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**Thesis Paper for M.S., Business Administration**  
경영학 석사 학위논문

**Rumor inquired disclosure of M&A  
and  
Stock Market Return**

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# Rumor inquired disclosure of M&A and Stock Market Return

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# **Rumor inquired disclosure of M&A and Stock Market Return**

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## **ABSTRACT**

Stock prices occasionally fluctuate in response to unverified rumors. To prevent investors from using false information for investment decisions in the stock market, the Financial Supervisory Service (FSS) operates a rumor inquired disclosure system to clarify whether the rumor is true or not. This study focuses on stock price movement after rumor inquired disclosure of merger and acquisition(M&A) and each investment entity's investment pattern in the KOSPI and KOSDAQ market. The study reveals that stock price drops after rumor inquired disclosure request. Especially for rumors that did not become true drops sharply compare to those that become true. The study also found different patterns of trading between each investor entities.

**Keywords:** Merger and Acquisition(M&A), rumor inquired disclosure, Public information, Efficient Market

# Table of Contents

<b>I. INTRODUCTION</b> .....	1
<b>II. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT</b> ..	2
<b>III. EMPIRICAL ANALYSIS</b> .....	4
3.1 Data and descriptive statistics.....	4
3.2 Event study for stock rumors .....	8
3.3 Investment pattern by each entity .....	12
3.4 Cumulative net buy volume ratio.....	15
<b>IV. Conclusion</b> .....	18
<b>REFERENCES</b> .....	20
<b>ABSTRACT IN KOREAN</b> .....	21

## Tables

<Table 1> Rumor inquired disclosures over time .....	5
<Table 2> Rumor inquired disclosures by industry .....	6
<Table 3> Rumor inquired disclosures by firm age .....	6
<Table 4> Rumor inquired disclosures by firm size .....	7
<Table 5> Event study for rumor inquired disclosures .....	11
<Table 6> Investor entities and rumor inquired disclosure relations ...	14

## Figures

<Figure 1> Investors' response on true samples .....	9
<Figure 2> Investors' response on false samples .....	10
<Figure 3> Cumulative net buy volume for all rumor inquired disclosures.....	15
<Figure 4> Cumulative net buy volume for true rumor inquired disclosures.....	16
<Figure 5> Cumulative net buy volume for false rumor inquired disclosures.....	17

## **I. Introduction**

Efficient Market Hypothesis (EMH) states that all public information is reflected in stock price and consistent alpha generation is impossible. According to EMH, stocks always trade at their fair value on exchanges, making it impossible for investors to purchase undervalued stocks or sell stocks for inflated prices. Nonetheless, investors can earn an abnormal return in the semi-strong efficient market while stock prices adjust quickly to the newly available information. Stock price moves on new public information during normal business hours, private information when informed investors trade, and pricing errors that occur during trading (Fama and Roll 1986).

Investors consider the information when making investing decisions. Sometimes, investors trade on unverified information to earn excess returns because the stock price moves in microseconds; there is not enough time to consider sources. In Korea, when stock price fluctuates without any new public information in the market, the Financial Supervisory Service (FSS) requests rumor inquired disclosure to prevent investors from trading based on false information.

I have conducted an event study to examine how investors react on stock price when FSS requests rumor inquired disclosure to a firm. By using python crawling program, I was able to gather samples of FSS's rumor inquired disclosures in a form of dataset to successfully conduct an empirical analysis. After gathering a set

of data, I verified whether each sample of rumor inquired disclosure become true or not by manually researching news articles. Throughout the study, I found that stock price drops for all rumor inquired disclosures whether the rumors become true or not. However, false rumors drop more sharply than true rumors. The result shows that FSS's inquired disclosure system functions well to give a break when stock price fluctuates in the stock market. The study also analyzes how each investment entity reacts in a different pattern to the rumor inquired disclosures by using net buy volume. For rumor inquired disclosures that became true in a period of time, institutional investors buy more even though a firm does not confirm whether a merger and acquisition will be happening or not. On the other hand, individual investors sell after the inquired disclosure request publications. It shows that institutional investors have more accurate information on rumors than individual investors in the stock market. However, I was not able to confirm this traditional study results on false rumors because both individual and institutional investors purchased on rumor inquired disclosures.

