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Predictability of Initial Merger Spread of Deal Completion & Long-Term Performance

Chung, W.Y.

Supervised by Dr. C. Lin

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Abstract

This paper tests whether initial merger spreads has a predictive power regarding either deal completion or future long term performance. By analyzing a substantial sample of deals in US market during the 2000 – 2013, this paper tests whether or not an initial merger spread works as an adequate *ex post* indicator of whether market has been capable of predicting the completeness or even future long-term performances. The main result of this paper implies no significant predictability of initial merger spread about either with deal completion or with future long-term performance in the US market during the period of 2000-2013. Interestingly, however, the merger-spread seems to be significantly predictable about deal completion only when the announcement was made during year 2000 and not during other years. In addition, there is no influence on predictability of initial merger spread from market size of bidders or targets. The results is quite robustness since the tests are replicated more than once using different types of initial merger spread and long-term performance data.

Key words: merger and acquisition, initial merger spread, deal completion or withdrawal, post-merger long-term performance, merger arbitrage, risk arbitrage, market size, relative market size, means of payment, frictions to arbitrage

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1. Introduction

Merger arbitrage, also known as risk arbitrage, uses merger spread of the target price after an announcement of merger. Merger arbitrageurs focus primarily on the risk of a deal being successfully accomplished. Merger spread is perhaps much beloved by investors due to its uncomplicated idea behind it: by speculating the deal completion, they profit from the current price spread of a stock of the target firm. However, due to the complexity of the evaluating the risk involved in the arbitrage, the problem lies in exercising that idea in real market. The risk is known as unsystematic and the evaluation process of the risk is quite subjective and far from being scientific (Brown & Raymond, 1986). In spite of having been used for a considerably long period of time by the risk arbitrageurs, any form of a sound mechanism of risk evaluation is yet little known to the contemporary academy. It requires the arbitrageurs a high level of expertise and persistent observation. This is where the academy steps in to delve into finding a systematic way of predicting the merger and acquisition (M&A) deal completion.

Some papers have attempted to model the risk of successfulness such as the paper by Branch and Wang (no date). And, like Brown and Raymond's paper (1986), there are many papers that research on the relationship between the risk arbitrage and the completeness of the merger and acquisition deals. In addition to such previous literatures, this paper researches further on whether the merger spread immediately after the announcement, which is called as an *initial* merger spread, significantly predicts the completeness of the deal. Also it includes the newest data available, and deals with an extensive amount of sample size and length of time period, which is more than 14 years from 2000 to 2013. Furthermore, this paper also researches on the predictive power of merger spread as to the post-completion long-term performance of acquirers. Merger spread may reflect the expectation of the market as to the future long term outcome of the merger. Apparently there are little researches conducted on this matter. Hence it provides some new insights for finding an *ax ante* indicator of long-term performance using the merger spread. Therefore the research question of this paper is: *to what extent can initial merger spread be used to predict the completion of an M&A deal and its future long-term performance in US market during 2000-2013?*

Not only does it give an additional or new insight about successful merger and future long-term prosperousness to the academy, it can also shed a new light for practical matters from arbitrageurs' point of view. If the merger spread turns out to be significantly predictive as to the probability of completion or magnitude of future performance, then it will imply that the market is, by and large, capable of estimating the likelihood of completion or future long-term prosperity. In other words, it indicates that the market is closer to the Efficient Market Hypothesis compared to when the merger spread is not predictive at all. Consequently, there is not likely to be any profit left, in case the merger spread is already quite predictive right after the announcement. However, if the merger spread is not predictive at all, this will appear as positive news to the arbitrageurs since it might mean that there is still a room for them to enjoy some profit out of the spread. Of course, this is true only to the extent that the arbitrageurs can actually predict the deal completion and future prosperousness at the initial state. Arbitrageurs use all relevant factors available in order to predict the completeness or future prosperity, and their reactions are reflected by the merger spread. Merger spread, therefore, represents an *ex post* indicator of whether market has been capable of predicting the completeness or even future long-term performances. If the result turns out to be that merger spread does not have any significant association with the completeness or long-term performance, then further research should unearth the underlying causes of it. When interpreting the results one must be careful, because absence of the association does not necessarily mean 'free lunch' if the cause is due to risk or transaction costs, for instance. Such factors hinge the market to arbitrage the spread that consequently weakens the association between the spread and completeness or expectation of future long-term performance.

Having said the above matters, this paper starts the research with two main hypotheses. First, initial merger spread is smaller for deals successfully completed than those withdrawn. Second, the initial merger spread is smaller for deals of which post-merger long-term performance is better than for those with worse post-merger long-term performance.

The main result of this paper implies no significant predictability of initial merger spread regarding either with deal completion or with future long-term performance in the US market during the period of 2000-2013. There is one intriguingly result that the merger-spread seems to statistically significantly distinguish the deal completion only when the announcement was made during year 2000, not during other years. The underlying cause is yet to be studied. In addition, there is no influence on predictability of initial merger spread from market size of bidders or targets. The results have gained some robustness by replicating the tests using different types of merger spread and long-term performance data.

The rest of this paper is structured as follows. Section 2 discusses some basic knowledge about merger arbitrage and its risks. Section 3 reviews the literature. Section 4 explains the data and methodology. Section 5 describes the summary statistic. Section 6 and 7 describe and discuss the test results and their interpretation respectively. Section 8 concludes the paper with its limitations and some suggestions for future researches.

2. Background of a merger arbitrage and its risks

In order to clearly comprehend the rationale behind this research, it is necessary to know the basic idea behind merger arbitrage and its associated risk. When a deal is announced the bidder makes an offer price at the same time. The stock price of the target firm does not immediately become the price offered at the moment of announcement. The offer price is just a publically promised price at which the bidder is willing to purchase the target firm when they actually merge. It is up to the market consisting of investors and brokers that decides whether or not the target's price should be the same as the price offered by the bidder firm. The major task of that is to speculate whether the deal will be completed or not. As a simple illustration, suppose a target's price has been $10 until the public announcement made by the bidder whose offer price is $20. It is unlikely that the offered price is lower than the current target stock price. Assume that the market reacts to the announcement by raising the target's stock price by $7, so from $10 to $17. Now the merger spread is $3 (= 20 – 17). Merger arbitrageurs then judge whether the probability of the deal completion is large enough to purchase the target's stock for profiting from its price spread. They lose $7 in case the deal does not go through eventually. The risk largely depends on the means by which the M&A deal is paid. Deals that are paid by cash only is relatively less risky since the offer price is locked, and thus its arbitraging strategy only requires the investors to look after the current target price. While, deals paid by stock exchanges requires the investors to speculate the bidder's stock price as well as the target's stock price, because fluctuation of the bidder's stock value makes the price spread fluctuate, too.

Brown and Raymond (1986), summarize it into two main questions on which arbitrageurs should base their decisions. First, is the current merger spread a sufficient compensation for the perceived risk? Second, will the merger occur soon enough for the current merger spread to be an adequate investment? In other words, the higher the risk is or the longer it takes for the merger to occur, the higher the spread should be. Hence, it is reasonable to argue that if the market is capable of correctly estimating the risks, the *ex post* observation must be able to show a clear distinction between completed and withdrawn deals using merger spread. Also, one may also expect to discover by the *ex post* analysis that merger spread also enables one to distinguish positive and negative long-term performance amongst the deal that are completed.

3. Literature review

There already exist many researches regarding on the subject of risk arbitrage or the merger arbitrage. Branch and Wang's paper, *Risk arbitrage spreads and performance of risk arbitrage*, attempts to estimate the probability of deal completion and model the merger spread using relevant firm- or deal-specific factors. Although perfectly modeling merger spreads is not yet academically substantiated, the arbitrageurs must have their own personal ways to estimate the risk, and their estimated risk is reflected in the merger spread. This paper tests whether the market is capable of correctly estimating the risk of deal completion and future prosperity.

A paper written by Brown and Raymond in 1986 analyzes on the predictability of merger spread as to the successfulness of takeover deals. The major finding of their research is that the market is able to distinguish, in a statistically meaningful way, between mergers that will eventually fail or succeed as far as three months in advance of the respective events. The sample period they used is 1980 – 1984. By contrast, this paper tries to see if the initial merger spread has such predictability using more recent sample period – form 2000 to 2013. Plus, this paper attempts to test whether the market is able to expect correctly according to the prosperousness of post-merger long-term performance.

In addition, there are a number of papers that analyze the deal completeness and future long-term performance with regard to the sizes of the bidder and target firms. One of them is the paper by Martynova et al. (2006), which finds out that takeovers of relatively large targets are more likely to achieve sizeable operating and financial synergies and economies of scale than small acquisitions, therefore leading to stronger post-acquisition operating performance. Inspired by such size-related findings, this paper analyzes whether the merger spread predictability varies according to the relative size of the bidder and target firms. It is intuitively reasonable to expect finding a weaker predictive power for smaller sized firms due to their lack of firm- or deal-specific information that is available out in the market.

This paper adopts the method employed by Jetley and Ji (2010). Further details about the method are illustrated in the methodology section later in this paper. They documented a substantial decline in the arbitrage spread since the 1990s, and attribute the observed decline in the spread to the reduced overall level of risk of the deals and increased liquidity in the market. One of the risks that has been declining is the risk associated with the means of payment. The risk is higher for the deals paid by means of stock exchanges than those by cash. This risk has been declining due to investors using cash deals more and more rather than stock deals. This paper tests whether it is true that merger spread varies according to the amount of risk in the merger deal completeness by. In other words, it tests if merger spread is lower for cash-only deals than stock-only deals. The rationale behind this test is that it captures the extent to which the arbitrageurs are vulnerable to the friction to arbitrage. Further explanation related to friction to arbitrage is presented in the following Data section.

4. Data and Methodology

4.1 Data

4.1.1 cross-sectional data

This paper focuses on the completed and withdrawn deals in the US market during 1st January 2000 and 31st December 2013, thus a period of 14 years. The data are collected from Thomson One database and Datastream. From Thomson One, 1640 deals are gathered as a sample among which 1050 are the successfully completed deals. For each announced deal, data related to merger spread, means of payment, market values of the targets and bidders are gathered. Since the database does not provide the merger spreads for each deal, initial offer prices and target prices at announcement are collected to manually calculate the merger spreads.

The way of obtaining the merger spread data is inspired by the method employed by Jetley and Ji (2010). It is simply the difference between the initial offer price and target price divided by the target price as shown in the equation (1), where t is the date announced.

$$\text{Merger Spread}_1 = \frac{\text{Initial Offer Price}_t - \text{Target Price}_t}{\text{Target Price}_t} \tag{1}$$

However, it is possible that for some deals the market may not react immediately and the target price adjustment to the offer price may be lagged. This paper takes into account such situations as well for the sake of robustness of the result. So target prices at 1 trading day after the date announced is also used to calculate another merger spread data as shown in equations (2) below.

$$\text{Merger Spread}_2 = \frac{\text{Initial Offer Price}_t - \text{Target Price}_{t+1}}{\text{Target Price}_{t+1}} \tag{2}$$

The variable for first merger spread that uses target price at the announcement date is named as MS0D, and the variable for second merger spread that uses target price after 1 trading day is MS1D for convenience.

