n = \beta_0 + \beta_1 Return_n + \beta_2 MktReturn + \beta_3 Size_n + \beta_4 Beta_n + \beta_5 VolumeShock_n + \beta_6 MTB_n$$

BHR_n is the buy-and-hold return for stock n for the 1-day, 2-day, and 5-day return periods after announcement. $Return_n$ is the return of stock n on Day 0, which is the first day on which investors are trading on the news of the announcement. $MktReturn$ is the return of the S&P 500 on Day 0. $Size_n$ depicts the natural logarithm of the market capitalization of firm n on Day 0. $Beta_n$ refers to the beta of firm n on Day 0. $VolumeShock_n$ is an indicator variable that is equal to one if trading volume on Day 0 exceeded the daily trading volume of the previous 30 trading days and is equal to zero otherwise. Lastly, MTB_n, refers to the market-to-book ratio of stock n on Day -1, the day prior to the announcement.

Results

Table 1 (see Appendix) shows how skewed the summary statistics are toward the characteristics of negative announcements. Despite only two more negative announcements than

positive, the sample has a mean Day 0 return of -13.44% as seen in Table 1. Table 2 shows how little impact the positive announcements in the sample affected investors' perception of the companies, as the median Day 0 return is 1.39%. On the other hand, Table 3 shows how negatively investors reacted to announcements of the same manner. The median return on Day 0 for negative announcements is -23.31%.

Through analysis of the regression results, it can be determined that for FDA clinical trials of small cap biotech companies, the market overreacts and subsequently corrects for negative announcements, but does not do so for positive announcements. The evidence for this is shown in Tables 4, 5, and 6, where there are several variables that are shown to be significant for negative announcements. There are a few sporadic variables that are significant for all announcements, but none for positive announcements.

By looking at the regression results in Table 4, it is observable that there are no significant variables for the positive FDA clinical trial announcements. This means that in the sample for this study, there is no evidence of overreaction or subsequent correction to positive announcements. In addition, volume shock is not significant for positive announcements. Looking at negative announcements, Table 5 shows several significant variables in the analysis. Stock returns on the announcement day are negatively related to 1-day buy-and-hold returns, significant at the 10% level. This indicates market overreaction on the announcement day and subsequent correction. Volume shock is significant for negative announcements. From this, it can be interpreted that market overreaction and subsequent reaction exists in the sample of stocks with negative announcements. The regression results show that the market does not overreact to positive announcements but overreacts to negative announcements. Therefore, we accept both hypotheses 1 and 2 in regard to market overreaction. However, the results support the second

hypothesis proposed earlier in this paper, as market overreaction for negative announcements is far greater than that for positive announcements. This is consistent with literature previously discussed in this paper (Atkins and Dyl, 1990). However, this is because no statistically significant overreaction takes place in the positive category. Investor attention is also shown to be significant for negative announcements but insignificant for positive announcements. Thus, we also accept hypotheses 3 and 4 in regard to investor attention and volume shock.

The market overreaction and subsequent correction for negative announcements is most evident in 1-day and 5-day returns after the announcement. Both of these intervals have five variables that have been deemed statistically significant by the linear regressions. Of course, all three intervals for negative announcements show evidence of market overreaction and subsequent correction, but these two are the most significant. This would suggest that stock price movements from negative announcements take a day or several trading days to gradually revert back to the previous price, although most never reverse that far.

The differences in reaction to announcements are easily observed when looking at the summary statistics in Table 3. The mean $Return_n$ for negative announcements of -32.04% is far greater a reaction than that for positive announcements of 6.14%. This could be for a variety of reasons. For one, the market could be slower to react to positive announcements than to negative announcements. The urge to sell on negative news could outweigh the urge to buy on positive news. This could also be caused by the positive news already being priced in. If true, investors would already believe the drug to be a future success, thus minimizing the impact of a positive announcement on the stock price. In addition, negative announcements were much more susceptible to extreme movements in price on the day following announcement. The 25th percentile for negative announcements found in Table 1 is -63.81%. This number is in stark

contrast with the same variable for positive announcements, which equals -2.69%. The fact that at least 25% of Day 0 returns after positive announcements were negative is actually quite surprising. It shows just how indifferent investors are to positive announcements in comparison to negative announcements. Or, it could show that the guidance provided in the announcements or their tone could be impacting the returns of the following day. Unfortunately, these factors are beyond the scope of this study.