## **II. Literature Review and Hypothesis Development**

In Korea, the concept of merger and acquisition (M&A) was vitalized under the International Monetary Fund (IMF) system in the 1990s (Lee 1998). Since then, corporate leadership recognizes M&A as an implication tool to pursue growth opportunities in an increasingly competitive environment. The evidence indicates that corporate takeovers generate positive gains, that target firm

shareholders' benefit and that bidding firm shareholders do not lose (Jensen and Ruback 1983). When executing M&A, sometimes rumor gets leaked in the stage of evaluation or finalization that might cause inefficiency for the M&A process. More importantly, it might distort investors' investing decisions when they trade on false rumors. Investors trade based on unverified rumors, and the ultimate source of such rumors are unknown (Peterson and Gist 1951), and, hence, they possibly originate from malicious rumormongers attempting to manipulate the stock market (Schmidt 2019). Yet, a surprisingly large fraction of rumors in my sample come true; therefore, investors would have the right to trade on these rumors. Especially, many articles discuss that there is considerable evidence that institutional investors have more accurate information than individual investors (Grinblatte and Keloharju 2001, Odean 1998). I thus expect to observe that individual investors react more strongly to false rumors.

An optimistic rumor is good news to the stock market, but it is no longer good news after receiving rumor-required disclosure requests (Kim and Jung 1995). Kim and Jung states that stock price moves in response to rumor of patent applications, but after requesting rumor inquired disclosure, it is no longer effective news to earn an excess return. This research found very similar results to the study of M&A rumor related that stock price fluctuates before rumor inquired disclosure, peaks at the rumor inquired disclosure date and dropped afterward. Many articles discuss inquired disclosure, but a lack of articles on inquiry

disclosure focused on M&A rumors. Especially, most of the articles' testing period was less than five years. To differentiate from other articles, I mainly focus on M&A rumors and expanded empirical testing period up to twelve years by utilizing a python crawling program.

### **III. Empirical Analysis**

#### **3.1 Data and descriptive statistics**

I constructed a sample of rumor inquired disclosure from FSS by using a python crawling program. The tool allowed me to extract data by programmatically going over a collection of web pages. I was able to acquire companies' name, rumor inquired disclosure date (which will be used in an event study as an event date), and detailed information on M&A. Next, I eliminated samples that are duplicated or unrelated to M&A and verify whether the rumor became true or not by confirming news articles that used words of confirmation on the deals such as “come true,” “conclude,” or “failed.” All the samples are listed in KOSPI and KOSDAQ market. In total, my final sample contains 965 M&A rumor inquired disclosures, the period between January 01 2008 to December 12 2019, of which 338 (35.0%) come true after a while. The <table 1> shows number of rumor inquired disclosures in each year. I decided to set my sample period between 2008 to 2019 because there are not enough samples in previous years. Using fndataguide provided by a company named fnguide Korea, I collected time-series data for stock return, market index, trading volume, and net buy in daily.

**Table 1**  
**Number of rumor inquired disclosures**

Year	# rumor inquired disclosure	# true rumor	% of true rumors
2008	72	25	34.7
2009	79	37	46.8
2010	67	28	41.8
2011	105	36	34.3
2012	156	42	26.9
2013	110	23	20.9
2014	120	43	35.8
2015	74	32	43.2
2016	71	26	36.6
2017	51	18	35.3
2018	38	21	55.3
2019	22	7	31.8
Total	965	338	35.0

This table shows number of rumor inquired disclosures and number of rumor inquired disclosures that became true after the event day (the day when FSS publish a request for inquired disclosure). A rumor inquired disclosure for a firm is considered as true if merger and acquisition is confirmed by news articles. Of all samples, 35% of the total samples become true rumors.

In <table 2>, the manufacturing industry constitutes the vast majority of the rumor disclosure for both true and false samples. Especially, false rumors in the manufacturing industry occupy almost 28% of the total of my samples. The information and communications industry presents the second largest number of rumor inquired disclosures, where false rumors double the true rumor.

In <table 3>, for true rumors, out of 338 samples, firm age between 11 to 20 years takes most samples. A firm age older than 20 years is less likely to announce an

**Table 2**  
**Rumor inquired disclosures by industry**

	True rumor	False rumor
Manufacturing	171	273
Construction	14	24
Finance and insurance	26	50
Wholesale and retail	32	58
Transportation	12	14
science and technology	32	92
Information and communications	44	94
Others	7	22
Total	338	627

The table presents number of true and false rumor disclosures by industry. The industry type is followed by the dataguide Korean Standard Industry Code 10<sup>th</sup>. However, an industry that contains less than three samples are all included in others category.