Means of payment is composed of two categories: cash-only and stock-only. When payment is done 100% by cash, it is ‘cash-only’, and when it is done 100% by stock, it is ‘stock-only’. As mentioned in the literature review section above, Jetley and Ji (2010) conclude from their findings that increased popularity of cash deals over time contributes to decline in arbitrage spread, due to its lower arbitrage risk than stock deals. So this variable is used to represent some extent of arbitrage limit that the merger arbitrageurs must confront. Later in this section, another variable that is used to represent some part of arbitrage friction is explained, which is Stock volatility prior to the announcement.

Market values of targets and bidders are gathered from 4 weeks prior to the date announced in order to avoid any source of influence from the announcement such as insider trading. Using the two variables, relative size variable is calculated that is the ratio of the Target market value to the Bidder market value.

4.1.2 Time-series data

In addition to the cross-sectional data above, time-series data of returns of each firm is obtained using Datastream. From the time-series data, variables for long term performance (LTAR) and target's stock return volatility (Tgt_Vol and Mkt_Vol) are constructed. First of all, for long-term performance, accumulated post-merger abnormal returns during 3-year period are used. For this analysis, 1050 completed deals is used as the sample. The benchmark of the long-term performance of each firm must be a long-term return expected to be generated supposing that no M&A takes place. So, each firm's benchmark is according to the Market Model, where α and β are estimated 3-year period beginning from 4 years before the *effective day*. For the market index, S&PCOMP is used. Agrawal and Jaffe (2000), in their paper, summarize numerous other previous papers that conduct long-term post-merger performance event studies. According to their paper, for high accuracy of the benchmark, they usually keep a gap of 10 months between the control periods and test period. In accordance with such previous legitimate studies, this paper also keeps 252 trading days, which is about a year, between the control period and the test period. This is in order to avoid any possible short-term irrational price movement incurred by the announcement. It is a reasonable length of gap since it usually takes about 6 months from announcement to implication of a merger. Also, the deals made between 2011 and 2013 cannot be used, because their post-merger 3-year return is not available, yet. Hence, in short, the control period is [-1008, -252] and test period is [0, +756] in terms of days, where 0 is the *effective day,* not announced day. Further discussion about methodology of computing the value of long-term performance is presented in the methodology section.

Secondly, the stock returns and market index return during 60-days starting from 70 days before the announcement is gathered in order to construct a variable for stock return volatility. This data is briefly introduced in the end of the cross-sectional data section as an indicator of limits to arbitrage. According to Branch and Wang (n.d.) who attempt to develop a prediction model for risk arbitrage spreads transaction costs is found to play a significant role. They also argue that return volatility is a proxy for it. Transaction cost is one of the arbitrage frictions, which causes the merger spread to persist even if the investors are rational. Thus, the stock return volatility variable and market volatility variable are constructed in order to represent some part of the arbitrage friction in the market, along with the means of payment variable.

4.2 Methodology

4.2.1 CAR vs. BHAR

In order to obtain the value of long term performance accumulated return of the stock during a certain period must be calculated. There are two possible approaches to this: Cumulative Abnormal Return (CAR) and Buy and Hold Abnormal Return (BHAR). Barber and Lyon (1997) presents in depth comparison between the two approaches and concluded that CARs are biased predictors of long run abnormal return analyses. To avoid such bias and drawing incorrect inference, this paper adapts BHAR for obtaining values of the long term performance variable. Equation (3) illustrates how BHAR for each firm is calculated. It is, in essence, the product of actual return subtracted by the product of expected return. It enables the analysis to avoid the effect of rebalancing of portfolio and to capture the compounded part of the return, which is not captured by CAR.

$$BHAR_i = \prod_{t=1}^{t=\tau}[1 + R_{it}] - \prod_{t=1}^{t=\tau}[1 + E(R_{it})] \tag{3}$$

However, BHAR method has its own downsides. Calculating the long-term abnormal return using a market index or any other reference portfolio is vulnerable against some bias. BHAR is affected by rebalancing and skewness biases. The resulting long-run BHAR and test statistics generally negatively biased (Barber & Lyon, 1997). Is is indeed observed in this paper's data as shown in the **Graph 1** and **Graph 2** in Appendix A**.** In the **Graph 1,** three extreme outliers can be observed in the long term performance variable. Further specification regarding the outliers is explained in the Summary Statistics Section.

Thus for the sake of higher robustness of representing the long term performance, a different method of computing long term abnormal return is employed next to BHAR. Equation (4) illustrates it.

$$LT\_AR_i = \prod_{t=1}^{t=\tau}[1 + AR_{it}] - 1 \tag{4}$$

In the equation, AR_{it} stands for the abnormal return calculated using the same market model employed for the BHAR. The only difference is that for BHAR the product is obtained before the abnormal return whereas for this method the product is calculated after obtaining the abnormal return. Same regressions as for the BHAR are run using this dependent variable instead of the BHAR. In order to distinguish this data from the data of BHAR, from now on the former is called LTAR2 and the latter (using BHAR method) is called simply LTAR.

4.2.2 Main specification

First basic analysis is on the predictive power of Merger spread as to whether a deal being successfully completed or withdrawn. For this analysis, the dependent variable is the dummy variable of completed and withdrawn deals. Since the dependent variable is categorical and dichotomous, binary logistic regression is more suitable choice for the analysis rather than ordinary least squares. The equation (5) illustrates the logit model where *D*_completed is a dummy variable that states 1 for completed deals and 0 otherwise, and MS_i is merger spread. This regression is conducted for both types of merger spread.

$$D\_Completed_i = \alpha_i + \beta_i * MS_i + \varepsilon_i \tag{5}$$

Next, in order to see whether the merger spread has a predictive power for the post-merger long term performance a simple Ordinary Least Square regression is used, as illustrated in the equation (6). This regression is also conducted for both types of merger spread.

$$LT\_Performance_i = \alpha_i + \beta_i * MS_i + \varepsilon_i \tag{6}$$

On top of the above two models, there are a few control variables added. The period from 2000 to 2013 includes two major events that occurred in the stock market: the dot com bubble (D_2000) and the financial crisis in the late 2000's (D_Crisis). These abnormal events are isolated using dummy variables. (how I got the dummies for these): The method employed in order to construct the dummy variables differs between the logit model (5) and the OLS model (6). For model (5) there two dummies constructed for each of Dot Com bubble and 2008 Financial Crisis. The dummies' values are set to be 1 if the announcement was made during the Dot Com bubble (year 2000) or the Crisis (year 2007 and 2008). For model (6), in order to isolate the unstable economic periods, the dummies are set to be 1 in case the LT return contains the year 2000 or both 2007 and 2008.

Additionally, it is quite interesting to test whether the value and the significance of the coefficient of each explanatory variable changes when firm's size factors are taken into account. This could answer questions such as: "would the predictive power differ according to difference sizes of the targets or acquirers?" and "would the predictive power exist or disappear for certain size groups?" Similar questions may be asked as to the ratio of target size to the bidder size. Dummies are constructed in order to answer these questions. There are two dummies for small and medium size of both targets and acquirers (D_Tgt_Small, D_Tgt_Medium, D_Acq_Small, and D_Acq_Medium). For the size ratio, on the other hand, there is just one dummy that is 1 when the ratio is relatively smaller (D_Rel_Small). The categorization is carried out rather arbitrarily. The 'small' group is the one third of the whole sample with smallest size and 'medium' group is the next one third of the sample with size that is larger than the 'small' group but smaller than the other one third. In a similar fashion, half of the sample with smaller ratio value is named as 'small' group.

4.2.3 Univariate and Multivariate analysis

The control variables are added to the basic research not only simultaneously but also individually at different times. For simplicity, let us call the models with just one kind of control variable an *univariately controlled* model, and models with more than one kind of control variables a *multivariately controlled* model. The rationale behind this method is to see the change in coefficients of independent variables. In this way, insignificant variables or spuriously related variables can be discovered.

The following models are *univariately controlled* models:

$$Y = \alpha_i + \beta_{1i} MS_i + \beta_{2i} D\_2000 + \beta_{3i} D\_Crisis + \beta_{4i} D\_2000 * MS_i + \beta_{5i} D\_Crisis * MS_i + \varepsilon_i \tag{7}$$

$$Y = \alpha_i + \beta_{1i} MS_i + \beta_{2i} D\_Tgt\_Small + \beta_{3i} D\_Tgt\_Medium + \beta_{4i} D\_Tgt\_Small * MS_i + \beta_{5i} D\_Tgt\_Medium * MS_i + \varepsilon_i \tag{8}$$

$$Y = \alpha_i + \beta_{1i} MS_i + \beta_{2i} D\_Acq\_Small + \beta_{3i} D\_Acq\_Medium + \beta_{4i} D\_Acq\_Small * MS_i + \beta_{5i} D\_Acq\_Medium * MS_i + \varepsilon_i \tag{9}$$

$$Y = \alpha_i + \beta_{1i} MS_i + \beta_{2i} D\_Rel\_Small + \beta_{3i} D\_Rel\_Small * MS_i + \varepsilon_i \tag{10}$$

Y is the dependent variable that is either the deal completion dummy or long term performance variable.

The following models are *multivariately controlled* models:

$$Y = \alpha_i + \beta_{1i}MS_i + \beta_{2i}D\_Tgt\_Small + \beta_{3i}D\_Tgt\_Medium + \beta_{4i}D\_Tgt\_Small * MS_i + \beta_{5i}D\_Tgt\_Medium * MS_i + \beta_{6i}D\_Acq\_Small + \beta_{7i}D\_Acq\_Medium + \beta_{8i}D\_Acq\_Small * MS_i + \beta_{9i}D\_Acq\_Medium * MS_i + \beta_{10i}D\_Rel\_Small + \beta_{11i}D\_Rel\_Small * MS_i + \varepsilon_i \quad (11)$$

Model (11) is consisted of regression (8), (9), and (10). It tests the effect of all size variables together. Following regressions are combination of financial crisis variables and size variables.

$$Y = \alpha_i + \beta_{1i}MS_i + \beta_{2i}D\_2000 + \beta_{3i}D\_Crisis + \beta_{4i}D\_2000 * MS_i + \beta_{5i}D\_Crisis * MS_i + \beta_{6i}D\_Tgt\_Small + \beta_{7i}D\_Tgt\_Medium + \beta_{8i}D\_Tgt\_Small * MS_i + \beta_{9i}D\_Tgt\_Medium * MS_i + \varepsilon_i \quad (12)$$

The regression (12) is a combination of regression (7) and (8).

$$Y = \alpha_i + \beta_{1i}MS_i + \beta_{2i}D\_2000 + \beta_{3i}D\_Crisis + \beta_{4i}D\_2000 * MS_i + \beta_{5i}D\_Crisis * MS_i + \beta_{6i}D\_Acq\_Small + \beta_{7i}D\_Acq\_Medium + \beta_{8i}D\_Acq\_Small * MS_i + \beta_{9i}D\_Acq\_Medium * MS_i + \varepsilon_i \quad (13)$$

The regression (13) is a combination of regression (7) and (9).

$$Y = \alpha_i + \beta_{1i}MS_i + \beta_{2i}D\_2000 + \beta_{3i}D\_Crisis + \beta_{4i}D\_2000 * MS_i + \beta_{5i}D\_Crisis * MS_i + \beta_{6i}D\_Rel\_Small + \beta_{7i}D\_Rel\_Small * MS_i + \varepsilon_i \quad (14)$$

The regression (14) is a combination of regression (7) and (10). And finally the last one, regression (15) combines all variables.

$$Y = \alpha_i + \beta_{1i}MS_i + \beta_{2i}D\_2000 + \beta_{3i}D\_Crisis + \beta_{4i}D\_2000 * MS_i + \beta_{5i}D\_Crisis * MS_i + \beta_{6i}D\_Tgt\_Small + \beta_{7i}D\_Tgt\_Medium + \beta_{8i}D\_Tgt\_Small * MS_i + \beta_{9i}D\_Tgt\_Medium * MS_i + \beta_{10i}D\_Acq\_Small + \beta_{11i}D\_Acq\_Medium + \beta_{12i}D\_Acq\_Small * MS_i + \beta_{13i}D\_Acq\_Medium * MS_i + \beta_{14i}D\_Rel\_Small + \beta_{15i}D\_Rel\_Small * MS_i + \varepsilon_i \quad (15)$$

4.2.4 Extension

Even if the merger spread between completed and withdrawn deals are not significantly different, this does not necessarily mean that the market is irrational, since there may be frictions to arbitrage that prevents the investor to profit from the arbitrage, and makes the merger spread persistently above zero. Thus, it is essential to analyze to what extent the arbitrage friction is pervasive in the market. This can be done by using the means of payment variables and return volatility variables.

