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Institutions and Risk Arbitrage

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Abstract
   Herein we report that the target firm's pre-merger institutional owners are likely to take a passive role in obtaining an arbitrage opportunity raised by an offer premium. Our test results reveal that 1) the target's pre-merger institutional ownership (proxied by the number of institutional owners) tends to negatively associate with the target stock's idiosyncratic risk during the merger attempt period. 2) Pre-merger institutional ownership insignificantly relates to the chance of receiving sweetened offer revisions and merger completion. 3) The pre-merger institutional ownership also negatively and nonlinearly relates to the performance of risk arbitrage, depending on merger success and failure. These findings confirm the passive role of pre-merger institutional owners in determining the performance of risk arbitrage. Lastly our profitability estimation model based on these findings can assist risk arbitrageurs to set up their portfolios.

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1. Introduction

  Recently the literature has explored the role of institutional owners in explaining stock price movements (Kahn and Winston, 1998, Maug, 1998 and *etc)*. Relatively little research, however, has focused on how institutional owners influence risk arbitrage performance. Risk arbitrage refers to a popular Wall Street trading strategy seeking to exploit favorable price disparities embedded in offer premiums (the amount by which the offered consideration exceeds the target's market price) created by takeover attempts and the market's reaction there to.

  Baker and Savasoglu (2002) report that risk arbitrage tends to generate an annual abnormal return of 7.2 to 10.8%. Merger completion (risk), helping realize those favorable price disparities or offer premiums, is one major risk factor determining risk arbitrage returns. The target size also positively relates to the returns. Branch and Yang (2003, 2006) find that a chance of merger completion positively relates to cash payment method in a merger attempt. The performance of risk arbitrage also associates with merger types and payment methods. Mitchell and Pulvino (2001) find that the annual abnormal return of risk arbitrage averages 4% after considering transaction costs. Risk arbitrage returns are significantly lower in down markets, indicating that return performance is nonlinear with respect to market conditions. They also show that a down market prior to a merger announcement tends to relate negatively to the chance of merger completion. Hsieh and Walkling (2005) explore the roles of active risk arbitrageurs, defined as institutions that, during a merger attempt, increase their ownership of the targets. They find that changes in risk arbitrageurs' ownership from the quarter (t-1, here, t is the quarter of the merger announcement) to the quarter (t) tend to relate positively to merger completion, bid premium, offer revision, and the return for investors, showing active risk arbitrageurs tend to influence the merger outcome and terms. And they show that risk arbitrageurs and regular institutional investors have different trading patterns. Institutional investors tend to purchase stocks, following the positive stock price return regardless of merger announcement whereas risk arbitrageurs are likely to purchase target stocks after the merger announcement.

  Extending these findings, we explore how pre-merger institutional ownership (t-1, here t is the quarter of the merger announcement) relates to the performance of passive risk arbitrage during the merger attempt period and then possible implications.

  Regarding the role of pre-merger institutional ownership during the merger attempt, two competing hypotheses are explored in this paper. One is an active role and the other is a passive role. The active role argument is based on institutional owners' monitoring and reducing information asymmetry. In literature, it has been noticed that institutional owners tend to monitor their firms in order to try to influence managerial decisions, reduce the potential agency problems and thereby enhance the performance of their investments [Kahn and Winston (1998) and Maug (1998)]. This monitoring would reduce information asymmetry regarding growth potential in the market and encourage institutional owners to bargain against an offer price which is believed to not reflect their expectation about growth or possible merger synergy. Thus well informed pre-merger institutional owners would positively relate to idiosyncratic risk which supposedly reflects information flows. Their ownership would relate to favorable equity price movement and then improvement in the risk arbitrage performance. Furthermore their

confidence on firm valuation would not relate them to price pressure/dramatic losses in risk arbitrage even though a merger attempt fails.

On the other hand the passive role argument is based on an arbitrageur's position simply extracting an offer premium after the (public) merger announcement. Pre-merger institutional owners would have less accessibility to information regarding their firms than managers who directly involve in forming merger terms. They may be limited to reduce information asymmetry regarding firm valuation. Short swing, inside trading issues, merger termination fees, legal costs from possible law suits, etc would also limit pre-merger institutional owners to disseminate information or to influence on the revision of merger terms or outcomes. Thus pre-merger institutional owners would simply support any merger attempt with a decent offer premium for profits. If they can not obtain the decent offer premium, they will close their whole or partial holding positions. These suggest that pre-merger institutional owners would have no impact on or negatively relate to the idiosyncratic risk around a merger attempt date. When the merger attempt fails and the proposed offer premium disappears, they will close their whole or partial positions, generating short term price pressure. However this price pressure would not be noticed in successful merger attempts. This would cause a nonlinear impact of pre-merger institutional ownership on the performance of risk arbitrage.