**Table 3**  
**Rumor inquired disclosures by firm age** (Unit: year)

	True rumor	False rumor
1~10	22	58
11~20	108	249
21~30	58	104
31~40	36	72
41~50	46	72
51~60	48	48
61~70	16	16
71~80	2	3
81~90	1	5
100<	1	0
Total	338	627

This table presents number of true and false rumor disclosures by firm age in the range of years. The data was created with the established dates of firms provided by fndataguide.

**Table 4****Rumor inquired disclosures by firm size****(Unit: 100 million won)**

	True rumor	False rumor
<1000	189	398
1000~2999	57	86
3000~5999	30	50
6000~8999	12	12
9000<	50	81
Total	338	627

This table presents number of true and false rumor disclosures by firm size in 100 million won. The information on total asset amount by firm is obtained from the fndataguide and it shows number of firms by true and false rumors in the range.

acquisition (Yim 2013). After 20 years of firm age, the number of rumor drops by half the previous years and as it gets older, there are fewer rumors. It is the same situation for the false rumors but with a higher number of occurrences.

In <table4>, the majority of rumor disclosure samples come from the firm size with less than 100,000 million won. As firms become larger, there are fewer rumors related M&A. However, interestingly, the number of rumor increases in the firm size larger than 900,000 million won.

Overall, both true and false rumor inquired disclosures are evenly spread regardless of industry, age, and size. However, there are a few ranges that stood out in each variables. The manufacturing industry presents the largest amount of samples, firm age older than 10 and less than 20 composes almost one third of the total samples, and firm size less than 100,000 million contains the largest number of samples among all.

### 3.2 Event Study for Rumor Disclosure

I conduct an event study to see how investors response to the occurrence of rumor inquired disclosure. Figure 1 traces the daily return relative to true rumor inquired disclosures from 20 days prior to the publication of the first rumor inquired disclosure to 20 days after the publication for all samples that become true. Figure 2 traces the daily return relative to false rumor inquired disclosure from 20 days prior to the publication of the first rumor inquired disclosure to 20 days after the publication for all samples that become false. I calculate abnormal return ( $AR_{i,d}$ ) by stock return ( $r_{i,d}$ ) minus risk free ( $rf_{i,d}$ ) plus beta of equity market premium ( $beta(rm - ri)_{i,d}$ ). Equity market premium is calculated by expected return( $rm$ ) of the market minus risk-free rate( $ri$ ). refer to equation (1) (Kho et al. 2018).

$$AR_{i,d} = r_{i,d} - rf_{i,d} + beta(rm - ri)_{i,d} \quad (1)$$

Using market-adjusted abnormal return, I calculated daily risk-adjusted one-year abnormal return prior to event date -300 to -60 days to reduce the information leakage effect of the news. The calculation is as follows. First, find abnormal return ( $AR_{i,d}$ ) and cross-section average excess return ( $AAR_d$ ). Sum up the given period of  $AAR_d$  to find cumulative abnormal returns (CARs).  $AAR_d$  and  $CAR(t_1: t_2)$  are calculated as:

$$AAR_d = \frac{1}{N} \sum_{i=1}^N AR_{i,d} \quad (2)$$

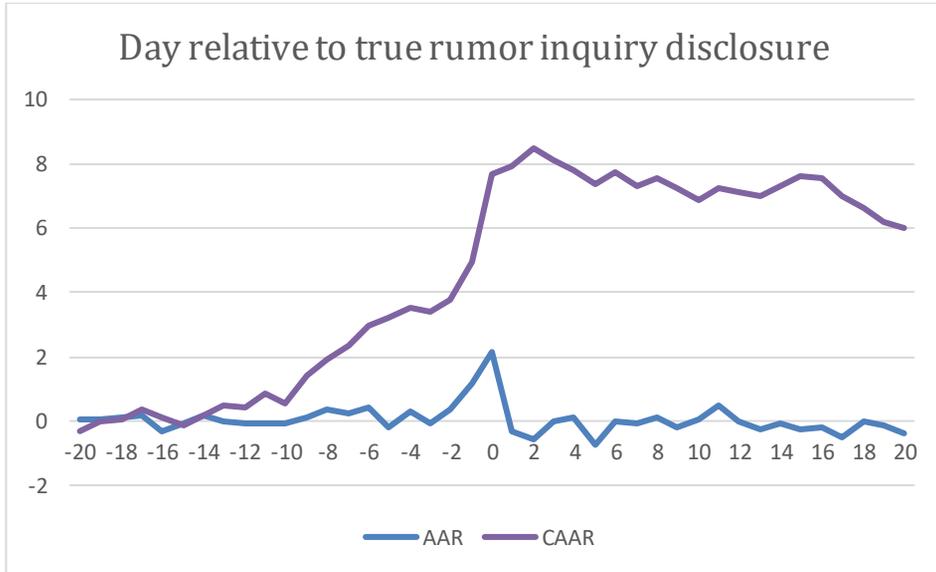
$$T_{AAR_d} = \frac{AAR_d}{s} \quad (3)$$