The following regression is constructed in order to test to what extent the means of payment influences the magnitude of merger spread. The result of this regression reflects the relative risk level associated with the stock-only deals compared to the cash-only deals. If the coefficient of the dummy variable is significantly negative, it indicates the fact that there is a certain level of perceived risk involved with stock-only deals that is not involved with cash-only deals.

$$MS_i = \alpha_i + \beta_i * D\_Cash_i + \varepsilon_i \tag{16}$$

Next regression is constructed for testing for how much merger spread varies according to the volatility of the target firm's stock return prior to the announcement controlling for the market volatility at the same period. Here stock volatility variables are employed as a proxy for the transaction cost associated with trading stocks of a target. If the coefficient of stock volatility is significantly positive, it indicates that the merger spread may persist regardless of the rationality of the market.

$$MS_i = \alpha_i + \beta_{1i} * Volatility_{Stocki} + \beta_{2i} * Volatility_{Marketi} + \varepsilon_i \tag{17}$$

The result of the above regressions could contribute to a much richer interpretation of the results of this paper's analysis.

5. Summary statistics

Table 1 in **Appendix A** presents the overview of the samples used for each basic type of regression employed in this paper. First row is for the logit model analyzes the predictive power of merger spread about the completeness of deals. The second row is for the Ordinary least square regression that analyzes the predictive power of merger spread about the long term performance of completed deals. Although 87.32% of 1640 is 1432, not 1050, due to unavailability of long term return of some firms, the number of deals in the sample for the regression is 1050.

Table 2 exhibits the descriptive statistics of all non-categorical variables. One noteworthy value is the minimum value Cumulated BHAR after merger (LTAR) which is -31330.0. It is remarkably lower than the average, -41.8969. The average is also much lower than the median, which is 0.15567. These numbers together indicate that the distribution is skewed to the negative side and possibly imply that there are some outliers to be taken care of. Indeed there are three extreme outliers as illustrated in the **Graph 1**. From left to right, the approximate values are -31330, -3030 and -8328 respectively. These can be a result of calculation error. However, evaluating the calculation process reveals no error. The cause is not from a human error but is rather from the fact that product of expected returns of the outliers were too high compared to their product of realized returns. This made their abnormal returns extremely low below 0. Even if there is no clear reason to isolate these outliers, solely due to the substantial deviation of their magnitude from other observations, they are excluded from the sample. **Table 2** presents the descriptive statistics of the LTAR without outliers on the next column. Although the mean and median get closer to each other, the minimum value is still quite low below 0. **Graph 2** shows the long term abnormal returns without the outliers**.** As shown there are lots of negative deviations observed.

Table 2 also presents the descriptive statistics of 2nd type of LTAR data (LTAR 2). The minimum value of the 2nd type of LTAR data (LTAR 2) is -1.0000. **Graph 3** illustrates the LTAH2 data. One can easily notice by looking at the graph that now the long term AR are more spread to the positive direction. Also the range of the magnitude of the deviation is much lower than the BHAR data. Above all, unlike BHAR, this method does not produce any extreme outliers.

Finally, **Table 3** displays the correlation of all variables used in the analysis, in order to detect possible multicollearity problems. Absolute values of all correlation remain relatively low. It seems that multicollearity is unlikely to cause any significant bias for any regressions.

6. Result

6.1 Deal completion and Initial merger spread

Table 4 illustrates the results of logistic regression models using merger spread calculated with target price at the announcement day (MS0D). As mentioned in the note below each table, for every regression, any heteroskedasticity or autocorrelation violation are checked and adjusted where necessary using White or HAC (Newey-West) method. The first regression includes only the merger spread variable. Its coefficient is negatively significant at 5% level. One must pay an extra attention to interpreting the coefficient of a logistic model, which is not an ordinary least square regression. In order to calibrate how hypothetically increasing the merger spread by one unit affects the probability of a successful M&A deal, following formula is presented, in which *l* is the logistic regression model.

$$\frac{dp}{dx_i} = \lambda(l)\beta_i = \frac{e^{-(l)}}{(1+e^{-(l)})^2} \times \beta_i \qquad (18)^{1}$$

As shown in the function, $\lambda(l)$ which is the probability density function of *l*, is always positive. Hence, in order to see whether an explanatory variable positively or negatively influences the probability of an M&A deal being successful, we only need to look at the sign of the coefficient of the variable, β_i. The coefficient of the first model is -0.163. So higher merger spread indicates that there is less probability of a deal being successfully completed on average. **Table 5** shows the same regressions but uses merger spread data computed with target prices of one trading after the announcement day (MS1D). The coefficient of the first model of **Table 5** has stronger significance and more negative influence on the probability of the deal completeness. Therefore, the results seem to support the hypothesis that higher merger spread indicates lower likelihood of successfulness of deals.

Then in an attempt to control for periods of relatively volatile market, the Dot Com bubble period and financial crisis dummies are added. For both types of merger spread, their significances disappear when the financial crisis periods are included in the model. It is the Dot Com bubble dummy multiplied with merger spread variable that became significant instead. More accurately saying, whenever D_2000*MS0D or D_2000*MS1D variable is included, the significance of MS0D or MS1D disappears. The significance of MS0D or MS1D does not disappear when only the D_2000 and D_Crisis, which are constant term dummies, are added. Only when the dummy term multiplied with MS0D or MS1D are added the significance shifts. The result implies that not all period's merger spread has significant explanatory power in relation to the deal's successfulness, but only those of which M&A deals were announced during the year 2000. Yet, it is still premature to conclude that it is specifically related to the Dot com bubble event.

[1] The process of deriving the formula is explained in the **Appendix B.**

Besides the latter finding, another financial-crisis-related variable, D_Crisis, remains negatively significant in all regression models as shown in **Table 4** and **Table 5**. It means that on average, deals, of which announcements were made during 2007 or 2008, are less likely to be succeeded compared to deals announced in other periods.

As to the firm's size factors, the only variable that preserves significance in univariate setting and multivariate settings (with the exception of the financial crisis variables) in both merger spread types is D_tgt_small*MS (dummy for small-sized targets multiplied with merger spread variable). The coefficient indicates that merger spread of deals with relatively smaller target firms increases with the probability of the deal's successfulness. Higher merger spread associated with higher probability of completeness seems quite counter intuitive. However, this variable loses its significance as soon as the financial crisis variables are included. Hence, this could be an indication of spurious relationship between the size variable and the completeness.

6.2 Post-merger long-term performance and initial merger spread

Table 6 illustrates the result of Ordinary Least Square regressions of long term performance using LTAR calculated through BHAR method and Merger spread with target price at the announcement day (MS0D). Contrary to the hypothesis, the coefficients of the Merger spread variables do not show significant outcomes. Interestingly, it is significant only when size ratio variable is included. It may be related to a kind of statistical issue such as suppressor effect. This issue must be further analyzed in future researches. Other than this, the merger spread remains non-explanatory. The result is not different using merger spread with target price at one trading day after the announcement, as shown in **Table 7.**

In both **Table 6** and **Table 7**, the constant term remains significantly negative. It is an attention-grabbing finding that implies that firms experience long term underperformance after M&A on average. This is in accordance with the findings by Agrawal and Jaffe (2000). Their conclusion is based on comparison with many other research results. Another noteworthy finding is that the Financial Crisis dummies remains significant in all kinds of regression models in both **Table 6** and **Table 7**. More precisely the Dummies for Dot com bubble and 2008 financial crisis events are positively significant. It means the LTAR of post-merger acquirers performed better during financial crisis periods than other periods on average. One possible explanation to this fairly unexpected finding is the following. During those periods, the whole market performs worse than during other periods. Since BHAR is adjusted for the market performance, when the market performs worse, the observed firm is also expected to perform worse. This means that the LTAR can still seem higher during crisis periods while the post-merger performance of bidders during crisis period are not relatively higher than that of other bidders in other periods, just because the market performed exceptionally worse during the period. Hence, it can make the coefficients of the dummies significantly positive, making it look like the bidders performed well during the crisis compared to other bidders of other periods.

Next, there are some interesting findings as to the size factor variables. As aforementioned earlier, the Merger spread variable becomes significant when D_Rel_Size_Small*MS is included. Interestingly, the variable D_Rel_Size_Small*MS is also significant and becomes insignificant without the merger spread variable. Accordingly, the two must be included together in one model for both of them to be significant. This may be related suppression effect. Discussion regarding this statistical complication seems to be out of the scope of this paper. Another finding related to the size factor is that the dummy for small bidder size (D_acq_small) persists to be significantly negative in all models in both **Table 6** and **Table 7**. It means that performance of the acquirer with relatively small market value tend to be lower than other bidder groups. Other size dummies such as for target or size ratio are insignificant contrary to the findings of Martynova et al. (2006) who found that acquiring larger target firms result in higher post-merger performance.

Table 8 and **Table 9** illustrate the same regressions as **Table 6** and **Table 7** but with LTAR2 instead of LTAR. Overall impression is that the results point to a direction consistent with that of LTAR. The signs of the constant term are the same, and the merger spread variable remains insignificant again. Major difference is that while the Dot com bubble dummy is still positively significant here, the 2008 crisis dummy is insignificant. Also, the size factor variables are all relatively insignificant at 5% level of significance.

6.3 Extension

Table 10 illustrates the results of the extended researches. The results show that dummy for means of payment seems insignificant, whereas the target firm's stock volatility is significantly positive even after controlling for the market return volatility. Thus it does not indicate significantly different risk for different means of payment but it does imply that the merger arbitrage strategy can be affected by transaction cost quite significantly.

7. Interpretation

Overall, the results of regressions using merger spread with target price at the announcement (MS0D) and on one trading day after announcement (MS1D) do not contradict against each other. Also the results related to long-term performance using either BHAR (LTAR) or the other method (LTAR2) show that merger spread variables are insignificant. So the result has gained stronger robustness regarding the relationship between long-term performance and the magnitude of merger spread.