Using in-sample data (461 merger attempts during 1993 to 2006), we test these arguments. Firstly we explore the impacts of various pre-merger institutional ownership variables (such as the numbers of institutional owners, percentage level, and percentage change in their ownership, as well as block institutions holding at least 5% during the quarter t-1) on the idiosyncratic risk during the merger attempt period. The relation to idiosyncratic risk tells whether pre-merger institutional ownership tends to generate (private) information flow. Secondly we test the impact of pre-merger institutional ownerships on the chances of receiving offer revisions and merger completion. Under the active (passive) role hypothesis, pre-merger institutional owners would positively (negatively) relate to idiosyncratic risk during the merger attempt period and significantly (insignificantly) influence the chances of receiving offer revisions and merger completion. Thirdly, using an annualized excess return of risk arbitrage as a performance measurement, we explore how pre-merger institution ownership would influence the performance of risk arbitrage and whether its influence differs depending on merger success or failure. The active (passive) role argument suggest that pre-merger institutional owners would positively (negatively) relate to the performance of risk arbitrage (especially in failed merger attempts). Lastly using stepwise regressions with in-sample data during the period of 1993 to 2006, we develop one profitability estimation model based on our findings. In order to test its effectiveness, we explore the performance of four portfolios set up by the model, using annualized excess return measurement and buy and hold risk arbitrage (BHRA) strategy with out of sample date (42 merger attempts during the year of 2007).

Our test results reveal that the target's pre-merger number of institutional owners tends to reduce the target stock's idiosyncratic risk during the merger attempt period. Though not shown in Tables, this result is consistent regardless of whether or not a merger attempt is successful. Pre-merger institutional owners are found not to significantly relate to the chance of receiving sweetened offer revisions and merger completion. The pre-merger number of institutional owners also negatively and

nonlinearly relate to the performance of risk arbitrage, depending on merger success and failure. The significantly negative impact on the performance of risk arbitrage is largely found in the failed merger attempts whereas insignificant impact is noticed in successful merger attempts. These findings indicate that pre-merger institutional owners are likely to take a passive role to extract an offer premium around the merger attempt period. The number of pre-merger institutional owners would be one of good indicators for potential short term price pressure and losses to risk arbitrage when a merger attempt is likely to fail. In addition, other conditional variables such as pre-merger G-Index (the number of provisions limiting shareholders' rights, Gompers *et al,* 2003) and Initial Spread [(an offer price - a target's market price one day after the merger announcement) / a target price one day after the merger announcement] also nonlinearly relate to the performance of risk arbitrage. They have significantly positive impacts on the risk arbitrage performance in successful merger attempts whereas negative impacts in failed merger attempts. This nonlinear influence of several variables suggests that we need to be careful in doing the determinant analysis to risk arbitrage.

Finally we find that Sharpe ratios of four buy and hold risk arbitrage (BHRA) portfolios of out of sample tend to increase from -7.3601 to 22.6981 as the range of estimated profitability increases from -10% to more than 20%. It shows the effectiveness of newly developed model.

The remainder of our paper is organized as follows. Section 2 contains our literature review and hypotheses. The sample, variables and methods are described in section 3. We present our test results in Section 4. In section 5, we further explore one possible implication based on our findings. Lastly, we report our conclusion and discussion in section 6.

2. Literature Review and Hypotheses

Information asymmetry and information flow have been found to explain stock price movement and valuation. Myers and Majiluf (1984) argue that under information asymmetry, an acquirer, whose stock is overvalued, prefers to finance mergers and acquisitions with stock rather than cash. Hansen (1987) demonstrates theoretically that an acquirer who has less information about the target's value than the target itself, would prefer financing with equity in order to share risk with target shareholders in the post merger period. These information asymmetry arguments have helped explain how payment methods relate to the targets' and acquirers' stock price movements around the merger announcement. In addition, Easley, Hvidkjaer and O'Hara (2002) explore the impact of information-based on trading and find that information asymmetry affects asset pricing. Easley and O'Hara (2004) show theoretically that the cost of capital and the relevant expected return depend upon how well the private information is disseminated, indicating potential impacts of information asymmetry on the valuation. Thus information asymmetry regarding the target firm or/and post merger synergy would be likely to generate different evaluation for the firm. It would cause arguments regarding the reasonability of the offer price and possible arbitrage opportunity resulting from fluctuating target stock price.