Conclusion

Small cap biotech stocks are susceptible to large movements in stock price. There is a plethora of smaller investors that rely on biotech firms for capital gains. The prices of biotech are largely (although temporarily) dependent on the results of their FDA clinical trials on drugs that they are trying to bring to market. Literature also shows that the market overreacts to similar releases of information. Therefore, there is utility in examining the effects of these announcements on the prices of small cap biotech stocks.

In the study of small cap biotech stocks and their FDA clinical trial announcements from 2011 to 2018, it is observable that the market overreacts to negative announcements but does not overreact to positive announcements on the days of their release. There is also evidence of subsequent correction for negative announcements, but none for positive announcements. This conclusion could be inferred just by looking at the summary data, as the initial return for negative announcements is massively negative while that for positive announcements is barely positive.

Although no significant variables were found in the analysis of positive announcements, several were found for negative announcements. For 1-day BHRs, these included $Return_n$,

MktReturn, $Beta_n$, $VolumeShock_n$, and MTB_n. For 5-day BHRs, these included $Size_n$, $Beta_n$, $VolumeShock_n$, and MTB_n. While the significant variables are not the same for each time interval after announcement, the mere presence of these significant variables provides evidence as to the theory of market overreaction and subsequent correction in small cap biotech stocks.

Of course, this study had some limitations. For one, it only expands on the behavior of small cap biotech stocks. This only provides information about the most volatile of securities, so the passive or long-term investor gains no benefit. Plus, a larger sample of announcements would have greatly contributed to the evidence. However, I had to make do with the information that was available. For many companies and drugs, there was not a great deal of information available. This certainly hampered the data gathering process as well as the overall sample size.

Despite these limitations, the evidence acquired in this study is significant to the field, as it gives us a glimpse into the behavior certain penny stocks. This is particularly useful for investors who trade these securities, as they have been the bane of many investors' existence. This study shows that there is a behavioral pattern within the movement of these securities. However, there is still plenty to learn about biotech stocks and the factors that affect their price. FDA clinical trial results are just one type of announcement that has this kind of impact. If future research were to be conducted on small cap securities, I believe it should be about the impacts of earnings announcements. There is evidence for the effects of earnings announcements for the market as a whole, but not specifically for small cap stocks. It would be interesting to see if there is any difference between the total market and some of the most volatile stocks it contains.

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Appendix

Table 1. Summary Statistics for All Announcements

This table includes summary statistics for positive and negative announcements. $Return_n$ is the return of the stock on the day immediately following announcement. *MktReturn* is the return of the market on the day immediately following announcement. $Size_n$ is the natural logarithm of the firm's market capitalization at the time of announcement. $Beta_n$ is the firm's correlation with the market at the time of announcement. $VolumeShock_n$ is the value (0 or 1) that depicts whether the trading volume of the firm's stock on Day 0 exceeds the daily trading volume of the previous 30 days. MTB_n is the ratio of the firm's stock price on Day -1 and book value per share at the same time.

Variables	Mean	Median	25th Percentile	75th Percentile	Standard Deviation	n
$Return_n$	-13.44%	-2.63%	-23.31%	2.98%	31.10%	78
MktReturn	0.12%	0.17%	-0.11%	0.53%	0.87%	78
$Size_n$	20.22	20.21	19.63	20.93	0.92	78
$Beta_n$	2.08	2.07	1.47	2.67	0.84	78
$VolumeShock_n$	0.88	1.00	1.00	1.00	0.32	78
MTB_n	-0.95	3.66	1.84	5.58	53.89	78

Table 2. Summary Statistics for Positive Announcements

This table includes summary statistics for positive announcements. All variables are defined in Table 1.

Variables	Mean	Median	25th Percentile	75th Percentile	Standard Deviation	n
$Return_n$	6.14%	1.39%	-2.69%	10.17%	14.29%	38
MktReturn	-0.06%	0.22%	-0.26%	0.48%	1.11%	38
$Size_n$	20.47	20.44	19.81	21.22	0.87	38
$Beta_n$	2.11	2.08	1.57	2.56	0.88	38
$VolumeShock_n$	0.89	1.00	1.00	1.00	0.31	38
MTB_n	-6.46	4.11	2.42	8.14	76.83	38

Table 3. Summary Statistics for Negative Announcements

This table includes summary statistics for positive announcements. All variables are defined in Table 1.

