

Measuring the effect of mergers and acquisition on North America stock market

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Abstract

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This study is investigate whether or not mergers and acquisitions (M&A) can create a value for shareholders. We employ the M&A data to test whether or not the North America stock market have achieved the Semi-strong form market efficiency. In order to investigate these two objective, an event study methodology is used in this study. Two data sets processed in this event study. The first one is the M&A announcements data in North America from 1979 to 2006 with 71,724 observations. The second data set is the daily return of all the public company and index from 2003 to 2006 with 4,549,085 observations. After analyzed the average cumulative abnormal return (ACAR) from short term event window and long term event window around the M&A announcement date. The study found there is positive and significant ACAR in short term after announcement, which means the North America stock market have not achieved the Semi-strong form of market efficiency. However, there is no significant ACAR in long term, which means M&A does not create value to shareholders in North America stock market.

September 10, 2014

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Chapter 1: Introduction

1.1 Overview:

The Efficiency Market Hypothesis (EMH) plays a very important role in today's financial market. Lots of investors believe this theory. Some investors think EMH is the most useful theory that relates to real financial market. It is because EMH refers to the speed and accuracy with which information is translated into security prices. Kent (2013) said if market is efficient, then "all known information about the security, such as stocks, is already factored into the price of those security." It shows the price of securities should not only reflect on dividends and cash flow, but all the information related to company. Therefore, whenever the new information is released, the price of security will adjust for it. The price will also change randomly. Therefore the security price will move like a random walk.

The EMH was proposed by Roberts (1967) and Fama (1970). According to Fama: "An efficient capital market is a market that is efficient in processing information. The price of securities at any time are based determined on correct evaluation of all information available to the market at that time. In an efficient capital market, price fully reflects available information." There are three conditions of EMH, and these conditions are also consistent with an efficient financial market. The first condition is the presence of large number of market participants each will value securities independent of others. It means the market will guaranties the existence of perfect

competition and all the participants are price takers. The second condition is information come into the market place in a “RANDOM” fashion. The timing of any announcement is independent of others and the information should under such conditions: (a) information is rapidly (quickly) disclosed to the public. (b) Information is widely released to the public. (c) Information is cheaply available to all investors. The last condition is market participants adjust price rapidly to reflect the information content of the news release. Therefore, if the market is efficient then current price reflect all information on the security. The security price reflect unbiased estimates of the intrinsic value of securities. Each security yields a return that is consistent with the risk associated the security (systematic risk)

There are three forms of efficient market: weak-form efficiency, semi-strong-form efficiency and strong-form efficiency. In the weak form of efficient markets, only the market information is available to investors. It means the stock price immediately reflect market data (historical data). In the semi-strong-form efficiency, all the public information is available to investors, and the stock price reflect all the public information. The last form is strong form efficiency market, which is all information include public and private is immediately reflect in shock price.

1.2 Background:

Merger and Acquisition (M&A) has become a very hot issue in recent year’s financial market. M&A is a combination of two business entities under common ownership

(Arnold 2005). However, there is a difference between merger and acquisition. Merger is two entities decided to combine together to become a new entity friendly. On the other hand, acquisition is one entity bought another one (target firm) even the target firm did not want to sell. It more likes a takeover.

Merger and Acquisition play very important rule to help company increases their size and expands the market share. According to Christopher (Feb, 2013) “ Wall Street dealmakers are off to a busy start to 2013, as some of corporate America’s most recognizable names have become involved in multi-billion-dollar mergers and acquisitions. Indeed, according to data from Dealogic, U.S. companies have spent \$219 billion on mergers and acquisitions so far in 2013, a sharp increase from 2012, when firms spent just \$85 billion during the same period. And U.S. firms are on pace to have the biggest year in M&A activity since 2000.” In Appendix A, Figure 1.1 shows the overall trend of M&A activity increased after financial crisis from 2009 to 2013. The number the deal from 2000 in 2009 to 4000 in the end of 2013. The value of dears increased from about 700 billion in 2009 to about 1200 billion at the end of 2013.

There are three major types of merger and acquisition. The first one is horizontal mergers. Horizontal mergers occur when two company are in same industry segment. They sell similar products in same market. The goal of horizontal merger are increase the market share and reduce the cost to create synergy. The two company are in same

market and share some customers. If they combine together, the new company can increase the market share and bargain power to their suppliers and customers. In addition, because of the similar of operations, the two company can reduce total cost by combing to one firm.

The second type of merger is vertical merger. Vertical merger happens when two company have vertical relationship. It means the two company are in same supply chain. Vertical merger is combination between suppliers and customers. The goal of vertical merger are increasing the transaction efficiency and easy to planning.

The third type of merger is conglomeration merger. The conglomeration merger occurs when two companies are in completely different market. There is no any connection between their product and services. It is usually no or little synergy create by this kind of merger, because their product line and market share is maintain same after merger. The benefit of a conglomerate merger is diversification. This idea is come from finance securities portfolio. Everyone knows investor should reduce their invest risk by putting the egg in different baskets. The businessman also want to reduce their risk by diversify their business portfolio.