Several scholars indicate that institutional ownership somehow relates to information asymmetry regarding the firm valuation. Kahn and Winston (1998) and Maug (1998) argue that institutions' two primary roles are monitoring/intervention and

trading with information. According to the monitoring/intervention view, institutions monitor their holdings in order to try to influence managerial decisions, reduce the potential agency problems and thereby enhance the performance of their investments. On the other hand, according to the short trading argument, institutions use (inside) information in order to enhance their own profits, perhaps at the expense of other shareholders. Smith (1996), Hartzell and Starks (2003), Cremers and Nair (2005), Borokhovich, Brunarski, Harman, and Parrino (2006), *etc* provide empirical evidence for the monitoring/intervention role of various types of institutions such as pension funds. And Chen, Harford and Li (2007) find that the benefit of monitoring tends to increase with the position's size and length of holding. They do not find that institutions engage in short term trading for their own profits but do find that the bidder's institutional ownership tends to decline prior to value reducing merger announcements.

These monitoring/intervention and short trading arguments suggest possible roles of pre-merger institutional owners in determining the risk arbitrage profitability after the (public) merger announcement: active and passive roles, respectively. The active role suggests that the better informed pre-merger institutional owners would have confidence on their firm's growth potential and synergy contribution. They would actively provide positive information regarding their firm valuation in order to improve the offer price or the chance of receiving sweetened offer prices and merger completion. Pre-merger institutional owners would positively relate to the risk arbitrage profitability. Furthermore their confidence would not lead pre-merger institutional owners to give up their holding positions even though a merger attempt is likely to fail.

On the other hand the passive role suggests that pre-merger institutional owners would focus on obtaining arbitrage generated by the proposed offer premium. They would have less accessibility to information regarding their firms than managers who directly develop merger terms with a counter party. Short swing rule, inside trading issues, potential legal costs from possible law suits, and etc would further limit them to provide information. After the merger announcement, pre-merger institutional owners would not actively bargain against merger terms in order to increase the proposed offer premium. Their passive profit-oriented behavior would generate price pressure when a merger attempt is unlikely to succeed and to provide the proposed offer premium. Price pressure would cause losses to risk arbitrage. Aligned with this passive role argument, Shelifer and Vishny (1997) theoretically points that institutional owners tend to focus on the short term investment profits due to capital constraints. Froot, Scharfstein, and Stein (1992) and Hirshleifer, Subrahmanyam, and Titman (1994) show that institutional owners tend to move together in selling and buying securities with the same information regarding the firm's value.

These active and passive role arguments suggest several testable hypotheses regarding information flow, chances of receiving offer revision and merger completion, and the performance of risk arbitrage. In literature Ross (1989) and Ferreira and Laux (2007) argue that private (inside) information or information flow would positively relate to idiosyncratic risk. Thus under an active (passive) role argument, 1) *pre-merger institutional ownership would increase (decrease) idiosyncratic risk during the merger attempt period, 2) pre-merger institutional ownership would increase (not increase) the chance of receiving offer revision and merger completion, and 3) pre-merger institutional*

ownership would positively (nonlinearly) relate to the performance of risk arbitrage depending on merger completion or failure.

3. Sample, Variable and Method

3.1. Sample Description

In order to assemble a sample for our study, we collected relevant information on 503 friendly and hostile US takeover attempts covering the 1993 - 2007 period, using Security Data Corporation (SDC), Investor Responsibility Research Center (IRRC), 13F, CRSP, COMPU STAT, and Lexis-Nexis. Table 1 reports information for our sample observations. Takeover attempts have an average transaction size of $4,313.83 million with an average takeover attempt period of 144 days. Ninety one percent of the sample merger attempts are completed. Fifteen percent receive offer revisions. Hostile takeover attempts (defined as either hostile or unsolicited in SDC) account for 13% of this sample. Tender offer and stock payment merger attempts represent 14% and 26% of the sample, respectively. Seventy and twenty one percent of the sample have termination fee options for targets and bidders, respectively. The target's market value (target stock price × number of shares outstanding for the last day of the quarter prior to the merger announcement date) and target's current ratio (current assets/current liabilities for the quarter prior to the merger announcement date) are $3,218.74 million and 0.38, respectively. The bidder has undertaken an average of 5.72 merger attempts during the three years prior to the new takeover effort.   Seven percent of sample shows pre-merger ownership by a bidder. An average G-Index is 9.27 (the number of provisions limiting shareholders' rights, Gompers *et al,* 2003) in the period of one or two years prior to the takeover attempt announcement.