On the other hand, it does not seems to be straightforward regarding how to conclude the results related to the relationship between completeness and merger spread. The result shows that higher merger spread is associated with lower probability of successful deals only to a very limited extent. Although it is unclear why the significance deteriorates when the D_2000*MS variable is added to the model, at least for deals of which announcement was made during year 2000 have Merger spreads that have some predictive power regarding whether a deal will be successful or not.

Based on the two 'basic' regressions without the control variables, one may conclude that merger spread can be used to predict likelihood of deal completion but not the future long term performance. If one assumes completely rational managements and perfectly efficient market in which all investors are completely rational, merger spread will have a high predictive power about the completeness and future long term performance. If one releases one of the above assumptions, which is the perfect rationality of management, the merger spread may not be able to predict the future performance. It is because the investors, who are rational and know that the managers may not be rational, will still buy target firms stocks regardless of their future performance since they can profit from arbitraging the merger spread as long as the deal is completed. Management irrationality such as hubris makes relationship between the M&A completeness and future long-term performance uncorrelated with each other. So, the result is expected to be similar to that of the 'basic' regressions of this paper: merger spread will be correlated with completeness, but not with post-merger long-term performance. But does this mean that one can conclude that this paper's result indicates irrational management such as hubris and rational and efficient market?

No, because in reality the stock market may not be perfectly efficient because of many frictions such as transaction costs. Even if the management and investors were completely rational and completely informed, the merger spread of a deal, which will be eventually completed and prosperous, will still remain not arbitraged away because of transaction costs and risks. These 'frictions' impede arbitraging and weakens the predictive power of the merger spread with regard to the completeness and future long-term performance. As the result of **Table 10** shows, targets stock return volatility has positively significant explanatory power as to the merger spread. As transaction cost is partially represented by the volatility of stock return, the positive significance of the variable may indicate that for target stocks with higher transaction costs, the merger spread tends to be higher. In other words, the result may illustrate the case where merger spread existing partly due to transaction costs, unrelated to rationality and information availability of the market. Thus, it is impossible to draw any valid and sound conclusion from the paper's results with respect to rationality. However, contrasting to the research done by Jetley and Ji (2010), the means of payment does not seem to affect the merger spread right after the announcement of M&A. It implies that the risk associated with means of payment perhaps starts to be reflected by the merger spread after a certain period of time after the announcement. So it leaves the question that whether or not the merger spread correctly reflects rational-based pricing of the target firm unanswered.

Leaving the issue of rationality aside, Does the result indicate that the market has been capable of predicting the completeness and long term performance of M&A? The answer is that it is very unlikely according this paper's result. Its sample includes deals from approximately 14 years. Amongst them only few Merger spreads of deals, of which announcements are made during the year 2000, are significant. Therefore, it would be highly unreliable to base judgment over completeness or future prosperousness of an M&A deal solely on its target firm's initial merger spread. Nevertheless, if the reason behind why the significance of Merger spread only appears for the year 2000 is discovered, there will be more possibility to use initial merger spread as one of technical factors to forecast completeness of an M&A deal.

As an attempt to figure out the reason behind the merger spread's effect being significant only during 2000, industry factor is added. The year 2000 is when the Dot com bubble burst, and it is highly related to the high technology industry or, more precisely, internet-based businesses. It means that the significance in 2000 is actually due to industry specific effect. In order to test this, two new dummies are built: one for deals carried out by high-technology industry (macro-industry factor) and the other for deals carried out by internet-based market (mid-industry factor). If the significance is associated with effects from high technology or internet industry, adding these dummies will take away the significance from the Dot com bubble variable. The result of the tests are shown in **Table 11**. Opposed to the expectation, the industry dummies do not influence the outcome significantly. Actually the result shows that the result is less likely to be due to the industry effects. Then maybe it is simply related to the time period. 2000 is the earliest year of this paper's sample. It is possible that the merger spread's significance decreases over time.

So, using subsamples the logistic regressions are tested again. The sample is divided into three periods: 2000-2004, 2005-2009, and 2010-2013. The results are shown in **Table 12.** Rather disappointingly, the merger spread variables becomes insignificant in all subsample periods, except for the MS1D in period 2005-2009. Although that variable is highly significant, it is not possible to draw a robust conclusion as MS0D is not significant in the same period. Additionally 2005-2009 is not the earliest period in which it is expected to show significance but the earlier period like 2000-2004 is supposed to show more significant MS variables. Overall, most of the merger spread variables in all periods are not significance unlike previous regressions that is probably due to lower number of observations in each regression. On top of that, p-value over time does not manifest any clear pattern. Thus, sub-sampling method does not unveil much about the mystery behind the Dot Com bubble variable. However, as shown in **Graph 4** and **Graph 5** in Appendix A**,** Jetley and Ji (2010) found out that the merger spread has been substantially shrinking since 1990's in the market and expects to keep shrinking permanently. They attribute the observed decline to reduced risk associated with the deal and increased liquidity after announcement. It could possibly mean that in the earlier periods, merger spread might have had more dramatic variation in magnitude depending on the risk associated with the M&A deals. In other words, the merger spread could have lost its statistically significant predictive power with regard to deal completion and future performance. If the latter argument is true, then the significance of D_2000 variable can be explained by the decline in predictive power of merger spread over time. But this is beyond the scope of this paper and is up to the future research.

Although this paper suggests a weak association between merger spread and completeness and future performance, it is very possible that the association between them becomes stronger as the number of days from effective date decreases. This argument is supported by Brown and Raymond (1986) as they found out that the market is able to discriminate, in a statistically meaningful way, between mergers that will eventually fail or succeed as far as three months in advance of the respective events (Brown & Raymond, 1986). If the sample of this paper were limited to include only those whose remaining trading day to the effective day is less than 3 months, the result might have shown significant. However, Brown and Raymond's paper is conducted in 1986, which is much older than this paper's sample period. So the sample from 2000-2013 can show a result that deviates from theirs.

8. Conclusion

8.1 Summary of the research

The overall result of the research implies no clear association between initial merger spread either with deal completion or with future long-term performance in the US market during the period of 2000-2013. Although at first the initial merger spread seems to have a statistically significant correlation with the probability of deal completion, its significance disappears when the Dot Com bubble (D_2000) variable is controlled. Interestingly enough, the merger-spread variable seems to be significant only when the announcement was made during year 2000 and not during other years. The underlying cause of it does not seem to be either the industry-specific characteristic or time-specific. The underlying cause is yet to be discovered. As the last remark, there is no statistically significant influence on predictability of initial merger spread from market size of bidders or targets. These results have gained some significant robustness because the tests are replicated using different merger spread (MS1D) and long-term performance (LTAR2), of which outcomes show compatible implications. Therefore, initial Merger spread does not seem to have any predictive power at all.

However, this does not necessarily mean that the market is irrational and fails to reflect the deal completeness and future performance correctly through pricing the target firm. The process of assessing the risk involved in each deal is quite unsystematic, and some other frictions to arbitrage are prominent in the market such as transaction costs and illiquidity. Also it is possible that the predictability of merger spread about either completeness or future performance of an M&A deal is stronger when the length of period from announcement date and effective date is shorter.

8.2 Limitation & Suggestions for future research

Firstly, despite that this research used two types of method to calculate the long term performance, long term performance may still need more investigation perhaps with a more sophisticated method of getting abnormal return that represents the performance with higher accuracy. BHAR, as mentioned above, is prone to negative skewness and rebalancing biases. The other method employed is an unsubstantiated way of getting a long-term return. One cannot be sure of to what extent it increases the robustness of the result to employ the other method.

Secondly, the merger spread's predictive power can improve as the length of remaining days to the effective date shortens. If it is possible to gather the data of change in merger spread over time between the announcement date and effective date of all M&A deals, the research will be able to draw much stronger conclusion as to the predictability of merger spread.

Thirdly, the sample deals are restricted to the US market. There can be a research done using international deals in the future research in order to see whether deals made in other countries present consistent results. Lastly, one may also focus on solving the relationship between the year 2000 and merger spread predictability about completion of deals. The research can be concentrated on analyzing whether the finding is related to the Dot Com bubble or simply a random, non-causal relationship.

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Appendix A

Tables

Table 1 Summary of M&A deals

	No. of deals in sample	% of successful deals	% of Cash-only deals	% of Stock-only deals
Completeness model	1640	87.32	54.12	40.00
LT performance model	1050	100	50.76	42.48

Table 2 Descriptive statistics of all non-categorical variables

	Merger spread at the ann. (MS0D)	Merger spread 1 day after the ann. (MS1D)	Cumulated BHAR after merger	Cumulated BHAR without outliers (LTAR)	2nd type of LTAR data (LTAR 2)	Relative size ratio	Target MV 4 weeks Prior to Ann. ($ mil)	Acquirer MV 4 Weeks Prior to Ann. ($ mil)	Target return vol. before ann.	market return vol. before ann.
Mean	0.1667	0.09036	-41.897	-1.2454	-0.0653	181.1463	1394.01	173588	0.0395	0.0110
Median	0.0504	0.02689	-0.1557	-0.1463	-0.1458	0.1352	183.529	1852.81	0.0296	0.0100
Maximum	14.833	14.8333	8.8307	8.8307	10.592	148069.7	61398.1	$1.35*10^8$	1.0860	0.0460
Minimum	-0.9998	-0.9998	-31323	-99.927	-1.0000	$2.04*10^{-5}$	0.1740	0.0300	0.0000	0.0041
Std. Dev.	0.6677	0.5470	1004.42	5.4735	0.8754	5169.23	4770.97	4429046	0.0420	0.0054
No. of Obs.	1640	1640	1050	1047	1050	1640	1640	1640	1578	1583

Table 3 Correlation matrix of all variables

	ACQ_MV	D_CASH	D_COMP	LTAR	LTAR2	MS0D	MS1D	REL_SIZE	TGT_MV	TGT_VOL	MKT_VOL
ACQ_MV		0.129	0.023	0.038	0.071	-0.03	-0.067	-0.165	0.260	-0.07	0.002
D_CASH	0.129		0.054	0.021	-0.083	-0.057	-0.183	-0.18	-0.148	-0.09	-0.109
D_COMP	0.023	0.054		-0.003	-0.004	0.011	-0.02	-0.193	-0.069	-0.059	-0.017
LTAR	0.038	0.021	-0.003		0.004	-0.005	-0.040	0.049	0.009	-0.076	0.027
LTAR2	0.071	-0.083	-0.004	0.004		0.027	0.025	-0.033	0.149	0.078	0.074
MS0D	-0.030	-0.057	0.011	-0.005	0.027		0.728	-0.078	-0.046	0.166	0.037
MS1D	-0.067	-0.183	-0.020	-0.040	0.025	0.728		0.009	0.018	0.210	0.039
REL_SIZE	-0.165	-0.180	-0.193	0.049	-0.033	-0.078	0.009		0.172	-0.040	0.014
TGT_MV	0.260	-0.148	-0.069	0.009	0.149	-0.046	0.018	0.172		-0.114	-0.041
TGT_VOL	-0.070	-0.090	-0.059	-0.076	0.078	0.166	0.210	-0.040	-0.114		0.314
MKT_VOL	0.002	-0.109	-0.017	0.027	0.074	0.037	0.039	0.014	-0.041	0.314	