1.3 Purpose of Study

The objective of this study is to investigate whether or not the North America stock

market to reach the semi-strong form EMH. In order to doing that, this paper will use even study to test is there any abnormal return in short-term after merger and acquisition announcements on stock price in period 2003 to 2006. If there ware any abnormal return after the announcements, that means the North America stock market is not semi-strong form EMH. If there is no abnormal return than semi-strong form is hold. This paper will also test whether or not the mergers and acquisition create value (synergy) for shareholders generally. This paper still use merger and acquisition announcement data from 2003 to 2006 to do an event study. It will test whether or not there is any cumulative abnormal return in long-term after the merger and acquisition announcement. If the abnormal return is positive and significant then it is a signal the mergers and acquisition creates value for shareholders. Otherwise, it is not create value.

1.4 Organization of Study

There are five chapters in this paper. The current chapter states the main objective of this paper and gave an introduction and background to the reader about the research. The second chapter will review literature review on subject area. In Chapter three, data and methodology are used for this event study will be described in detail. The following chapter will analysis the result of this event study and discuss the implication of the result on the economy. Finally, chapter five will summarize research funding and discuss several limitations and recommendations on this research.

Chapter 2: Review of literature on subject area

2.1 Test for Efficient Market Hypothesis

Salmen and Khalid (2001) claimed that tests for market efficiency are usually empirical tests. The test will be on how well the market absorbs new information.

Saqib and Muhammad (2012) used Technical Analysis approach to test for the weak form EMH in South Asia market. Mihaley (2002) who empirically tested the semi-strong and strong form EMH in Hungarian Capital Market.

Hadi (2006) conducted test of weak, semi-strong and strong forms of market efficiency. This paper generally assumes the market is in semi-strong form and test for it. The reason behind is the financial reports and news are all public information and market react very quickly.

For semi-strong form, the securities prices should fully reflected all the publicly available information and market data. Prices are already reflect all public information; therefore, fundamental analysis cannot generate abnormal return on a consistent basis.

The key is whether or not the abnormal return can be realized after a news released.

Therefore the event study is an important way to test the semi-strong form EMH.

2.2 Event study

Event study is an empirical study that use statistical method to assess the impact of an event on the value of a corporation. In finance, event study methodology has been

used to assess the impact of Micro-Economic events or Macro-Economic events on the returns of securities. Lots of studies are available on event study method. Most recent studies in this area are Rozeff and Kinney (1976) who found a relationship between information flow and stock market activity. The reason of investor got abnormal stock returns in the month of January, is due to above-average flow of information in this month.

Raymond and Hartmann (1979) used the event study to test semi-strong form market efficiency of the Live-Hog futures market. The test showed that live-hog futures market is inefficient in semi-strong form.

Lo & Mackinlay (1997) clarified the steps for the typical event study. Generally, there are seven steps in event study. The first step is “defining the event and establish the event window.” It means to determine what the event is and the period to do the event study. The second step is “establishing firm selection criteria.” Researchers need to prepare all the data set and calculate the return during event window. The third step is calculating the normal return of this data set. The fourth one is “estimating model parameters using data in an estimation window.” Estimate model parameters for all variables in event window. The fifth step is conducting test. “Define null and alternative hypotheses, aggregate returns over time during the event period and across securities.” The last two steps are presenting results and conclusions.

2.3 Impacts from M&A

There are lots of research that investigate the effect of M&A. They usually compare the performances of corporation before and after the M&A, such as profits, growth rate, and market shares. The major study in early year is start from Ravenscraft & Scherer (1987). They analysis 6000 mergers from 1950 to 1977. Finally, they found the profit ratio of the company with M&A is 2.82% below those of Non-merge Company.

Mueller (1985) also examined the effects of M&A for 1000 largest companies of 1950 in USA. There were 209 acquired companies from the 1000 largest companies. Mueller did not test the impact of profit from M&A, but test the impacts of market shares. The study compare the market share between acquired firm and non-acquire firm in similar size and same industries.

Brown & Medoff (1990) did a research focus on the impacts on the employment rate and wages after firm merge and acquisitions. They actually distinguished the firm that acquisitions and “true mergers”. The data that this research used is a firms in Michigan, USA from 1970 to 1984. This data also included all the small firm that not public. When the acquisition happened, the result showed the wages was 5% higher but employment was 5% lower before the acquisition. On the other hand, after merger take place in Michigan, firm’s employment increased by 2%, but wages decreased by 4%.

Chapter3: Data and Methodology

3.1 Define the objective

The objective of this study is use North America merger and acquisition data as a event to do an event study. This event study is to test whether or not the North America stock market have achieved the Semi-strong form of market efficiency. In addition, this paper also use the longer term abnormal return to test whether merger and acquisition create value or reduce value to shareholders.