3.2. Dependent Variables: Idiosyncratic risk and Risk arbitrage excess return

We measure a target's stock's idiosyncratic risk during the merger attempt in order to implement our test of the first hypothesis. Following Ferreira and Laux (2007), we use the market model (Equation (1)) to estimate the idiosyncratic risk unexplained by the market.

$$r^T_{id} = \alpha_i + \beta_i r_{md} + e_{id} \tag{1}$$

Where r^T_{id} means a daily return of a target firm's stock in a takeover attempt i at a date d; r_{md} is a daily value weighted CRSP market return at a date d.

Using the logistic transformation of R-square (R_i^2) of the market model, idiosyncratic risk is measured below,

$$ID_i \equiv \log[(1 - R_i^2)/R_i^2] \tag{2}$$

Where ID_i refers to the (relative) idiosyncratic risk of the target firm's stock in merger attempt i during the merger attempt period starting one day after the merger announcement; R_i^2 refers to the R-square of the market model (Equation (1)) with a target firm's stock return in merge attempt i during the merger attempt period.

Table 1. Sample Description

Transaction size (Million$)	4,313.83
	(8,620.69)
Merger period (Days)	144
Merger completion	0.91
Offer revision	0.15
Hostile takeover	0.13
Tender offer	0.14
Stock payment	0.26
Termination fee for targets	0.70
Termination fee for bidders	0.21
Target market value (Million $)	3,218.74
	(6,655.46)
Target current ratio	0.38 (0.26)
Merger experience (#) of the bidder	5.72 (6.73)
Pre-merger ownership of the bidder	0.07
Average G-Index (t-1)	9.27 (2.713)

This Table shows sample description about 503 merger attempts during 1993 to 2007. Here t, t-1 and t-2 mean quarter of merger announcement, one quarter prior to the merger announcement, and two quarters prior to merger announcement, respectively. Hostile takeover, tender offer, cash payment, termination fee for targets, termination fee for bidders, merger completion, offer revisions, or pre-ownership of the bidder means a ratio of each count to 503. GIndex is the number of provisions limiting shareholders' rights (Gompers, et al, 2003) prior to the merger announcement.

We also measure the performance of risk arbitrage, following Hsieh and Walkling (2005). [1]   They reference two types of risk arbitrage return measurements, depending on the payment methods – cash or stock payment. In a cash offer, risk arbitrageurs are assumed to set up only a long position in the target's stocks. With a stock offer, however, risk arbitrageurs are assumed to establish a long position in the target's stock coupled with a short (hedging) position in the bidder's stock. This structural difference stems from the need in a stock offer to hedge the value of the anticipated receipt of the bidder's shares against market fluctuations. A cash offer needs no hedge. We assume that the trading position is established one day after the takeover announcement and held until its consummation/termination date. First we estimate the daily excess returns of risk arbitrage for cash (Equation (3)) or stock offers (Equation (4)). [2]   Then the daily compounded return during the day after the takeover announcement through the consummation/termination date is estimated (Equation (5)).   The compounded return measures the accumulated excess return for the merger attempt period.

$$r_{id} = (P_{id}^T + D_{id}^T)/P_{id-1}^T - 1 - r_{fd} \qquad (3)$$

Where r_{id} is the daily return of risk arbitrage for takeover attempt i at a date d; P^T_{id} is the target's stock price in takeover attempt i at a date d; P^T_{id-1} is the target's stock price in

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[1] They are assumed to borrow at the risk free rate in order to set up a long position.