$$T_{CAR} = \frac{CAR(\tau_1:t_2)}{\sqrt{(t_2-t_1) \times s}} = \frac{\sum_{t_1}^{t_2} AAR_d}{\sqrt{(t_2-t_1) \times s}} \quad (4)$$

Here,  $s = \sqrt{\frac{1}{240} \sum_{d=-60}^{-300} (AAR_d - \overline{AAR_d})^2}$  and  $\overline{AAR_d} = \frac{1}{240} \sum_{d=-60}^{-300} AAR_d$

### Figure 1 Investors' response on true samples

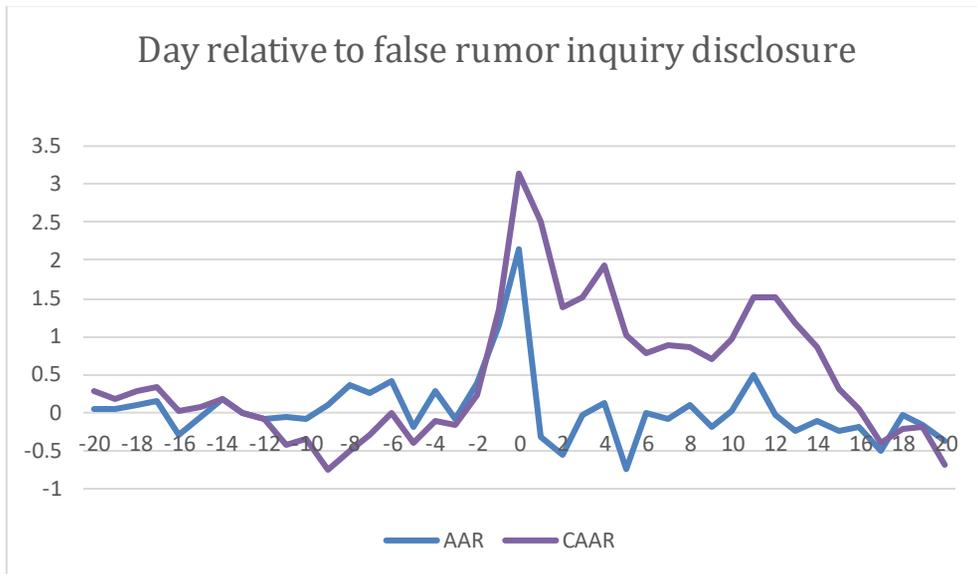
To look over investors' performance before and after the true rumor inquiry disclosure, I have conducted an event study. This figure traces day relative to true rumor inquiry disclosure. The event day (t=0) is the day of FSS's first published rumor inquiry disclosure. It presents investor's cumulative average abnormal return (CAAR) and average abnormal return (AAR) in percentage. The calculation for CAAR and AAR are followed by the above equations. On true samples, the investor's CAAR increase right after the event date (t=0) for two days and start to decrease afterward.



**Figure 2**

**Investors' response on false samples**

To look over investors' performance before and after the false rumor inquiry disclosure, I have conducted an event study. This figure traces day relative to false rumor inquiry disclosure. The event day ( $t=0$ ) is the day of FSS's first published rumor inquiry disclosure. It presents investor's cumulative average abnormal return (CAAR) and average abnormal return (AAR) in percentage. The calculation for CAAR and AAR is followed by the above equations. On false samples, the investor's CAAR decreases right after the event date ( $t=0$ ).