3.2 Data Description

To assess the impact of merger and acquisition on North America market, this paper will process the M&A announcements data in North America from 1979 to 2006 with is gathered from the Securities Data Company (SDC). There are 71,724 observations in this data set. This data set include the firm's ID which is under column called iperm and announcement data which is under date_announce column. The other data set is the daily return of all the public company and index in North America from 2003 to 2006. It is a very large database with 4,549,085 observations which is obtained from the Center for Research in Security Prices database (CRSP). There are four columns in this date set. The first column is "iperm," same as previous data set. It includes all 92,930 publicly traded companies in North America upon to 2006. The second column is "retn." In this column, all the daily return for each company from 2003 to 2006 has be recorded. The third column is called "vwretd". It is the daily return on

Value-Weighted Index contains, returns, excluding all dividends, on a value-weighted market portfolio (excluding ADRs). The last column is “date” column which record each trading day for every company.

3.3 Research Rationale

The rational reason to choosing the data (from year 2003 to 2006) to do the event study is this period is before the 2008 financial crises. Another even study I did is using the data from year 2005 to 2013. The even I chosen was dividend announcements. The result for that one is very confused because it include financial crises period (2007-2009). The data for 2007 to 2009 is not efficient. Too many firms bankruptcy, and the data is very hard to connect with other years. Therefore, the data set for the period of 2003 to 2006 is good enough to test whether or not the market in North America is semi-strong form of market efficiency.

3.4 Methodology and models

This paper will follow the steps for the typical event study that be introduced by Lo & Mackinlay (1997). There are seven steps:

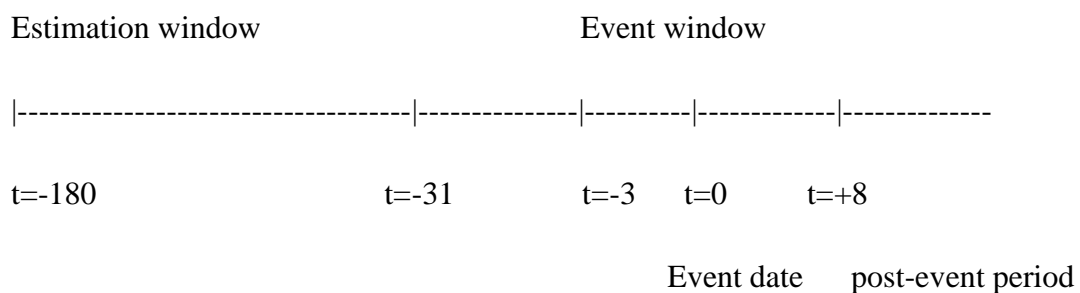
1. Define the event and establish the event window.
2. Establish firm selection criteria.
3. Calculate normal and abnormal returns for securities in the sample set.
4. Conduct tests
5. Present results and diagnostics.

6. Interpret results and draw inferences and conclusions.

3.5 Event Windows & Estimation Window

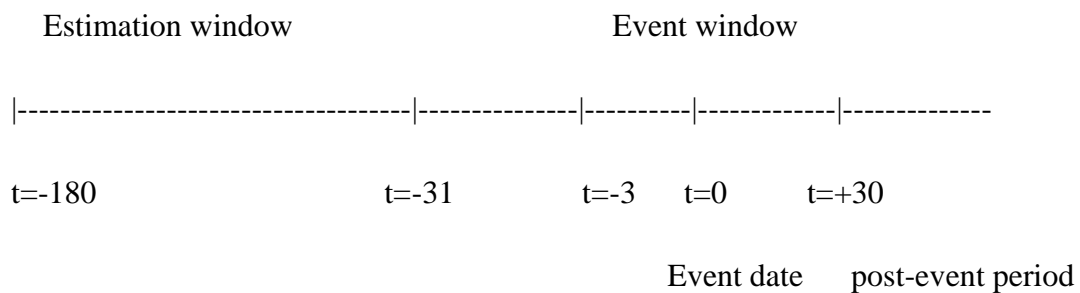
The first step is “defining the event and establish the event window.” The even in this paper is merger and acquisition event. The first purpose of this event study is to determine whether there is abnormal return (AR) in short period time after M&A announcements. If it has abnormal return in short term, then the market is not efficiency in semi-strong form. Therefore, this paper will use the period from 3 days before the announcement to 8 days after as event window for semi-strong test. The estimation window is the period to estimate the parameter for variables in normal return. In this research paper, the estimation window will be -30 to -180 days. The event date is the announcement date.

Figure 3.1 for short -term abnormal return test



The second purpose for this research paper is test whether or not M&A is add the value to shareholders. It test the true value add to shareholders; therefore, the short-term speculation should not in account. The longer event window should be used. If there are abnormal return in long-term, it means M&A create value to shareholders. The even window for this test is from -3 days to +30 days. The event date is the announcement date.

Figure 3.2 for longer term abnormal return test



3.6 Market Model & variables

The idea behind event study is to test how fast and how accurate the reaction of stock prices is to some events. To test that the market model is widely used in event study. This model is also called single-index model. In this model, the return on securities depends on the return on market portfolio. It also involves the the residual term which is measures the firm-specific component of stock's return, ϵ_t .

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t} \quad (\text{Equation 3.1})$$

$R_{i,t}$ = the daily rate of return on individual security i . It be calculated in data set “retn.”