[2] If both stock and cash payments are used, we set up a long position in the target stock and a corresponding short position in the bidder stock in order to cover the stock portion of the payment.

takeover attempt i at a date d-1; D^T_{id} is the dividend payment for the target's stock in takeover attempt i at a date d; r_{fd} is the three month T-bill rate/365.

$$r_{id} = (P^T_{id} + D^T_{id})/P^T_{id-1} - 1 - r_{fd} - [(P^A_{id} + D^A_{id})/P^A_{id-1} - 1 - r_{fd}] \times \delta \times P^A_{id-1}/P^T_{id-1} \qquad (4)$$

Where P^A_{id} is the acquirer's stock price in takeover attempt i at a date d; P^A_{id-1} is the acquirer's stock price in takeover attempt i at a date d-1; D^A_{id} is the dividend payment for the acquirer's stock in takeover attempt i at a date d; δ is the exchange ratio.

Table 2. The Initial Spread, Performance of Risk Arbitrage, and Idiosyncratic Risk

	Success	Failure	Total
Initial Spread	0.0472	0.0662	0.0489
	(0.1373)	(0.1203)	(0.1360)
Excess Return	0.0580	-0.1191	0.0414
	(0.1241)	(0.2571)	(0.1506)
Annualized Return	0.1654	-0.9325	0.0628
	(0.3507)	(2.5567)	(0.9016)
Idiosyncratic risk	2.8830	3.4183	2.9330
	(2.1432)	(2.5865)	(2.1910)
Average number of institutional owners (t-1)	154	148	154
	(115)	(146)	(118)
Average number of block institutional owners (t-1)	2	2	2
	(1)	(2)	(1)
Average percentage ownership of institutional owners (t-1)	0.6333	0.6568	0.6355
	(0.2299)	(0.2263)	(0.2294)
Average percentage ownership of block institutional owners (t-1)	0.1288	0.1627	0.1320
	(0.1307)	(0.1698)	(0.1349)
Average percentage ownership change of institutional owners (t-2 to t-1)	0.0797	-0.0141	0.0709
	(1.5464)	(0.1747)	(1.4729)
Average percentage ownership change of block institutional owners (t-2 to t-1)	0.0571	-0.0037	0.0513
	(0.3852)	(0.2451)	(0.3743)

This Table shows initial spread [(an offer price - a market price of the target one day after a merger announcement)/a market price of the target one day after a merger announcement], excess return (Equation (5)) of risk arbitrage, annualized excess return (Equation (5) /merger period * 365), idiosyncratic risk (Equation (2)), and various pre-merger ownerships of sampled 503 merger attempts during the period of 1993 to 2007. Standard errors are in parentheses.

$$r_i = (\prod_{d=1}^{E}[1 + r_{id}] - 1) \tag{5}$$

Where r_i is the daily compounded risk arbitrage excess returns for takeover attempt i; E is the consummation or termination date.

Table 2 shows our measurements. An average initial spread [(an offer price - a market price of the target one day after a merger announcement)/a market price of the target one day after a merger announcement] of samples is 4.89%. The average initial spread of successful merger attempts tends to be lower than that of failed merger attempts. The risk arbitrage trading strategy generates an average excess return of 4.14% (annualized excess return of 6.28%). Successful merger attempts, on average, generate an excess return of 5.80% (annualized excess return of 16.54%) whereas failed merger attempts produce an excess return of -11.91% (annualized excess return of -93.25%). The average idiosyncratic risk is 2.9330 (standard deviation = 2.1910) during the sample period. Successful merger attempts have an idiosyncratic risk of 2.8830 (standard error = 2.1432) lower than an idiosyncratic risk of 3.4183 (standard error = 2.5865) of failed merger attempts.

3.3. Proxy variables for pre-merger institutional ownership

Hartzell and Starks (2003), Cremers and Nair (2005), and Chen, Harford and Li (2007) show the monitoring benefits from the various types of institutional owners and sizes or changes in their ownerships. Thus we consider several proxies for target's pre-merger institutional ownership during the quarter t-1 (Here quarter t refers to the quarter in which the merger announcement occurs); 1) pre-merger percentage ownership (POIH), and 2) pre-merger percentage ownership change (ΔPOIH). However, it is not clear whether the size (percentage ownership) is an effective proxy for information dissemination during the limited merger attempt period because the larger the owner' size, the more regulated his or her behavior. Thus we include the number of pre-merger institutional owners (NIH) that is believed to better indicate information dissemination on the top of the capability of institutions' monitoring/intervention and possible price pressure during the merger attempt period. Furthermore in order to explore the internal ownership structure, we consider block institutional ownership variables (at least 5% ownership); 1) the number of block institutional owners (NBIH), and 2) percentage ownership of block institutions (POBIH). If these proxies positively relate to the idiosyncratic risk, the chance of receiving offer revisions or merger completion, and the risk arbitrage performance, pre-merger (block) institutional ownership could be believed to take an active role during the merger attempt period.