Overall, the evidence suggests that investors respond to rumor inquiry disclosures. <Figure 1> presents the cumulative average abnormal returns (CAARs) for rumor inquiry disclosures that become true over time. <Figure 2> presents the cumulative average abnormal returns (CAARs) for rumor inquiry disclosures that become false. Interestingly, rumor inquiry disclosures that become false show poor performance compare to those that become true. Investors reacted more sensitively on stocks with true rumor inquiry disclosures. This can

**Table 5**  
**Event study for rumor inquired disclosures**

Day	True Rumor		False Rumor	
	AAR	CAAR	AAR	CAAR
-10	-0.07	-0.30	-0.07	0.07
-9	0.09	0.56	0.09	-0.33
-8	0.35	1.08	0.35	-0.07
-7	0.26	1.46	0.26	0.12
-6	0.42	2.11	0.42	0.42
-5	-0.18	2.37	-0.18	0.03
-4	0.29	2.67	0.29	0.31
-3	-0.07	2.56	-0.07	0.26
-2	0.39	2.90	0.39	0.66
-1	1.13	4.08	1.13	1.78
0	2.15	6.83	2.15	3.56
1	-0.33	7.06	-0.33	2.93
2	-0.57	7.63	-0.57	1.80
3	-0.04	7.28	-0.04	1.93
4	0.13	6.94	0.13	2.36
5	-0.74	6.50	-0.74	1.44
6	-0.01	6.86	-0.01	1.21
7	-0.09	6.46	-0.09	1.30
8	0.10	6.72	0.10	1.28
9	-0.18	6.39	-0.18	1.14
10	0.02	5.99	0.02	1.39

This table presents event study results for rumor inquired disclosures. The event day (t=0) is the first publication day of rumor inquired disclosures. The above table shows average abnormal returns (AARs) and cumulative average abnormal returns (CAARs) in percentage for prior to and after ten days from the event day for both true and false rumors.

be interpreted as investors can earn an excess return by trading on private rumors, especially on the rumors that are more likely to come true.

<Table 5> presents event study results for rumor inquired disclosures before and after 10 days. The “day 0” is the first publication day of rumor inquired disclosure for each sample. The calculation for average abnormal return(AAR) and cumulative average abnormal return(CAAR) are followed by above equations. For both rumors, the AAR become negative right after the rumor inquired disclosure publication. This shows that FSS’s inquired disclosure system operates as a break in the stock market. For true rumors, the CAAR turned into positive number 9 days before the event date, and it keeps increasing until 3 days after the event date. On false rumors, the CAAR started to show positive number 7 days before the event date and it keeps increasing until 4 days after the event date. The increasing pattern is similar for both true and false rumors but it is interesting to see that the CAAR on true rumors are almost three times more than the false rumors.

### **3.3 Investment pattern by each entity**

In the model, each investor entity response in a different pattern to rumor inquired disclosures. Institutional investors earn excess return around the disclosure date through transactions before the disclosure date by having the advantage of the information on profit forecasts. However, individual investors are in the opposite position as institutional investors by showing opposite trading

behavior (Gim and Park 2012). I thus expect to observe that institutional investors have a positive relationship and individual investors have a negative relationship with rumor inquired disclosure.

$$IND_i = \alpha_0 + \beta_1 CAR[-20, +20] + \beta_2 KOSPI_i + \beta_3 SIZE_i + \beta_4 ROA_i + \varepsilon_i$$

$$INST_i = \alpha_0 + \beta_1 CAR[-20, +20] + \beta_2 KOSPI_i + \beta_3 SIZE_i + \beta_4 ROA_i + \varepsilon_i$$

$$FORE_i = \alpha_0 + \beta_1 CAR[-20, +20] + \beta_2 KOSPI_i + \beta_3 SIZE_i + \beta_4 ROA_i + \varepsilon_i$$

Where  $IND_i$ ,  $INST_i$ , and  $FORE_i$  is individual, institutional, and foreign investor entities' investing pattern for cumulative abnormal return on prior and after 20 days of the event date, correspondingly. The key variable  $CAR[-20, +20]$  is calculated by abnormal return minus normal return (using CAPM) on each date, and it has been cumulated for 40 days. When the market is KOSPI,  $KOSPI_i$ , a dummy variable, gets a value of 1.  $SIZE_i$  is a log of a total asset for a firm size for one day before (t-1) the event date.  $ROA_i$  is net income divided by a total asset.