Table 4 Result - Deal completion and MS0D

Model number:	**1.**	**2.**	**3.**	**4.**	**5.**
	Dependent variable				
Independent Variables	D_Completed	D_Completed	D_Completed	D_Completed	D_Completed
Constant	1.961*** (0.076150)	2.185*** (0.097634)	2.175*** (0.155348)	2.127729*** (0.153928)	2.000513*** (0.116204)
MS0D	-0.163** (0.079123)	-0.121 (0.082040)	-1.029545** (0.500622)	-0.124628 (0.488622)	-0.977076*** (0.313476)
D_2000		0.011 (0.271767)			
D_Crisis		-0.705*** (0.216932)			
D_2000*MS0D		-3.261***			

		(0.779314)			
D_Crisis*MS0D		-0.141 (0.550099)			
D_TGT_Small			-0.306968 (0.201071)		
D_TGT_Medium			-0.206967 (0.213344)		
D_TGT_Small*MS0D			0.897849* (0.507012)		
D_TGT_Medium*MS0D			0.741373 (0.767599)		
D_ACQ_Small				-0.147625 (0.208030)	
D_ACQ_Medium				-0.244466 (0.200881)	
D_ACQ_Small*MS0D				-0.633317 (0.556485)	
D_ACQ_Medium*MS0D				0.144994 (0.514196)	
D_Rel_size_Small					0.023712*** (0.161243)
D_Rel_size_Small*MS0D					0.957836*** (0.339868)

Model number:	**6.**	**7.**	**8.**	**9.**	**10.**
			Dependent variable		
Independent Variables	D_Completed	D_Completed	D_Completed	D_Completed	D_Completed
Constant	2.164413*** (0.219766)	2.360700*** (0.175237)	2.304712*** (0.174857)	2.149375*** (0.128694)	2.310791*** (0.237376)
MS0D	-0.940044 (0.616389)	-0.201966 (0.634722)	0.590966 (0.635621)	-0.464501 (0.331257)	0.091853 (0.783184)
D_2000		0.022431 (0.274542)	0.007041 (0.275131)	-0.010323 (0.272906)	-0.009260 (0.276093)
D_Crisis		-0.727562*** (0.219550)	-0.695663*** (0.226662)	-0.708054*** (0.219370)	-0.703274*** (0.228955)
D_2000*MS0D		-3.484247*** (0.860947)	-3.491673*** (0.841535)	-3.121399*** (0.805866)	-3.365687*** (0.893256)
D_Crisis*MS0D		-0.216839 (0.574936)	-0.440902 (0.692791)	-0.172233 (0.585672)	-0.585551 (0.719800)
D_TGT_Small	-0.401422 (0.301345)	-0.288968 (0.211300)			-0.408798 (0.307128)
D_TGT_Medium	-0.314649 (0.251344)	-0.260047 (0.217782)			-0.361419 (0.253846)
D_TGT_Small*MS0D	1.895083** (0.902480)	0.085798 (0.638173)			1.013852 (0.950480)
D_TGT_Medium*MS0D	1.625359* (0.948387)	0.756565 (0.837316)			1.488605 (0.979234)
D_ACQ_Small	0.165071 (0.330801)		-0.164688 (0.215581)		0.161862 (0.333930)
D_ACQ_Medium	-0.037758 (0.233953)		-0.191990 (0.212445)		-0.044505 (0.238776)
D_ACQ_Small*MS0D	-1.796069* (0.944552)		-1.091305 (0.665781)		-1.604120 (0.900685)
D_ACQ_Medium*MS0D	-1.096473 (0.832358)		-0.435675 (0.697801)		-0.844706 (0.819695)
D_Rel_size_Small	0.143387 (0.227600)			0.097866 (0.164258)	0.206029 (0.231675)
D_Rel_size_Small*MS0D	0.231276 (0.477879)			0.497112 (0.368545)	-0.074955 (0.507182)

*P-value <0.1, **P-value < 0.05, ***P-value < 0.01
Note: Standard errors are in parentheses. D_Completed is 1 when the deal is completed. MS0D stands for the merger spread using target price at the announcement date. D_2000 is the dummy for the Dot com bubble. D_Crisis is the dummy for the 2008 financial crisis. TGT stands for target firms, and ACQ stands for the Acquirers. Rel_size stands for the relative size, which is the ratio of target market value to the acquirer market value. Models are adjusted for heteroskedasticity where necessary.

Table 5 Result - Deal completion and MS1D

Model number:	**11.**	**12.**	**13.**	**14.**	**15.**
			Dependent variable		
Independent Variables	D_Completed	D_Completed	D_Completed	D_Completed	D_Completed
Constant	1.960595*** (0.075805)	2.179913*** (0.096697)	2.190597*** (0.149405)	2.159309*** (0.147038)	2.011194*** (0.114102)

MS1D	-0.288215*** (0.141429)	-0.171087* (0.097829)	-1.742198*** (0.581225)	-0.750088 (0.681311)	-1.471685*** (0.385138)
D_2000		-0.156721 (0.250437)			
D_Crisis		-0.570822*** (0.218802)			
D_2000*MS1D		-2.923914*** (0.789521)			
D_Crisis*MS1D		-1.938775** (0.967368)			
D_TGT_Small			-0.328760* (0.195566)		
D_TGT_Medium			-0.129858 (0.207021)		
D_TGT_Small*MS1D			1.558232*** (0.590328)		
D_TGT_Medium*MS1D			-0.183536 (0.953181)		
D_ACQ_Small				-0.213028 (0.199355)	
D_ACQ_Medium				-0.265438 (0.194617)	
D_ACQ_Small*MS1D				-0.161568 (0.753468)	
D_ACQ_Medium*MS1D				0.676427 (0.696335)	
D_Rel_size_Small					0.014533 (0.158266)
D_Rel_size_Small*MS1D					1.414114*** (0.413916)

Model number:	**16.**	**17.**	**18.**	**19.**	**20.**
	Dependent variable				
Independent Variables	D_Completed	D_Completed	D_Completed	D_Completed	D_Completed
Constant	2.195422*** (0.211033)	2.367119*** (0.166089)	2.335494*** (0.164790)	2.159103*** (0.127229)	2.357600*** (0.224869)
MS1D	-1.369970* (0.760019)	-0.737475 (0.703944)	0.239217 (0.849517)	-0.640125 (0.464815)	-0.417004 (0.910202)
D_2000		-0.183504 (0.252273)	-0.178337 (0.251613)	-0.176814 (0.251408)	-0.216946 (0.253679)
D_Crisis		-0.617881*** (0.221628)	-0.604385*** (0.221385)	-0.598169*** (0.219874)	-0.641112*** (0.223094)
D_2000*MS1D		-2.625689*** (0.911811)	-2.969685*** (0.837061)	-2.706672*** (0.838519)	-2.364952** (0.946406)
D_Crisis*MS1D		-1.618665 (1.004595)	-1.760153* (1.015014)	-1.498530 (1.036677)	-1.350539 (1.038905)
D_TGT_Small	-0.374642 (0.286170)	-0.308621 (0.202401)			-0.393951 (0.289720)
D_TGT_Medium	-0.196973 (0.240818)	-0.176905 (0.209373)			-0.233165 (0.242731)
D_TGT_Small*MS1D	2.521301** (1.030918)	0.585587 (0.708491)			1.597424 (1.166592)
D_TGT_Medium*MS1D	0.819341 (1.158886)	0.239499 (1.014457)			0.932866 (1.201471)
D_ACQ_Small	0.083505 (0.316685)		-0.217082 (0.204763)		0.068360 (0.320114)
D_ACQ_Medium	-0.046028 (0.222862)		-0.218603 (0.200315)		-0.063619 (0.226094)
D_ACQ_Small*MS1D	-2.081236* (1.196145)		-0.657340 (0.879046)		-1.635264 (1.277895)
D_ACQ_Medium*MS1D	-1.581511 (1.006848)		-0.251765 (0.864109)		-1.239645 (1.069956)
D_Rel_size_Small	0.089074 (0.219657)			0.069706 (0.161297)	0.138029 (0.221992)
D_Rel_size_Small*MS1D	0.468732 (0.604065)			0.641950 (0.499614)	0.116498 (0.643690)

*P-value <0.1, **P-value < 0.05, ***P-value < 0.01
Note: Standard errors are in parentheses. D_Completed is 1 when the deal is completed. MS1D stands for the merger spread using target price one trading day after the announcement date. D_2000 is the dummy for the Dot com bubble. D_Crisis is the dummy for the 2008 financial crisis. TGT stands for target firms, and ACQ stands for the Acquirers. "Rel_Size" stands for the relative size, which is the ratio of target market value to the acquirer market value. Models are adjusted for heteroskedasticity where necessary.

Table 6 Result - LTAR and MS0D

Model number:	**21.**	**22.**	**23.**	**24.**	**25.**
	Dependent variable				
Independent Variables	LTAR	LTAR	LTAR	LTAR	LTAR
Constant	-1.222489*** (0.174780)	-1.648159*** (0.209350)	-0.736263** (0.341149)	-0.724511** (0.305352)	-1.277632*** (0.297826)
MS0D	-0.131830 (0.251314)	-0.092690 (0.254065)	-0.170176 (1.384723)	0.047614 (1.014698)	-2.314761** (1.110385)
D_2000		1.350851** (0.623126)			
D_Crisis		1.338340*** (0.502055)			
D_2000*MS0D		-0.334225 (2.475330)			
D_Crisis*MS0D		0.058989 (1.864755)			
D_TGT_Small			-0.923303** (0.455440)		
D_TGT_Medium			-0.579312 (0.475766)		
D_TGT_Small*MS0D			0.077996 (1.409266)		
D_TGT_Medium*MS0D			0.498040 (1.944350)		
D_ACQ_Small				-1.406847*** (0.469548)	
D_ACQ_Medium				-0.227727 (0.425454)	
D_ACQ_Small*MS0D				-0.995843 (1.351411)	
D_ACQ_Medium*MS0D				-0.101351 (1.049878)	
D_Rel_size_Small					0.288974 (0.375462)
D_Rel_size_Small*MS0D					2.275772** (1.139907)
Model number:	**26.**	**27.**	**28.**	**29.**	**30.**
	Dependent variable				
Independent Variables	LTAR	LTAR	LTAR	LTAR	LTAR
Constant	-0.424047 (0.484302)	-1.241350*** (0.378074)	-1.171303*** (0.340395)	-1.698276*** (0.322081)	-0.950558* (0.516082)
MS0D	-1.772497 (1.648515)	-0.229192 (1.523714)	0.067026 (1.088971)	-2.414004** (1.146541)	-1.901259 (1.781883)
D_2000		1.288884** (0.634507)	1.215837* (0.626451)	1.265007** (0.623628)	1.227195* (0.632913)
D_Crisis		1.215963** (0.515151)	1.114105** (0.509053)	1.246753** (0.502937)	1.124346** (0.515302)
D_2000*MS0D		-0.543652 (2.694921)	-0.647285 (2.546380)	0.684061 (2.509266)	-0.306258 (2.686534)
D_Crisis*MS0D		0.075493 (1.978914)	0.248974 (1.930203)	0.597291 (1.884832)	0.333335 (1.989643)
D_TGT_Small	0.210348 (0.649352)	-0.660455 (0.465447)			0.374130 (0.652185)
D_TGT_Medium	-0.153025 (0.537410)	-0.476529 (0.475985)			-0.098953 (0.537289)
D_TGT_Small*MS0D	-1.261313 (2.036274)	0.163445 (1.541774)			-1.073030 (2.110852)
D_TGT_Medium*MS0D	-0.052239 (2.094680)	0.488006 (1.987373)			-0.052392 (2.140478)
D_ACQ_Small	-1.613367** (0.720185)		-1.223582*** (0.473009)		-1.488629** (0.719639)
D_ACQ_Medium	-0.300979 (0.492372)		-0.140481 (0.427637)		-0.215659 (0.492142)
D_ACQ_Small*MS0D	0.342705 (1.813471)		-0.920718 (1.381116)		0.338363 (1.812279)
D_ACQ_Medium*MS0D	0.298355 (1.431584)		-0.095487 (1.116400)		0.227831 (1.438531)
D_Rel_size_Small	-0.364962 (0.516614)			0.291020 (0.375778)	-0.319664 (0.515732)
D_Rel_size_Small*MS0D	2.675847* (1.527931)			2.399485** (1.167623)	2.703742* (1.524873)