Table 2 shows that during the quarter prior (t-1) to the merger announcement quarter (t), the target has had an average of 154 pre-merger institutional owners (representing 63.55% of ownership). Successful merger attempts have an average of 154 pre-merger institutional owners (representing 63.33% of ownership) whereas failed merger attempts have an average of 148 pre-merger institutional owners (representing 65.68% of ownership). The average numbers of pre-merger block institutional owners (holding at least 5% of the ownership) is 2 (representing 13.20 % of ownership). Both successful and failed merger attempts have an average of 2 pre-merger block institutional

owners (representing 12.88% and 16.27% of ownership, respectively).   During the quarter (t-1), the ownerships of institutions and block institutions have increased by 7.09%, and 5.13%, respectively.   In successful merger attempts, the ownerships of pre-merger institution and block institutional owners increase by 7.97% and 5.71% whereas in failed merger attempts, they have decreased by 1.41% and 0.37%, respectively.

3.4. Conditional variables

Additional conditional variables relevant to the offer premium or the performance of risk arbitrage are considered for hypothesis tests. Baker and Savasoglu (2002) find that target size is positively related to the risk arbitrage performance. We consider an announced transaction size (TS) as a size variable. Mitchell and Pulvino (2001) show that a pre-merger down market condition reduces the chance of merger completion, implying a negative impact on risk arbitrage performance. Pre-merger market condition (PREMK), the daily compounded value weighted CRSP market returns during 30 days prior to the takeover announcement, is considered. Betton and Eckbo (2000) argue that the bidder's pre merger ownership position in the target is negatively related to the offer premium. A dummy variable for pre merger ownership (PREOW) is considered. Officer (2003) argues that termination fee options would enhance the likelihood of merger completion. Branch and Yang (2006) show that payment methods tend to impact the performance of risk arbitrage. Thus dummy variables for the existence of a termination fee option for the target (TFT), for the bidder (TFB) and stock payment (ST) are considered. Delong and DeYoung (2007) find that past experience generally helps bidders learn how to extract synergy more effectively. Past merger experience of the bidder would also influence the offer premium. The number of merger attempts prior to a new merger announcement during the last three years (ME) is considered. Finally, a dummy variable for an initial tender offer (IT) reflecting hostility, G-Index (the number of provisions limiting shareholders' rights, Gompers *et al,* 2003), and the targets' liquidity (TLI, current assets/current liabilities for the quarter prior to the merger announcement date) are considered.

3.5. Methods

We divide our data into in sample and out of sample categories. Our in sample part contains 461 takeover attempts covering the 1992-2006 period. Our out of sample data set contains 42 takeover attempts for the 2007 period. We use the in sample data set to test our hypotheses and build our model. We employ OLS regressions with idiosyncratic risk (Equation (2)) and annualized excess return (Equation (5) / merger period $\times$ 365) as dependent variables in order to do our hypothesis tests, respectively. Here an annualized excess return does not represent actual annualized excess return but is interpreted as a standardized daily profitability reflecting the merger period. In order to mitigate possible endogenous issues with dependent variables, proxies and conditional variables prior to or on the merger announcement date are used.   And logistic regressions with dummy variables for offer revisions, and merger completion as dependent variables are used to test the impact of pre-merger institutional ownership on the chances of offer revisions, and merger completion. Lastly, for an implication purpose, a step wise regression with entry p-value of 0.2 is estimated in order to develop a simple profitability estimation model. Then we generate four buy and hold risk arbitrage (BHRA) portfolios depending

on the range of estimated profitability by the model. Here we assume that long (in target stocks) and short position in (acquirer stocks) of risk arbitrage will be held from one day after the merger announcement to the last day of merge consummation or failure. Each merger attempt receives equal weight when a (BHRA) portfolio is set up. Then Sharpe ratios of four buy and hold risk arbitrage (BHRA) strategy with out of sample piece are explored in order to confirm the effectiveness of the model.

4. Test Results

4.1.Pre-merger institutional ownership, Idiosyncratic risk and Chances of offer revisions and merger completion.