$R_{m,t}$ = the daily rate of return on value weighted index.(Benchmark). It be calculated in data set “vwret.d.”

β_i = a covariance between $R_{i,t}$ and $R_{m,t}$ divided by a variance of $R_{m,t}$.

α_i = intercept for security i , it measures the excess return for security i .

$\varepsilon_{i,t}$ = model error term. The different between expected value ($E_{i,t}$) and true value ($R_{i,t}$)

The market model are already be chosen. The next step is estimating model parameters using data in an estimation window. These parameters (β_i^* , α_i^*) are used to get the normal return (Expect return) for each security. The abnormal return (AR) is the difference between actual return and expect return.

$$AR_t = R_{i,t} - E(R_{i,t}) \quad (\text{Equation 3.2})$$

AR_t = Abnormal return of security

$R_{i,t}$ = actual daily return of security

$E(R_{i,t})$ = Expect daily return = $\alpha_i^* + \beta_i^* R_{m,t}$

α_i^* and β_i^* are estimated parameters

Cumulative abnormal return (CAR) is sum of daily abnormal return of all securities

during event window period:

$$CAR_t = \sum_i AR_{ni} \quad (\text{Equation 3.3})$$

Average cumulative abnormal return (ACAR) is average of cumulative abnormal return.

$$ACAR = 1/n \sum CAR_t \quad (\text{Equation 3.4})$$

3.7 Hypothesis test

First of all, in order to determine whether the North America stock market achieved semi-strong form market efficiency, the hypothesis test should be taken. This paper will test whether or not the average cumulative abnormal returns (ACAR) is statistically and significantly different than zero for short term event window (-3 to +8). If ACAR for this window equal to zero, it means semi-strong form market efficiency has be hold for North America stock market. If ACAR is greater or less zero, then the semi-strong market efficiency is not achieved.

Hypothesis 1:

Ho: ACAR (-3 to +8) = 0

Ha: ACAR (-3 to +8) \neq 0

Secondly, to determine whether or not merger and acquisition create value for shareholders, we should test the average cumulative abnormal returns (ACAR) is statistically and significantly different great than zero for long term event window (-3 to +30). If ACAR for this window equal to zero, it mean M&A do not have any effect on shareholders' value. If the ACAR for long term is statistically and significantly great than zero, it mean M&A add value to shareholder. Otherwise, it reduce the value for shareholders.

Hypothesis 2:

Ho: ACAR (-3 to +30) = 0

Ha: ACAR (-3 to +30) \neq 0

Chapter 4: Analysis the result

4.1 Overall

This chapter will analysis and interpret the result of event study. The data and regression run under STATA 13 software. The code and method will be provide in the Appendix A. This paper use STAT to analysis the effect on M&A announcement both for 3 years together and separately. In order to test the two hypothesis in last chapter, the average cumulative abnormal returns (ACAR) and cumulative abnormal returns (CAR) will be calculated for both short term and long term event window in the period 2003 to 2006.

4.2 Even window (-3 to +8) from 2003 to 2006:

As this paper mentioned before, if the average cumulative abnormal returns (ACAR) is statistically and significantly different than zero for short term event window (-3 to +8), the H_0 should be reject. It means investors can make abnormal return in these 11 days after the announcement went public. That shows the semi-strong form market efficiency has not be hold for North America stock market. On the other hand, if the ACAR in this window is not statistically and significantly different than zero, then the semi-strong form market efficiency has be hold for North America stock market.

Cumulative abnormal returns (CAR)