*P-value <0.1, **P-value < 0.05, ***P-value < 0.01
Note: Standard errors are in parentheses. LTAR is the long term accumulated return calculated using the BHAR method. MS0D stands for the merger spread using target price at the announcement date. D_2000 is the dummy for the Dot com bubble. D_Crisis is the dummy for the 2008 financial crisis. TGT stands for target firms, and ACQ stands for the Acquirers. Rel_size stands for the relative size, which is the ratio of target market value to the acquirer market value. Models are adjusted for heteroskedasticity where necessary.

Table 7 Result - LTAR and MS1D

Model number:	**31.**	**32.**	**33.**	**34.**	**35.**
	Dependent variable				
Independent Variables	LTAR	LTAR	LTAR	LTAR	LTAR
Constant	-1.214705*** (0.171661)	-1.638677*** (0.206147)	-0.701966** (0.317454)	-0.665490** (0.287866)	-1.271055*** (0.279240)
MS1D	-0.356266 (0.339211)	-0.281471 (0.342490)	-0.887443 (1.792120)	-0.924566 (1.729361)	-3.797919*** (1.279476)
D_2000		1.448486** (0.579685)			
D_Crisis		1.399823*** (0.463665)			
D_2000*MS1D		-1.205077 (2.380247)			
D_Crisis*MS1D		-2.290625 (5.057004)			
D_TGT_Small			-0.938232** (0.434598)		
D_TGT_Medium			-0.607905 (0.443368)		
D_TGT_Small*MS1D			0.574397 (1.826207)		
D_TGT_Medium*MS1D			1.528201 (2.789702)		
D_ACQ_Small				-1.384105*** (0.445231)	
D_ACQ_Medium				-0.291809 (0.410464)	
D_ACQ_Small*MS1D				-1.343419 (2.043733)	
D_ACQ_Medium*MS1D				0.862347 (1.766890)	
D_Rel_size_Small					0.283573 (0.358075)
D_Rel_size_Small*MS1D					3.695163*** (1.326546)
Model number:	**36.**	**37.**	**38.**	**39.**	**40.**
	Dependent variable				
Independent Variables	LTAR	LTAR	LTAR	LTAR	LTAR
Constant	-0.378815 (0.455789)	-1.243636*** (0.356423)	-1.120854*** (0.323726)	-1.704503*** (0.303106)	-0.939294* (0.488772)
MS1D	-3.495740* (2.117199)	-0.331965 (2.096171)	-0.675255 (1.871935)	-3.793962*** (1.331347)	-2.849986 (2.341053)
D_2000		1.369162** (0.587208)	1.250890** (0.581374)	1.392721** (0.578118)	1.306604** (0.585233)
D_Crisis		1.297015*** (0.474548)	1.150463** (0.467605)	1.262190*** (0.464082)	1.182106** (0.472656)
D_2000*MS1D		-1.576522 (2.777103)	-0.927062 (2.523911)	0.227923 (2.420416)	-1.779202 (2.773531)
D_Crisis*MS1D		-2.679791 (5.220317)	-1.486117 (5.068161)	0.170668 (5.101735)	-1.629289 (5.201665)
D_TGT_Small	0.251312 (0.606397)	-0.640795 (0.443458)			0.444109 (0.609605)
D_TGT_Medium	-0.181668 (0.503703)	-0.476495 (0.444006)			-0.103524 (0.503633)
D_TGT_Small*MS1D	-3.682257 (3.189169)	0.061838 (2.118957)			-4.135081 (3.445263)
D_TGT_Medium*MS1D	0.197662 (3.354833)	1.162500 (2.828231)			-0.229917 (3.414580)
D_ACQ_Small	-1.640612** (0.686989)		-1.191462*** (0.449227)		-1.510842** (0.686655)
D_ACQ_Medium	-0.409810 (0.471346)		-0.187111 (0.413022)		-0.314023 (0.471094)

D_ACQ_Small*MS1D	2.128827 (3.236943)		-1.400888 (2.134488)		2.113805 (3.241031)
D_ACQ_Medium*MS1D	2.539935 (2.817702)		0.639407 (1.896731)		2.356076 (2.821724)
D_Rel_size_Small	-0.344480 (0.483790)			0.306258 (0.356785)	-0.298413 (0.483082)
D_Rel_size_Small*MS1D	4.542525* (1.923998)			3.723059*** (1.367338)	4.555922** (1.925012)

*P-value <0.1, **P-value < 0.05, ***P-value < 0.01
Note: Standard errors are in parentheses. LTAR is the long term accumulated return calculated using the BHAR method. MS1D stands for the merger spread using target price one day after the announcement date. D_2000 is the dummy for the Dot com bubble. D_Crisis is the dummy for the 2008 financial crisis. TGT stands for target firms, and ACQ stands for the Acquirers. Rel_size stands for the relative size, which is the ratio of target market value to the acquirer market value. Models are adjusted for heteroskedasticity where necessary.

Table 8 Result - LTAR2 and MS0D

Model number:	**41.**	**42.**	**43.**	**44.**	**45.**
	Dependent variable				
Independent Variables	LTAR2	LTAR2	LTAR2	LTAR2	LTAR2
Constant	-0.067269** (0.028225)	-0.115158*** (0.031961)	-0.109160** (0.055130)	-0.106588** (0.052113)	-0.075586* (0.044305)
MS0D	0.012237 (0.049584)	-0.016908 (0.026514)	0.239487 (0.210963)	0.150347 (0.162574)	0.103466 (0.145809)
D_2000		0.423337** (0.176256)			
D_Crisis		-0.008431 (0.053696)			
D_2000*MS0D		0.388214 (0.523642)			
D_Crisis*MS0D		0.141740 (0.172852)			
D_TGT_Small			0.098716 (0.073010)		
D_TGT_Medium			-0.019053 (0.076367)		
D_TGT_Small*MS0D			-0.261499 (0.217468)		
D_TGT_Medium*MS0D			-0.020094 (0.304014)		
D_ACQ_Small				0.053153 (0.073915)	
D_ACQ_Medium				0.048894 (0.070492)	
D_ACQ_Small*MS0D				-0.140573 (0.203076)	
D_ACQ_Medium*MS0D				-0.155730 (0.172520)	
D_Rel_size_Small					0.007582 (0.058411)
D_Rel_size_Small*MS0D					-0.102837 (0.155097)
Model number:	**46.**	**47.**	**48.**	**49.**	**50.**
	Dependent variable				
Independent Variables	LTAR2	LTAR2	LTAR2	LTAR2	LTAR2
Constant	-0.104497 (0.077343)	-0.146068*** (0.054984)	-0.161812*** (0.059350)	-0.091712* (0.047139)	-0.128845 (0.088895)
MS0D	0.238678 (0.243150)	-0.093570 (0.204192)	0.031894 (0.177928)	-0.053314 (0.119205)	-0.148392 (0.298156)
D_2000		0.432521** (0.176703)	0.430736*** (0.112726)	0.419824** (0.175771)	0.429813*** (0.114132)
D_Crisis		0.017213 (0.055512)	0.009938 (0.087173)	-0.009364 (0.053821)	0.021248 (0.088413)
D_2000*MS0D		0.450310 (0.586511)	0.415116 (0.450546)	0.410707 (0.539665)	0.485767 (0.485640)
D_Crisis*MS0D		0.081500 (0.192060)	0.118410 (0.327786)	0.156841 (0.175597)	0.076391 (0.337537)
D_TGT_Small	0.116624 (0.105010)	0.099234 (0.073672)			0.095108 (0.111270)
D_TGT_Medium	-0.011643 (0.087686)	-0.033545 (0.072697)			-0.030660 (0.092695)

D_TGT_Small*MS0D	-0.277356 (0.306942)	0.061220 (0.205655)			0.031585 (0.345081)
D_TGT_Medium*MS0D	-0.026194 (0.324769)	0.258155 (0.282337)			0.251279 (0.357776)
D_ACQ_Small	-0.018083 (0.115189)		0.102761 (0.080219)		0.025784 (0.123518)
D_ACQ_Medium	0.013320 (0.080656)		0.029123 (0.074064)		0.001839 (0.084656)
D_ACQ_Small*MS0D	0.006615 (0.274239)		-0.044085 (0.219277)		0.010968 (0.289370)
D_ACQ_Medium*MS0D	0.020363 (0.222959)		-0.056083 (0.185864)		-0.033592 (0.232209)
D_Rel_size_Small	-0.021836 (0.081363)			-0.038282 (0.060778)	-0.044705 (0.087962)
D_Rel_size_Small*MS0D	-0.000960 (0.215915)			0.041326 (0.123130)	0.119273 (0.237760)

*P-value <0.1, **P-value < 0.05, ***P-value < 0.01
Note: Standard errors are in parentheses. LTAR2 is the long-term accumulated return calculated by using the method other than BHAR. Refer to the methodology section for more details. MS0D stands for the merger spread using target price at the announcement date. D_2000 is the dummy for the Dot com bubble. D_Crisis is the dummy for the 2008 financial crisis. TGT stands for target firms, and ACQ stands for the Acquirers. Rel_size stands for the relative size, which is the ratio of target market value to the acquirer market value. Models are adjusted for heteroskedasticity where necessary.