Table 3 shows test results regarding the relationship of pre-merger institutional ownership to information dissemination (Models (1) and (2)) and chances of offer revisions (Model (3) and (4)) and merger completion (Models (5) and (6)). Models (1) and (2) use idiosyncratic risk as a dependent variable. Models (3) and (4) have a dummy for offer revision (SW) as a dependent variable. Models (5) and (6) have a dummy for merger completion (MC) as a dependent variable. The test results reveal that only the target's number of pre-merger institutional owners (NIH, $\beta = -0.0043$) significantly and negatively relate to the idiosyncratic risk during the merger attempt period (Model (1) and Model (2)). However we can not find the significant influence of other ownership variables including block institutional ownership. In logistic regression tests both pre-merger institutional and block institutional ownership variables do not significantly relate to the chances of receiving offer revisions and merger completion. These findings suggest that pre-merger institutional ownership is unlikely to relate to information dissemination and to influence on the revision of the proposed merger terms and merger outcomes.

Table 3. Pre-merger Institutional Ownership, Idiosyncratic risk, and Chances of Offer Revisions and Merger Completion.

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Intercept	3.3847***	2.7310***	-2.1829***	-2.0770***	2.3402***	2.7068***
	(0.3067)	(0.2239)	(0.4244)	(0.2868)	(0.5067)	(0.3524)
NIH	-0.0043***		0.0003		0.0009	
	(0.0008)		(0.0010)		(0.0015)	
POIH	0.4039		0.8572		-0.4272	
	(0.4816)		(0.6277)		(0.7738)	
ΔPOIH	-0.0942		-1.0387		0.7475	
	(0.0656)		(0.8092)		(0.9935)	
NBIH		0.0475		0.1058		-0.1510
		(0.1091)		(0.1297)		(0.1533)
POBIH		1.3006		0.9649		-1.0854
		(1.1342)		(1.3289)		(1.5933)
ΔPOBIH		-0.1486		0.4285		0.5661
		(0.3071)		(0.3239)		(0.6732)
Adj R-Square	0.0517	0.0024	0.0187	0.0175	0.0065	0.0260

This Table reports the hypothesis test results (OLS) with 461 merger attempts during 1993 to 2006. Dependent variable is the annualized excess return of risk arbitrage from Equation (5)/merger period*365.

NIH and NBIH mean the target's numbers of pre-merger institutional owners and pre-merger block institutional owners who have at least 5% ownership during the quarter (t-1) prior to the merger announced quarter (t), respectively. POIH and POBIH mean the target's percentage ownerships of pre-merger institutional owners and pre-merger block institutional owners during the quarter (t-1) prior to the merger announced quarter (t). ΔPOIH and ΔPOBIH means the target's percentage changes of ownership in pre-merger institutional owners and pre-merger block institutional owners during the quarter (t-1).
1)***, ** and * means significance at 99%, 95% and 90% confidence intervals, respectively.
2) Standard errors are in parenthesis.

4.2.Pre-merger institutional ownership and Risk arbitrage performance

Table 4 show how pre-merger institutional ownership associates with the performance (annualized excess return) of risk arbitrage. The test results reveal that only the number of pre-merger institutional owners (NIH, β = -0.0012) significantly and negatively impact the performance (annualized excess return) of risk arbitrage at α = 1%.

Table 4. Pre-merger Institutional Ownership and Risk Arbitrage Performance

	Model (7)	Model (8)	Model (9)	Model (10)
Intercept	0.1406	0.0858	0.0325	-0.9352***
	(0.1352)	(0.1014)	(0.0917)	(0.1476)
NIH	-0.0012***			-0.0012***
	(0.0004)			(0.0003)
POIH	0.1694			
	(0.2124)			
ΔPOIH	-0.0029			
	(0.0289)			
NBIH		-0.0659		
		(0.0494)		
POBIH		0.7937		
		(0.5135)		
ΔPOBIH		0.0382		
		(0.1391)		
ΔNIHM			0.0128	
			(0.0186)	
ΔPOIHM			0.8049**	
			(0.3356)	
ΔPOBIHM			0.4927**	
			(0.2345)	
IS				-0.0345
				(0.2842)
MC				1.2251***
				(0.1423)
SW				0.4422***
				(0.1098)
Adj R-Square	0.0162	0.0000	0.0393	0.1701

This Table reports the hypothesis test results (OLS) with 461 merger attempts during 1993 to 2006. Dependent variable is the annualized excess return of risk arbitrage from Equation (3)*365/merger period.