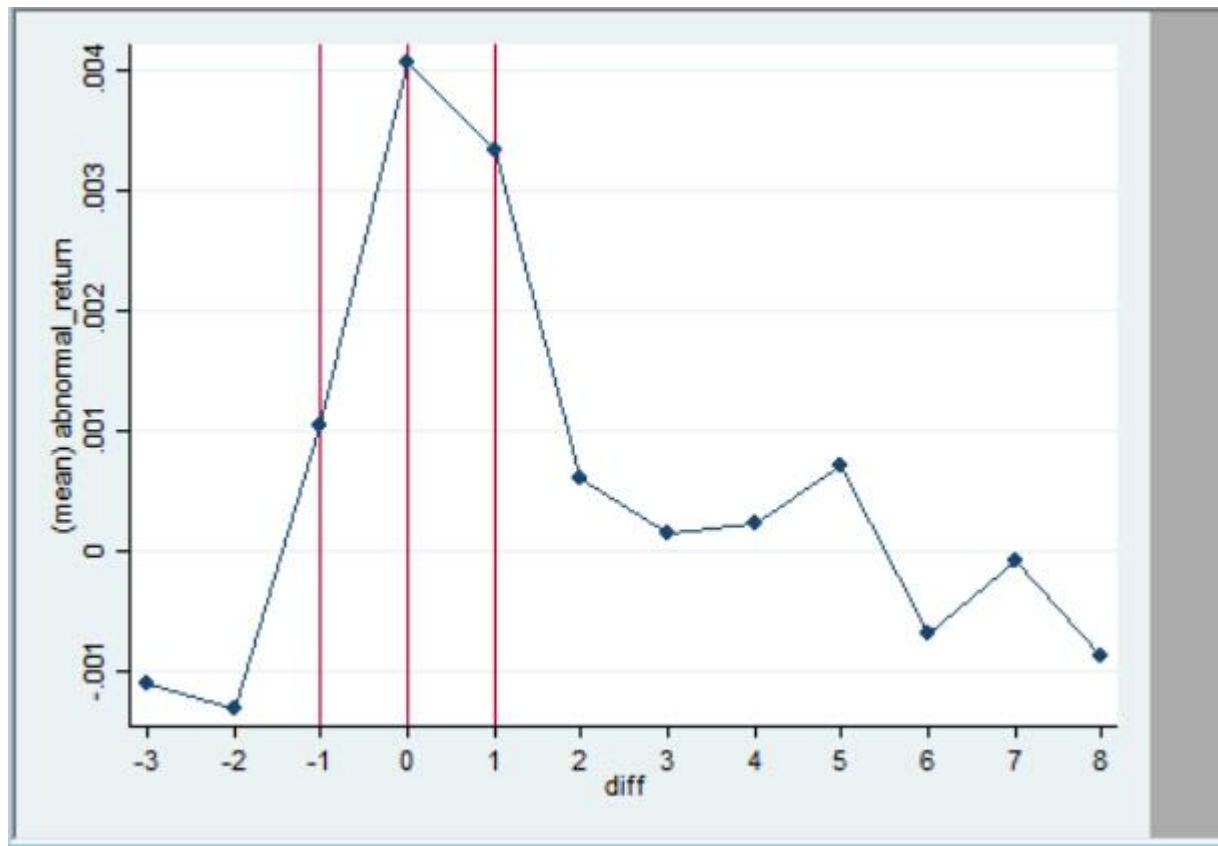
Table 4.1

```
Linear regression                                Number of obs =    2733
                                                F( 0, 2732) =    0.00
                                                Prob > F      =      .
                                                R-squared    = 0.0000
                                                Root MSE    = .09924
```

cumulative~n	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
_cons	.0060641	.0018983	3.19	0.001	.0023418	.0097865

This is the regression result of cumulative abnormal returns for short term window during the period 2003 to 2006. The number of observation is 2733 which is greater than 30. Base on the central limit theory, the sample will distribute as normal distribution. Moreover, this regression with Robust command to deal with auto-correlation and heteroscedasticity issues. Table 4.1 shows when we use t-test to check the significant of CAR, the p value in t-test is 0.001 which is less than 5% (0.005) confident interval. It means the CAR is 95% confident in those three years is statistically and significantly different than zero. The constant term is positive.

Graph 4.1



The graph 4.1 show the average daily abnormal return in short term event window from 2003 to 2006. This graph shows the M&A news already be aware by some insiders before it announced to public, because the cumulative abnormal returns raise significantly from two days before M&A announcement until to announcement data (upon to 4%). After announcement date there are still have positive abnormal return until 5 days after. It shows investors can earn positive abnormal return after the announcement become public information. Therefore, the North America stock market is not efficient in semi-strong form market efficiency.

Table 4.2

```
Bootstrap results      Number of obs      =      2733
                      Replications      =      1000
```

```
command: bootcumret
boottest: r(cumret)
```

	Observed Coef.	Bootstrap Std. Err.	z	P> z	Normal-based [95% Conf. Interval]	
boottest	.0060641	.0019118	3.17	0.002	.0023171	.0098112

Table 4.2 is the result is from bootstrap test. The number of observation is 2733 which greater than 30. The p value of t - test is 2% less than 5% confident interval. Therefore, it shows the abnormal return is statistically significant difference in one-day before and one-day after the event date. This test shows stock price do reflect on the public information.

Table 4.3

```
. mean cumulative_abnormal_return
```

```
Mean estimation      Number of obs      =      439429
```

	Mean	Std. Err.	[95% Conf. Interval]	
cumulative_abnormal_return	.006003	.0001493	.0057103	.0062956

Table 4.3 is result of the short term average cumulative abnormal returns (ACAR) for 2003 t o2006. The ACAR of these 11 days (-3 to +8) is 0.6% which is greater than

zero. Table 4.1 shows the CAR is significant different than zero; therefore, the average of CAR is also significant different than zero. It proved Ho of hypothesis 1 should be reject and the semi-strong form market efficiency has not be hold for North America stock market.