In <table 6>, the main regression specification, individual investors show a negative relationship, and institutional investors show a positive relationship with the cumulative abnormal return for all true and false rumors. For all rumors, it is significantly visible that individual investors sell after the rumor inquired disclosures whereas institutional investors buy. Similarly, for true rumors, individual investors and institutional investors

**Table 6****Investor entities and rumor inquired disclosure relations**

The table shows investor entities' investing patterns for rumor inquired disclosures for all rumors, true rumors, and false rumors. IND represents individual investors, INST represents institutional investors, and FORE represents foreign investors.

	<b>All rumor</b>		
	IND	INST	FORE
CAR	-0.20 (-4.16)*	0.08 (1.63)	0.07 (1.41)
AGE	-0.08 (-1.46)	0.11 (2.01)*	-0.04 (-0.80)
SIZE	0.10 (-1.61)	-0.04 (-0.67)	-0.12 (-1.80)*
ROA	-0.10 (-1.88)*	0.04 (0.72)	0.06 (1.19)
KOSPI	-0.08 (-1.46)	-0.05 (-0.79)	0.18 (2.54)*
	<b>True rumor</b>		
	IND	INST	FORE
CAR	-0.27 (-3.47)*	0.04 (0.45)	0.15 (1.84)*
AGE	0.08 (0.93)	0.01 (0.07)	-0.91 (-1.05)
SIZE	0.09 (0.84)	0.10 (0.91)	-0.21 (-1.94)*
ROA	-0.10 (-1.25)	0.03 (0.35)	0.07 (0.85)
KOSPI	-0.12 (-1.03)	-0.14 (-1.18)	0.23 (1.96)*
	<b>False rumor</b>		
	IND	INST	FORE
CAR	-0.17 (-2.70)*	0.16 (1.72)*	0.02 (0.34)
AGE	-0.17 (-2.50)*	0.17 (2.50)*	-0.03 (-0.38)
SIZE	0.11 (1.34)	-0.15 (-1.40)	-0.05 (-0.57)
ROA	0.09 (-1.37)	0.05 (0.76)	0.05 (0.72)
KOSPI	-0.07 (-0.81)	-0.03 (-0.30)	0.16 (1.82)

response in opposite direction where individual investors sell and institutional investors buy. In addition, foreign investors also show a significantly positive relation to CAR in this case. Lastly, the false rumors significantly indicate that institutional investors and individual investors behave in the opposite direction.

### 3.4 Cumulative net buy volume ratio

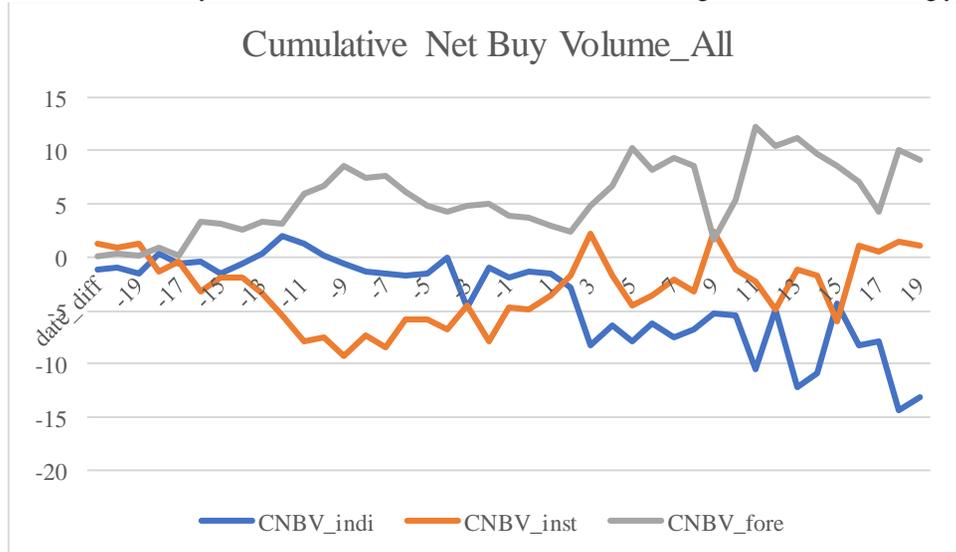
Net buy volume ratio for each investor is calculated as:

$$Net\ Buy\ Ratio_{t,i\ investor} = \frac{Net\ Buy_{t,i\ investor}}{trading\ Volume_t}$$