Table 9 Result - LTAR2 and MS1D

Model number:	**51.**	**52.**	**53.**	**54.**	**55.**
	Dependent variable				
Independent Variables	LTAR2	LTAR2	LTAR2	LTAR2	LTAR2
Constant	-0.064517** (0.027430)	-0.115575*** (0.031750)	-0.083608 (0.051610)	-0.104927** (0.049383)	-0.066061 (0.042566)
MS1D	-0.008545 (0.053745)	-0.027703 (0.017193)	0.069749 (0.271356)	0.352366 (0.296863)	0.046934 (0.172295)
D_2000		0.445011*** (0.160426)			
D_Crisis		0.014720 (0.051133)			
D_2000*MS1D		0.297855 (0.560959)			
D_Crisis*MS1D		-0.176007 (0.425890)			
D_TGT_Small			0.073487 (0.069516)		
D_TGT_Medium			-0.067819 (0.071611)		
D_TGT_Small*MS1D			-0.112399 (0.276994)		
D_TGT_Medium*MS1D			0.796246* (0.424362)		
D_ACQ_Small				0.052532 (0.070650)	
D_ACQ_Medium				0.048979 (0.068028)	
D_ACQ_Small*MS1D				-0.345906 (0.335654)	
D_ACQ_Medium*MS1D				-0.378341 (0.302561)	
D_Rel_size_Small					-0.000519 (0.056422)
D_Rel_size_Small*MS1D					-0.061433 (0.181361)
Model number:	**56.**	**57.**	**58.**	**59.**	**60.**
	Dependent variable				
Independent Variables	LTAR2	LTAR2	LTAR2	LTAR2	LTAR2
Constant	-0.078999 (0.073277)	-0.126445** (0.051061)	-0.155329*** (0.056730)	-0.091335** (0.046296)	-0.110810 (0.084408)
MS1D	0.125501 (0.339015)	-0.471641 (0.292950)	0.001928 (0.345937)	-0.106759 (0.138099)	-0.420656 (0.411910)
D_2000		0.431689*** (0.159210)	0.453190*** (0.106731)	0.440923*** (0.159932)	0.420793 (0.107668)
D_Crisis		0.032949 (0.053131)	0.031047 (0.080294)	0.013934 (0.051586)	0.035795 (0.081167)

D_2000*MS1D		0.517623 (0.606594)	0.319927 (0.464577)	0.337988 (0.577131)	0.610524 (0.515797)
D_Crisis*MS1D		-0.337711 (0.456279)	-0.212523 (0.849832)	-0.139549 (0.443485)	-0.310980 (0.865411)
D_TGT_Small	0.097244 (0.098790)	0.079648 (0.070405)			0.078058 (0.104452)
D_TGT_Medium	-0.059512 (0.082428)	-0.072389 (0.066639)			-0.070450 (0.086975)
D_TGT_Small*MS1D	-0.027040 (0.462447)	0.428471 (0.293193)			0.733234 (0.611479)
D_TGT_Medium*MS1D	0.894288* (0.484162)	1.259286** (0.540369)			1.531996 (0.599399)
D_ACQ_Small	-0.021892 (0.109697)		0.095545 (0.076638)		0.024219 (0.117120)
D_ACQ_Medium	0.022253 (0.077537)		0.020743 (0.071792)		0.006446 (0.081281)
D_ACQ_Small*MS1D	-0.253482 (0.501888)		-0.026086 (0.379596)		-0.488140 (0.582329)
D_ACQ_Medium*MS1D	-0.245669 (0.436671)		-0.033025 (0.349673)		-0.490648 (0.529292)
D_Rel_size_Small	-0.028582 (0.076919)			-0.038218 (0.059156)	-0.044052 (0.082868)
D_Rel_size_Small*MS1D	0.110510 (0.291725)			0.085127 (0.141083)	0.140396 (0.313598)

*P-value <0.1, **P-value < 0.05, ***P-value < 0.01
Note: Standard errors are in parentheses. LTAR2 is the long-term accumulated return calculated by using the method other than BHAR. Refer to the methodology section for more details. MS1D stands for the merger spread using target price one day after the announcement date. D_2000 is the dummy for the Dot com bubble. D_Crisis is the dummy for the 2008 financial crisis. TGT stands for target firms, and ACQ stands for the Acquirers. Rel_size stands for the relative size, which is the ratio of target market value to the acquirer market value. Models are adjusted for heteroskedasticity where necessary.

Table 10 Result - Extended research

Regression number:	**61.**	**62.**	**63.**	**64.**
	Dependent variable			
Independent Variables	MS0D	MS1D	MS0D	MS1D
Constant	0.178179*** (0.026779)	0.120274*** (0.021932)	0.013904 (0.050196)	0.030746 (0.024208)
D_CASH	-0.015482 (0.035328)	-0.050496* (0.028933)		
TGT_VOL			6.414792** (2.810141)	1.000123*** (0.258332)
MKT_VOL			-9.786468* (5.914825)	1.009529 (2.017296)

*P-value <0.1, **P-value < 0.05, ***P-value < 0.01
Note: Standard errors are in parentheses. MS0D stands for the merger spread using target price at the announcement date. MS1D stands for the merger spread using target price one trading day after the announcement date. D_Cash is 1 when the means of payment is cash 100%. The TGT_VOL is the target firm's stock return volatility before the announcement. MKT_VOL is the index return's volatility before the announcement. Models are adjusted for heteroskedasticity where necessary.

Table 11 Interpretation - Industry factor controlled

Regression number:	**65.**	**66.**	**67.**	**68.**
	Dependent variable			
Independent Variables	D_Completed	D_Completed	D_Completed	D_Completed
Constant	2.219515*** (0.110504)	2.214607*** (0.109671)	2.023810*** (0.093837)	2.020366*** (0.093115)
MS0D	-0.126934 (0.082805)		-0.150118* (0.080135)	
MS1D		-0.173653* (0.098873)		-0.228379** (0.113909)
D_2000	0.018171 (0.272965)	-0.155066 (0.251324)		
D_Crisis	-0.696202*** (0.217449)	-0.566646*** (0.219158)		
D_2000*MS0D	-3.273214*** (0.812964)	-2.882653*** (0.850729)		
D_Crisis*MS0D	-0.169346 (0.558363)	-1.926488** (0.982404)		

D_IndHT	-0.128698 (0.177236)	-0.113396 (0.170993)	-0.146274 (0.169140)	-0.113191 (0.166737)
D_IndHT* MS0D	0.129473 (0.446018)		-0.302329 (0.341556)	
D_IndHT* MS1D		0.015987 (0.562153)		-0.826508* (0.494856)

Regression number:	**69.**	**70.**	**71.**	**72.**
	Dependent variable			
Independent Variables	D_Completed	D_Completed	D_Completed	D_Completed
Constant	2.180595*** (0.098952)	2.175553*** (0.098029)	1.960772*** (0.078517)	1.961466*** (0.078211)
MS0D	-0.120572 (0.082697)		-0.159584** (0.079831)	
MS1D		-0.176210* (0.099030)		-0.291887** (0.147402)
D_2000	0.008796 (0.271986)	-0.153083 (0.250801)		
D_Crisis	-0.705277*** (0.216927)	-0.568476*** (0.219174)		
D_2000*MS0D	-3.262078*** (0.780324)	-3.006569*** (0.807896)		
D_Crisis*MS0D	-0.148785 (0.553287)	-2.001120** (0.978762)		
D_IndInt	0.084092 (0.351568)	0.031707 (0.349677)	0.019182 (0.334503)	-0.020097 (0.322887)
D_IndInt* MS0D	-0.032873 (0.577570)		-0.116438 (0.486516)	
D_IndInt* MS1D		0.586255 (1.143485)		0.078541 (0.681375)

*P-value <0.1, **P-value < 0.05, ***P-value < 0.01
Note: Standard errors are in parentheses. D_Completed is 1 when the deal is completed. MS0D stands for the merger spread using target price at the announcement date. D_2000 is the dummy for the Dot com bubble. D_Crisis is the dummy for the 2008 financial crisis. TGT stands for target firms, and ACQ stands for the Acquirers. Rel_size stands for the relative size, which is the ratio of target market value to the acquirer market value. Models are adjusted for heteroskedasticity where necessary.

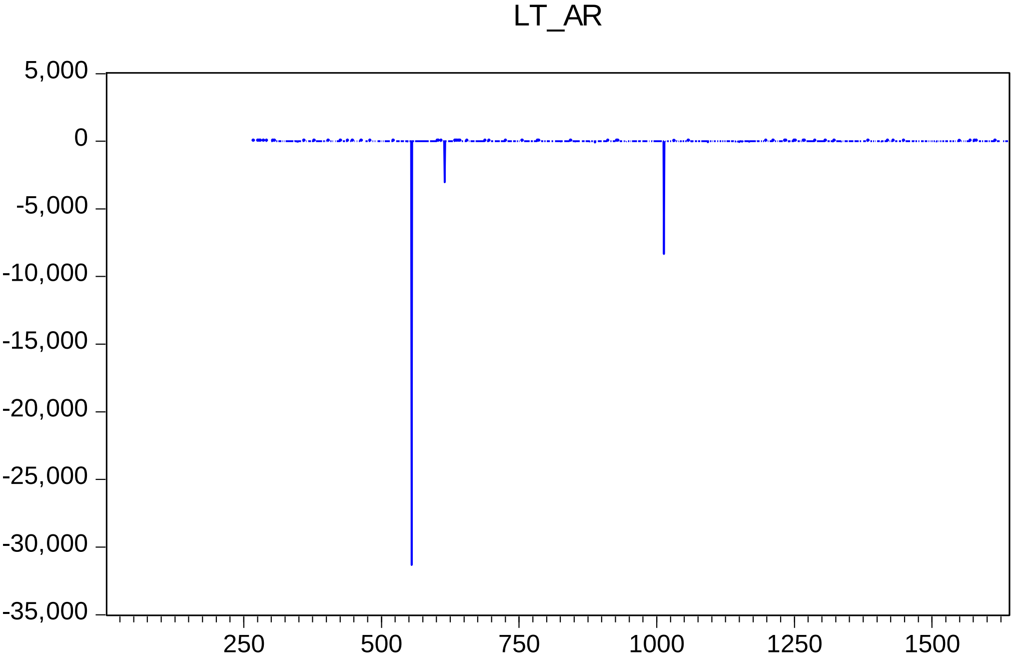
Table 12 Interpretation - sub-sampling

Regression number:	**73.**	**74.**	**75.**	**76.**	**77.**	**78.**
Period:	**2000 - 2004**		**2005 - 2009**		**2010 - 2013**	
	Dependent variable					
Independent Variables	D_Completed	D_Completed	D_Completed	D_Completed	D_Completed	D_Completed
Constant	1.901309*** (0.109299)	1.130579*** (0.058319)	1.071643*** (0.077292)	1.888993*** (0.137692)	2.428640*** (0.199609)	2.406095*** (0.194861)
MS0D	-0.088202 (0.101401)		-0.119202 (0.228359)		-0.493464 (0.434943)	
MS1D		-0.101524 (0.074232)		-1.701846*** (0.658198)		-0.593712 (0.592463)