4.3 Even window (-3 to +30) from 2003 to 2006:

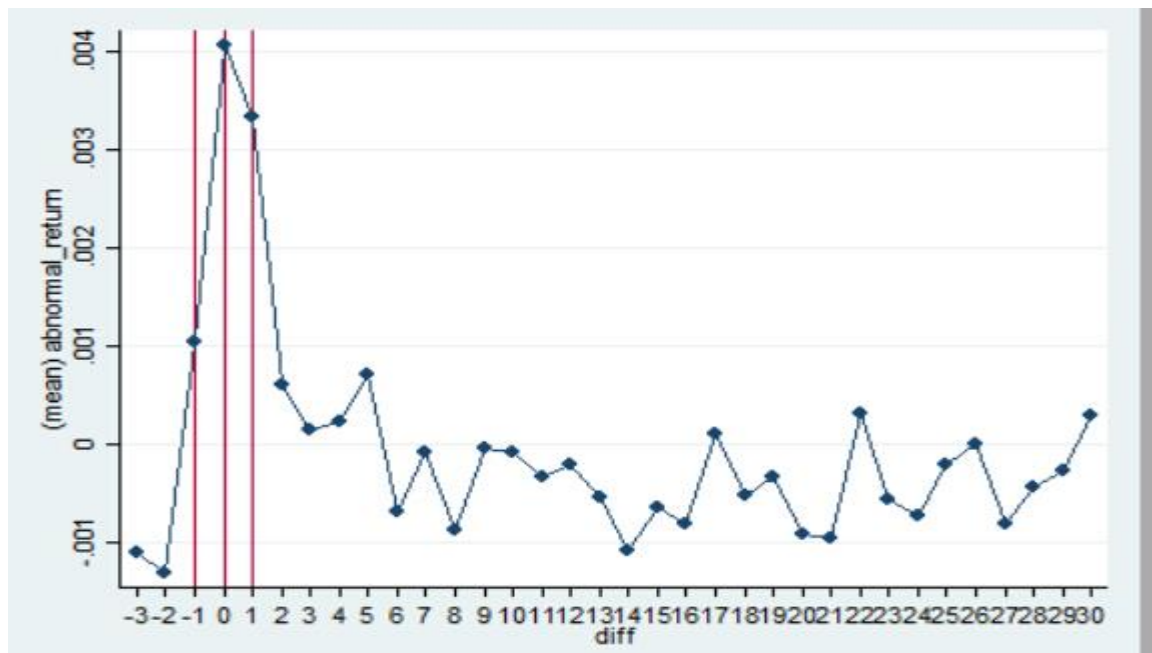
This paper already prove the short term of ACAR after M&A of those three years is positive. It shows investors can earn short term profit from purchase acquired company stock after the M&A announcement. Now the question is can investor earn abnormal return in long term. If the ACAR for long term is still positive, then it means the M&A can add value to shareholders. Therefore, Hypothesis 2 is test whether the ACAR for event window (-3 to +30) is statistically and significantly different than zero or not.

Table 4.4

```
Linear regression                                Number of obs =    2733
                                                F( 0, 2732) =    0.00
                                                Prob > F      =     .
                                                R-squared    =  0.0000
                                                Root MSE    =  .15719
```

cumulative~n	Robust				
	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
_cons	-.0027209	.0030068	-0.90	0.366	-.0086169 .003175

Graph4.2



The graph 4.2 show the trends of average daily abnormal return in 30 days from 2003 to 2006. The abnormal return was very high from two days before to five days after the announcement. However, after the day six the abnormal return become shift from zero to -0.1%. The 33 days average is not significance different zero. It shows investors can not earn positive abnormal return for long term after the announcement become public information. Therefore, M&A activities did not create value for shareholders in long term.

Table 4.6 ACAR for Individual years

Year \ ACRA	-3 to +8 days	Significant or not	-3 to +30 days	Significant or not
2003 - 2004	0.605%	Significant	-0.207%	Not significant
2004 - 2005	0.416%	Significant	-0.297%	Not significant
2005 - 2006	1.330%	Significant	0.605%	Not significant

This paper also use STATA 13 to run the regression for every year from 2003 to 2006.

The STARA result for CAR and ACAR in every year is provided in Appendix B.

Table 4.6 is the summary of average abnormal return and significant test result for each year. The analysis for individual years is consistent with the result of what we got for all three years. The ACAR for short term window is significant and positive which proved the semi-strong market efficiency is not hold for North America stock market. The ACAR for long term event window is not statistically and significantly different than zero. It shows the M&A activity was not very create value for shareholders generally.

Chapter 5: Conclusion and recommendation

5.1 Conclusion:

This paper is examined the effects of merger and acquisition activity on North America stock market. In order to test those effects, this study observed the price of stock change from 2003 to 2006 after merger and acquisition announcement go public in North America. Two large data set involved in this study. The first one is 71724 firms that had M&A activity from 1979 to 2006. The second data set is daily return of 92,930 publicly traded companies from 2003 to 2006 in North America with 4,549,085 observations.

First of all, event study method was used to investigate whether or not the semi-strong market efficiency be hold in North America stock market. The event window is 11days around the M&A announcement to check whether or not investors can earn abnormal return after the information go public. After ran regression under STATA, the output showed there was a positive significant average abnormal return in this event window. It means the the semi-strong market efficiency is not hold for North America stock market. Secondly, this paper tested whether or not M&A activity add value to shareholder in long term. The event window switched from short term which is 11 days to long term 33 days. The output of STATA showed the average abnormal return is not statistically and significantly different than zero. Therefore, M&A did not create any value to shareholders. The same tests were ran for individual years and the

result is consistent with three year periods. All in all, this study proved M&A does not create value to shareholders in North America and stock market does not reach semi-strong market efficiency.