<Figure 3>

#### Cumulative net buy volume for all rumor inquired disclosures

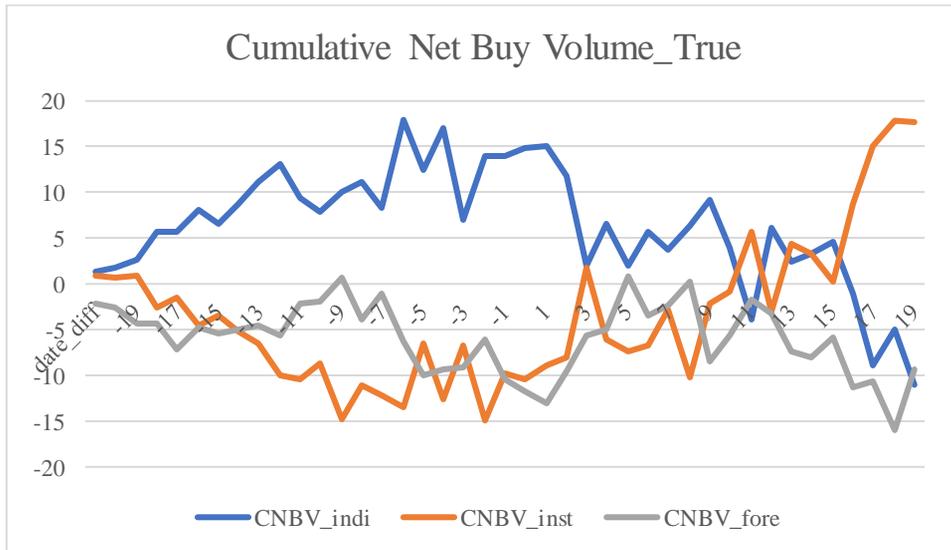
The figure presents the cumulative net buy volume for each investor entity on all rumor inquired disclosure. Net buy volume was calculated by [Net buy(sell) volume in t day, A investor / total trading volume in t day]. CNBV\_indi, CNBV\_inst, CNBV\_fore represents cumulative net buy volume for individual, institutional, and foreign investors accordingly.



<Figure 4>

**Cumulative net buy volume for true rumor inquired disclosures**

The figure presents cumulative net buy volume for each investor entity on true rumor inquired disclosure. Net buy volume was calculated by [Net buy(sell) volume in t day, A investor / total trading volume in t day]. CNBV\_indi, CNBV\_inst, CNVB\_fore represents cumulative net buy volume for individual, institutional, and foreign investors accordingly.

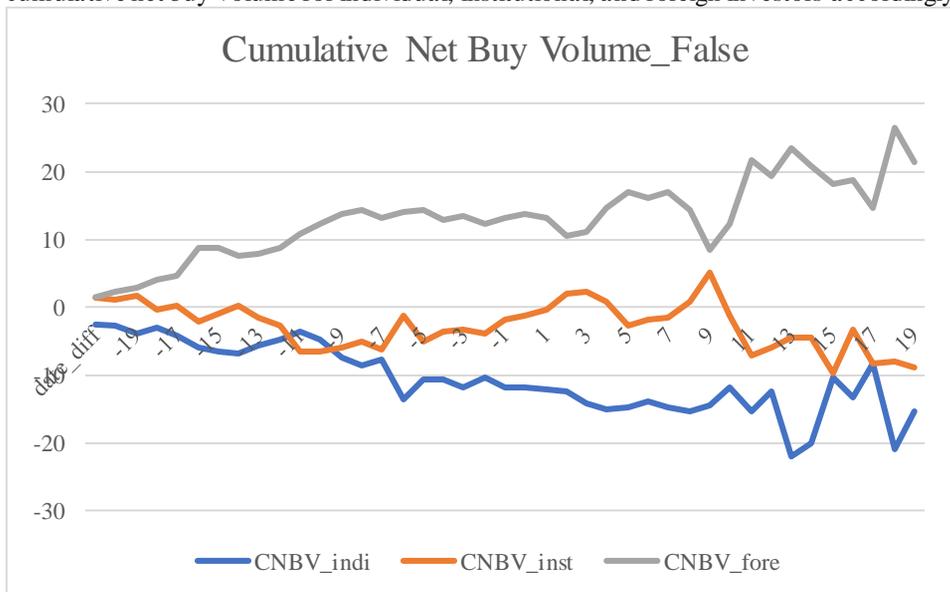


In <figure 3>, for all rumors, individual investors tend to sell after rumor inquired disclosures whereas institutional investors buy. Especially for true rumors, it is firmly visible on the <figure 4> that institutional investors buy, and individual investors sell after rumor inquired disclosures for three days. This can be interpreted as institutional investors have more accurate private information than individual investors that they buy more on true rumors before the publication date. The <figure 5> presents cumulative net buy volume on false rumors. It shows that institutional investors buy and foreign investors sell after the rumor inquired disclosure publication. The individual investors do not show a significant