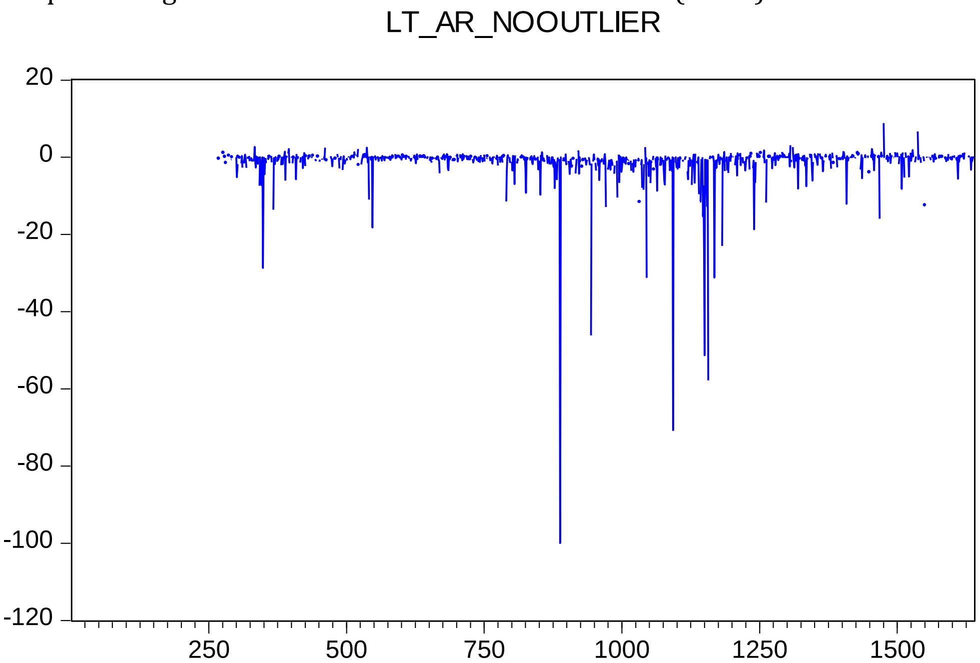
*P-value <0.1, **P-value < 0.05, ***P-value < 0.01
Note: Standard errors are in parentheses. D_Completed is 1 when the deal is completed. MS0D stands for the merger spread using target price at the announcement date. D_2000 is the dummy for the Dot com bubble. D_Crisis is the dummy for the 2008 financial crisis. TGT stands for target firms, and ACQ stands for the Acquirers. Rel_size stands for the relative size, which is the ratio of target market value to the acquirer market value. Models are adjusted for heteroskedasticity where necessary.

Graphs

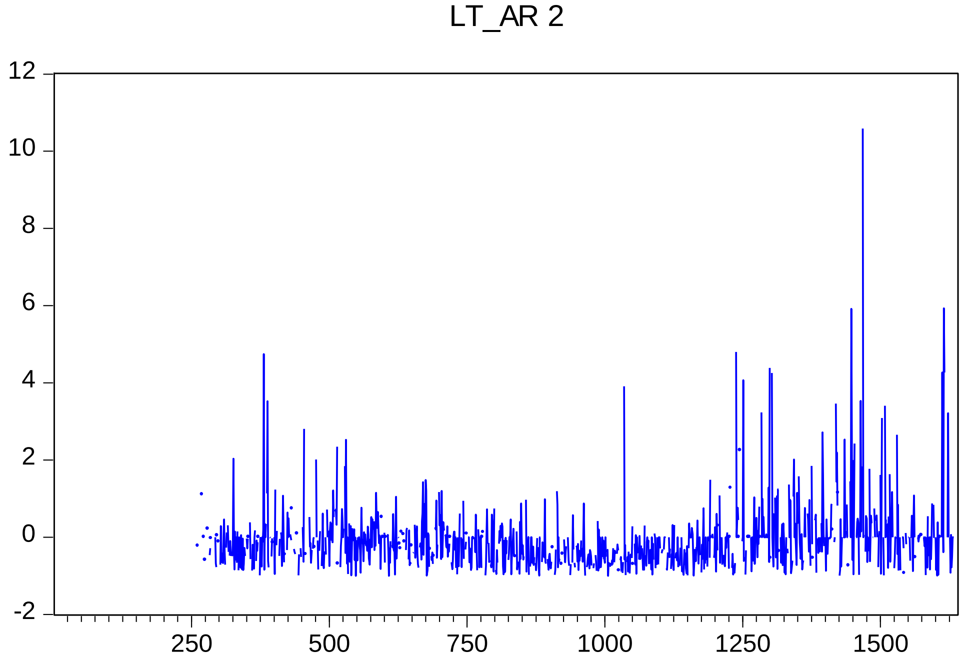
Graph 1. Long term abnormal return with outliers (LTAR with outliers)



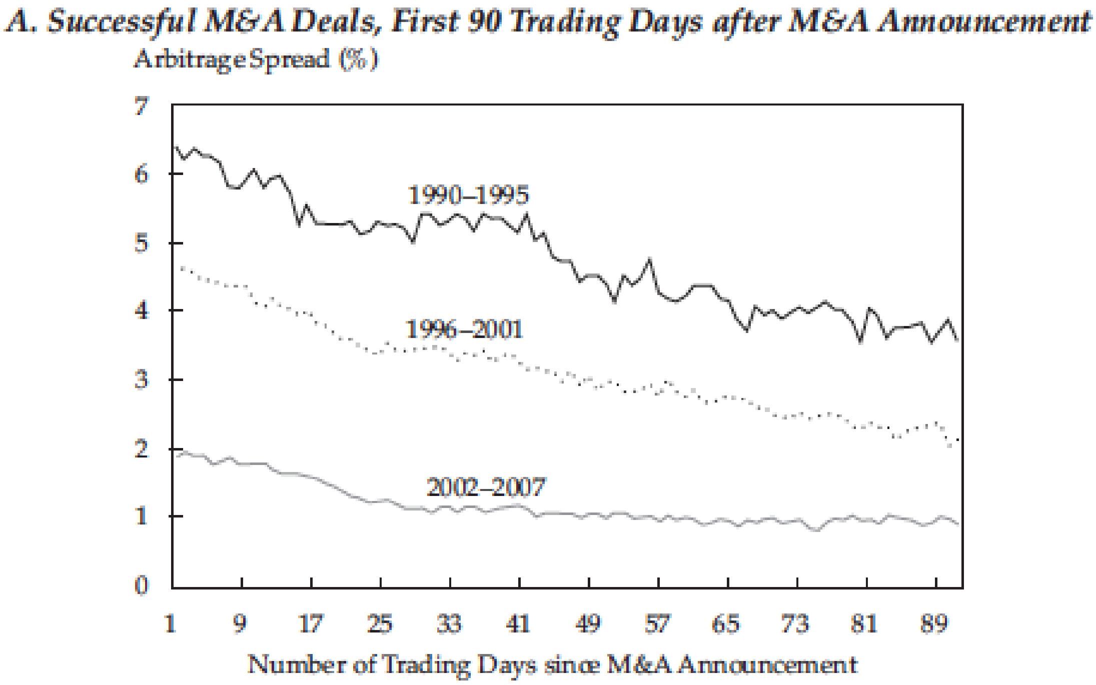
Graph 2. Long term abnormal return without outliers (LTAR)



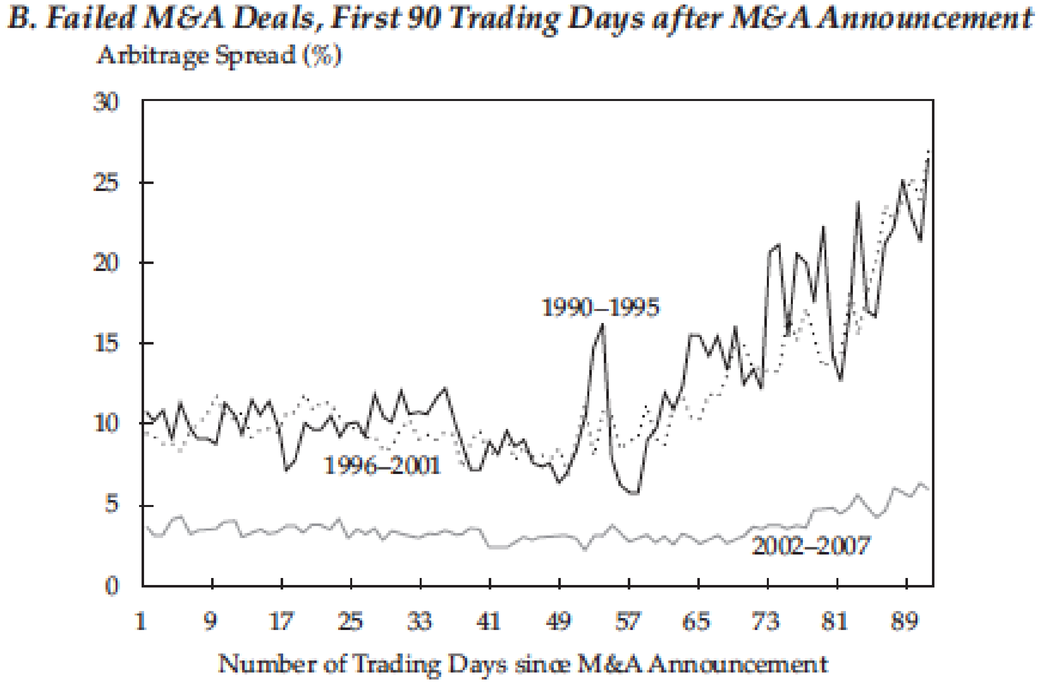
Graph 3. Long term abnormal return with outliers (LTAR2)



Graph 4 Median Arbitrage Spreads for M&A Deals, 1990-2007 (see Jetley and Ji, 2010)



Graph 5 Median Arbitrage Spreads for M&A Deals, 1990-2007 (see Jetley and Ji, 2010)



Appendix B

How to run and interpret a logistic regression model (Hill, Griffiths, & Lim, 2012)

In order to derive the function that gives the change in probability of the dependent dummy variable having a value of 1 when the value of an independent variable *x* increases by 1, one must first understand the following formulae.

Logistic cumulative distribution function

The probability that dependent dummy variable takes a value 1 at a certain value of *x* is:

$$p = \Lambda(l) = \Lambda(\beta_1 + \beta_2 \mathrm{x}) = \frac{1}{1 + e^{-(\beta_1 + \beta_2 \mathrm{x})}} = \frac{exp(\beta_1 + \beta_2 \mathrm{x})}{1 + exp(\beta_1 + \beta_2 \mathrm{x})} \tag{19}$$

The probability that dependent dummy variable takes a value 0 at a certain value of *x* is:

$$1 - p = 1 - \Lambda(l) = 1 - \frac{exp(\beta_1 + \beta_2 \mathrm{x})}{1 + exp(\beta_1 + \beta_2 \mathrm{x})} = \frac{1}{1 + exp(\beta_1 + \beta_2 \mathrm{x})} \tag{20}$$

Logistic probability density function

Differentiating the cumulative distribution function one can change the function for the change in probability that dependent dummy variable takes a value 1 when *l* increases by 1:

$$\frac{dp}{dl} = \lambda(l) = \lambda(\beta_1 + \beta_2 \mathrm{x}) = \frac{e^{-(\beta_1 + \beta_2 \mathrm{x})}}{(1 + e^{-(\beta_1 + \beta_2 \mathrm{x})})^2} \tag{21}$$

Interpreting the logit estimates

Now it is possible to derive the function using the method called 'the chain rule of differentiation'. The Chain rule looks like the following:

$$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx} \tag{22}$$

Using $\frac{dp}{dl}$, one can relate the *p* and *x* as thus:

$$\frac{dp}{dx} = \frac{dp}{dl} \times \frac{dl}{dx} = \lambda(l) \times \beta_2 = \frac{e^{-(\beta_1 + \beta_2 \mathrm{x})}}{(1 + e^{-(\beta_1 + \beta_2 \mathrm{x})})^2} \times \beta_2 \tag{23}$$