5.2 Recommendations:

Several recommendations and limitations should be taken in account when people use the results of this study. The first limitations is the data is taken in this study is whole North America stock market. Therefore, people cannot use this result to analysis a specific country or industry. In other words, M&A activity may add or reduce value for shareholders in some specific countries and industries. Another limitation is the data is from 2003 to 2006 which is before the financial crisis 2008. I recommend other researchers could use the data after financial crisis to check the difference. The last recommendation is other researchers can changed the event window to see how the result shift in different windows.

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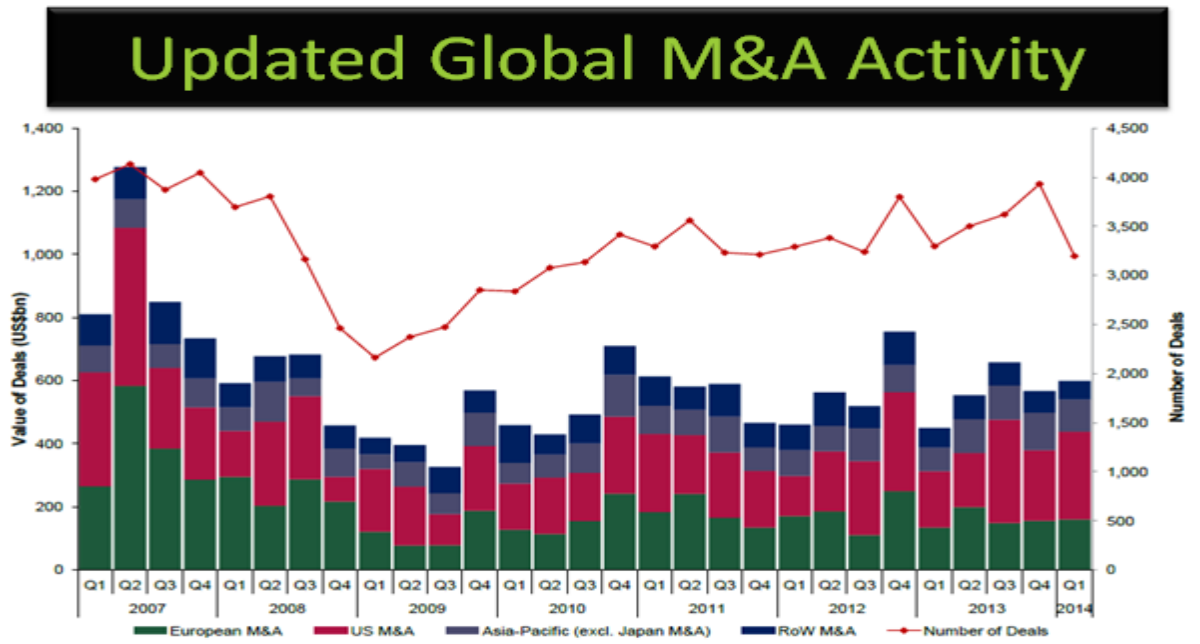
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Appendix A

Figure 1.1



Appendix B

Outcomes from STATA of Individual year (from 2003 to 2006)

Short term event window (-3 to +8):

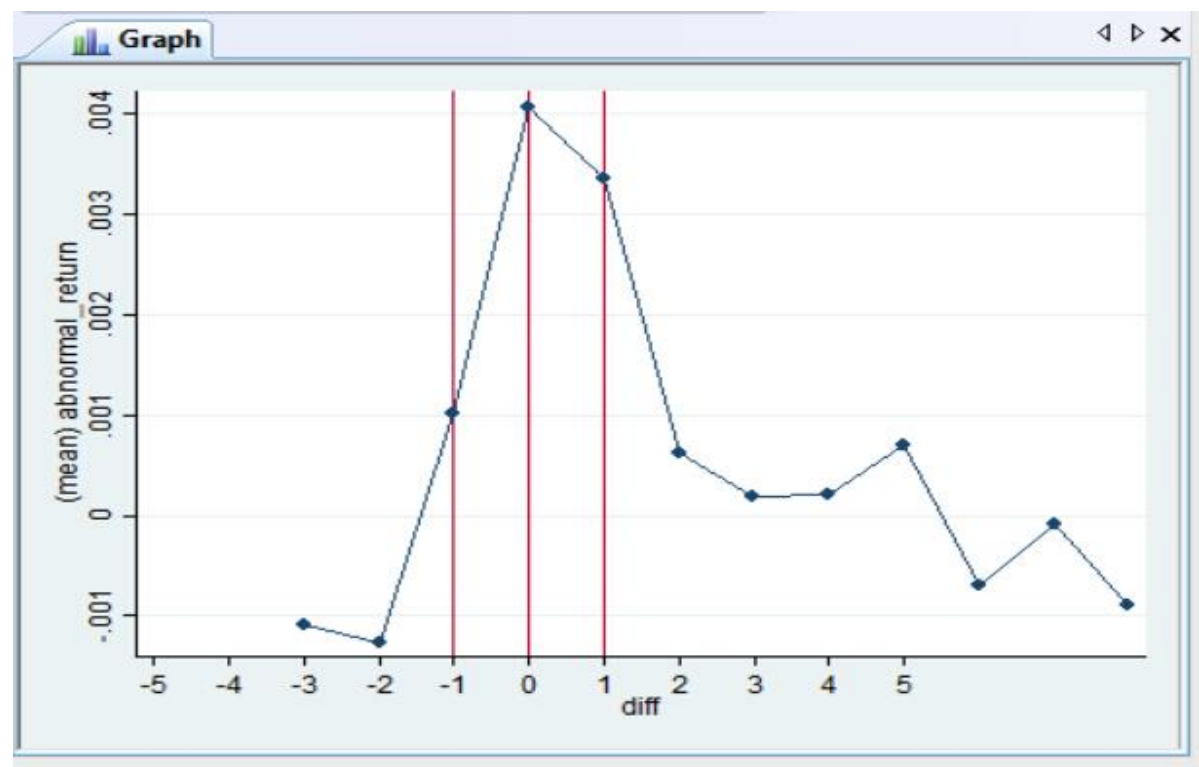
Year 2003 to 2004:

Cumulative abnormal returns (CAR):

Linear regression

Number of obs = 2684
F(0, 2683) = 0.00
Prob > F = .
R-squared = 0.0000
Root MSE = .09985

	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
cumulative~n						
_cons	.006112	.0019274	3.17	0.002	.0023327	.0098913



Long term event window (-3 to +30):

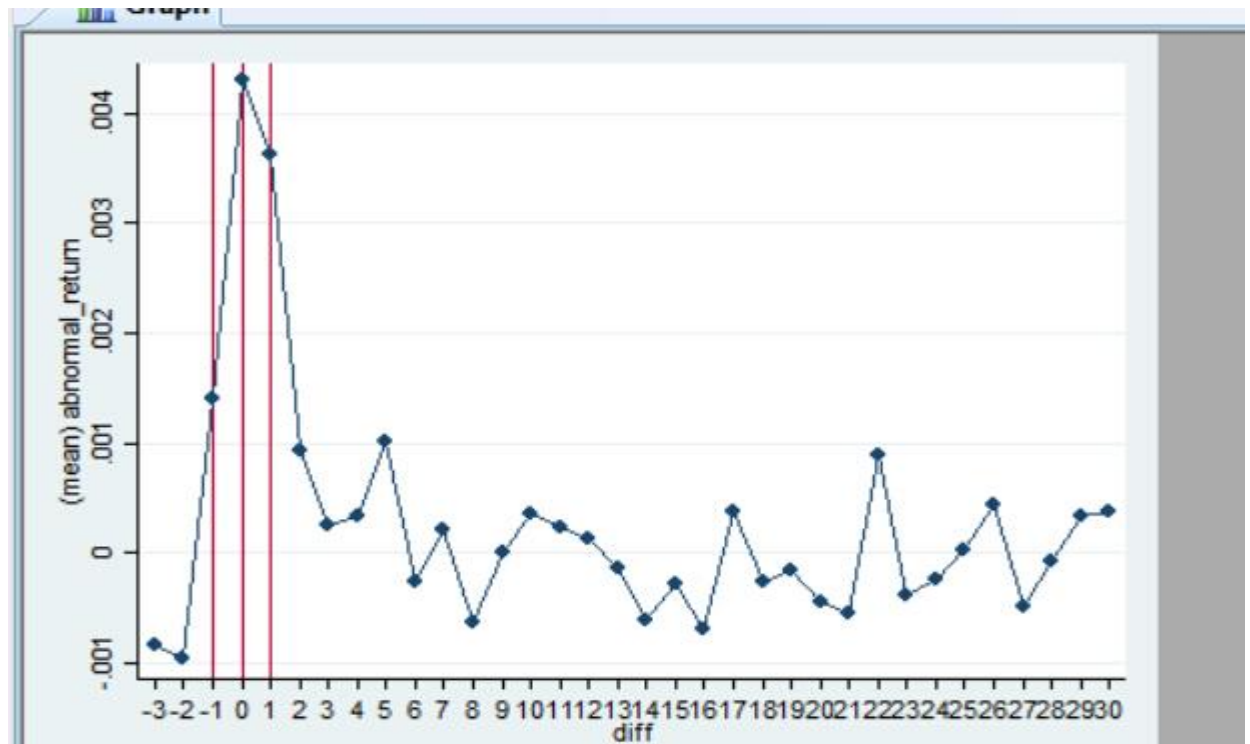
Year 2003 to 2004:

Cumulative abnormal returns (CAR):

Linear regression

Number of obs = 2684
F(0, 2683) = 0.00
Prob > F = .
R-squared = 0.0000
Root MSE = .15628

cumulative-n	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
_cons	-.0016926	.0030166	-0.56	0.575	-.0076077	.0042225



Average cumulative abnormal returns (ACAR)

Mean estimation

Number of obs = 50207

	Mean	Std. Err.	[95% Conf. Interval]	
cumulative_abnormal_return	-.0044412	.0008059	-.0060208	-.0028615