<Figure 5>

**Cumulative net buy volume for false rumor inquired disclosures**

The figure presents cumulative net buy volume for each investor entity on false rumor inquired disclosure. Net buy volume was calculated by [Net buy(sell) volume in t day, A investor / total trading volume in t day]. CNBV\_indi, CNBV\_inst, CNVB\_fore represents cumulative net buy volume for individual, institutional, and foreign investors accordingly.



movement. Even though this study was not able to explain why institutional investors buy on false rumors, the study explained that each investor entity has heterogeneous expectations on rumor inquired disclosures.

More importantly, Domestic individual investors have a short-lived private information advantage for individual stocks over foreign investors (Choe et al. 2001). My results show a very similar outcome to the previous literature that foreign investors do not show specific patterns as an entity in the Korean stock market.

## **IV. Conclusion**

According to the Efficient Market Hypothesis (EMH), all information should be reflected on stock price, and only new public information will be capitalized in the newly adjusted price. On the other hand, investors sometimes trade on rumors to earn excess returns in semi-strong market because it is possible to earn excess return while stock price gets adjusted to its fair values. Accurately analyzing a firm's information that affects a value of the firm has significant implication to an investment in the stock. Since information in the capital market is disproportionate among investors, a few investors with more information chase after to earn excess returns by using undisclosed information. In addition, some investors make investment decision on undisclosed information without verifying accuracy because they do not have enough time to consider the sources.

In Korean stock market, when stock price fluctuates on undisclosed information, the Financial Supervisory Service (FSS) operates a rumor inquired disclosure system to prevent investors from trade on false rumors. To examine investors' reaction on a rumor inquired disclosure system, I gathered rumor inquired disclosure samples on merger and acquisition from FSS to execute an empirical study. The python crawling program allowed me to extract a dataset by programmatically go over the FSS website, and verified whether the rumors become true or not by manually research news articles.

By conducting an event study on rumor inquired disclosures, the study finds that individual investors tend to sell, and institutional investors buy on rumor

inquired disclosure. Especially for true rumors, institutional buy on rumor disclosure inquiries whereas individual investors sell. This proves that institutional investors have more accurate private information than individual investors. For foreign investors, which resemble numerous literature, it was difficult to confirm their trading pattern in the Korean stock market.

This literature is to expand the field of study on inquired disclosure in the Korean stock market. Also, the study presented that FSS inquired disclosure functions for market stability and investor protection. More importantly, the study serves as a reminder to generally rethink the information exchange in financial markets.

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## 요약(국문초록)

본 연구는 국내 주식시장에서 특별한 정보 공개 없이 주가가 비이성적으로 움직이는 것에 대한 금감원의 조회공시요구(풍문또는보도)를 사건일로 하여 주가의 움직임과 투자자별 거래 패턴에 대해 실증적으로 분석하였다. 조회공시요구 중에서도 인수·합병에 관련된 사건들을 중심으로 연구하였다. 이를 위해, 2008년 1월 1일부터 2019년 12월 3일까지 12년간 금감원의 유가증권 시장 및 코스닥 시장에 상장된 기업들을 대상으로 비이성적 주가 변동에 대해 조회공시요구를 받은 경우가 연구 표본으로 사용되었다. 분석 결과, 특별한 공개 정보 없이 인수·합병에 대한 풍문으로 급등 또는 급락을 반복했던 기업들의 주가가 공시일을 기준으로 하락하는 것을 볼 수 있었다. 또한, 연구 표본을 사실 풍문과 거짓 풍문으로 나눠서 보았을 때 공시 직 후 거짓 풍문의 주가가 사실 풍문에 비해 더 하락한다는 것도 알 수 있었다. 마지막으로, 투자주체별 순매수대금을 통해 특별한 공개정보가 없는 상황에서 각 투자자들이 어떤 패턴으로 공시에 민감하게 반응하는지도 보았다.

주요단어: 인수·합병, 풍문조회공시, 공개정보, 효율적시장