Variables	Mean	Median	25th Percentile	75th Percentile	Standard Deviation	n
$Return_n$	-32.04%	-23.31%	-63.81%	-1.07%	31.42%	40
MktReturn	0.30%	0.11%	-0.06%	0.61%	0.51%	40
$Size_n$	19.97	20.11	19.44	20.34	0.91	40
$Beta_n$	2.05	1.97	1.35	2.72	0.80	40
$VolumeShock_n$	0.88	1.00	1.00	1.00	0.33	40
MTB_n	4.28	2.91	1.80	4.84	8.73	40

Table 4. Market Correction after Positive Announcements

This table includes the regression results for positive announcements. All variables are defined in Table 1 above. T-statistics are reported in *italics*. Asterisks (*, **, ***) correspond with significance levels of 10%, 5%, and 1%, respectively.

	1-Day BHR	2-Day BHR	5-Day BHR
$Return_n$	0.0704 *0.8616*	0.0641 *0.5881*	0.2109 *1.5986*
MktReturn	-1.1633 *-1.0925*	-0.1783 *-0.1254*	-1.2267 *-0.7134*
$Size_n$	-0.0043 *-0.3589*	0.0048 -0.2988	0.0113 *0.5787*
$Beta_n$	-0.0047 *-0.3352*	-0.0166 *-0.8863*	-0.0022 *-0.0948*
$VolumeShock_n$	-0.0226 *-0.6139*	-0.0314 *-0.6389*	-0.0475 *-0.7979*
MTB_n	-0.0001 *-0.8126*	-0.0003 *-1.6218*	-0.0002 *-0.8474*
Intercept	0.1159 *0.4627*	-0.0380 *-0.1137*	-0.1859 *-0.4594*
n	38	38	38
R^2	0.1057	0.1437	0.1328

Table 5. Market Correction after Negative Announcements

This table includes the regression results for negative announcements. All variables are defined in Table 1 above. T-statistics are reported in *italics*. Asterisks (*, **, ***) correspond with significance levels of 10%, 5%, and 1%, respectively.

	1-Day BHR	2-Day BHR	5-Day BHR
$Return_n$	**-0.1000***	-0.0448	-0.0452
	-1.9909	*-0.7016*	*-0.5566*
MktReturn	**7.0415****	3.3629	6.4108
	2.4869	*0.9344*	*1.3986*
$Size_n$	0.0104	0.0144	**0.0518****
	0.6715	*0.7300*	*2.0605*
$Beta_n$	**-0.0563*****	**-0.0504****	**-0.0532***
	-3.2743	*-2.3058*	*-1.9103*
$VolumeShock_n$	**-0.0830***	-0.0790	**-0.1585****
	-1.7955	*-1.3457*	*-2.1197*
MTB_n	**0.0055*****	0.0040	**0.0131*****
	3.1654	*1.8169*	*4.6651*
Intercept	-0.0999	-0.1725	**-0.8752***
	-0.3255	*-0.4420*	*-1.7609*
n	40	40	40
R^2	0.5022	0.2566	0.5574

Table 6. Market Correction after All Announcements

This table includes the regression results for both positive and negative announcements. All variables are defined in Table 1 above. T-statistics are reported in *italics*. Asterisks (*, **, ***) correspond with significance levels of 10%, 5%, and 1%, respectively.

	1-Day BHR	2-Day BHR	5-Day BHR
$Return_n$	-0.0529 *-1.6548*	-0.0148 *-0.4066*	-0.0530 *-0.9725*
MktReturn	0.3429 *0.3012*	0.3540 *0.2733*	-0.0059 *-0.0030*
$Size_n$	0.0158 *1.4830*	0.0193 *1.5914*	**0.0538***** *2.9632*
$Beta_n$	**-0.0324***** *-2.7165*	**-0.0323**** *-2.3850*	-0.0239 *-1.1754*
$VolumeShock_n$	-0.0037 *-0.1199*	-0.0264 *-0.7538*	-0.0488 *-0.9307*
MTB_n	-0.0001 *-0.2811*	-0.0003 *-1.2191*	*0.0000* *-0.0608*
Intercept	-0.2567 *-1.1929*	-0.3082 *-1.2596*	**-0.9949***** *-2.7129*
n	78	78	78
R^2	0.1354	0.1209	0.1305