NIH and NBIH mean the target's numbers of pre-merger institutional owners and pre-merger block institutional owners who have at least 5% ownership during the quarter (t-1) prior to the merger announced quarter (t), respectively. POIH and POBIH mean the target's percentage ownerships of pre-merger institutional owners and pre-merger block institutional owners during the quarter (t-1) prior to the merger announced quarter (t). ΔPOIH and ΔPOBIH means the target's percentage changes of ownership in pre-merger institutional owners and pre-merger block institutional owners during the quarter (t-1). MC and SW are dummy variables for merger completion and offer revision (sweetened offers), respectively. IS is an initial spread (= [an offer price - a target's market value one day after the merger announcement]/target's market value one day after the merger announcement).
1)***, ** and * means significance at 99%, 95% and 90% confidence intervals, respectively.
2) Standard errors are in parentheses.

Other pre-merger ownership variables, however, do not significantly explain the performance of risk arbitrage. This finding is also consistent with major post-merger announcement determinants such as initial spread (IS), offer revisions (SW), and merger completion (MC).

In Model (9) we explore how the change of institutional ownership change between quarter (t-1) and quarter (t) relate to the risk arbitrage performance. It is noticed that the percentage changes of institutional (ΔPOIHM) and block institutional (ΔPOBIHM) ownerships positively impact the performance of risk arbitrage as expected.

4.3 .Pre-merger institutional owners and Price Pressure

We further test whether the negative impact of the number of pre-merger institutional owners largely results from failed merger attempts. To deal this, we test the significance of the number of pre-merger institutional owners in all (Model (11)), successful (Model (12)), and failed (Model (13)) merger attempts, separately. As shown in Table 5, the significance of the number of pre-merger institutional owners disappears in successful merger attempts whereas strongly appear in failed merger attempts. The significance is consistent with additional conditional variables which have been noticed significant in explaining the risk arbitrage performance. Combing with findings in the previous sections, this suggests that pre-merger institutional owners tend to take a passive role when a merger attempt is announced. Their profit oriented behavior looks like contributing price pressure and losses in risk arbitrage when the merger attempt fails. Pre-merger institutional owners tend to nonlinearly influence on the risk arbitrage performance depending on merger success and failure.

Our test results also show nonlinear influences of several variables such as initial spread (IS) and G-Index. Initial spread and G-index positively associates with the risk arbitrage performance in successful merger attempts whereas negatively relate to the performance in failed merger attempts.

Table 5. Regression Tests with Pre-Merger Variables

	Model (11)	Model (12)	Model (13)
Intercept	0.3139	0.1089	-0.0625
	(0.3425)	(0.1264)	(3.3619)
NIH	-0.0018***	0.0002	-0.0151***
	(0.0006)	(0.0003)	(0.0040)
IS	-0.2211	0.4722***	-6.3614*
	(0.5287)	(0.1282)	(3.6871)
TS	0.0186	-0.0190	0.7523
	(0.0399)	(0.0146)	(0.4786)
PREMK	0.2677	0.2358	-3.4655
	(0.5324)	(0.1963)	(4.8855)
IT	0.5191*	0.3670***	0.6998
	(0.2857)	(0.1145)	(1.5051)
ST	0.1156	0.0375	0.0413
	(0.1260)	(0.0472)	(0.8674)
TFT	0.0559	-0.0391	-1.3995
	(0.1259)	(0.0485)	(0.9840)
TFB	-0.1770	-0.1108**	-1.4498
	(0.1405)	(0.0517)	(1.2887)
ME	0.0059	-0.0047	0.1286
	(0.0080)	(0.0029)	(0.0787)
PREOW	-0.0423	-0.0209	-1.2401
	(0.2062)	(0.0793)	(1.3403)
TLI	-0.2061	0.1385*	-2.2820
	(0.2035)	(0.0754)	(1.8868)
G-Index	-0.0140	0.0169**	-0.2939*
	(0.0201)	(0.0076)	(0.1697)
Adj R-Square	0.0249	0.1066	0.4481

This Table reports the test results (logistic regressions) with 461 merger attempts during 1993 to 2006. NIH means the target's number of institutional owners during the quarter (t-1) prior to the merger announced quarter (t). GIndex is the target's number of provisions limiting shareholders' rights (Gompers, et al, 2003) prior to the merger announcement. TS is log (announced transaction size including offer premiums). PREMK is the daily compounded value weighted CRSP index returns during 30 days prior to the takeover announcement. IT is a dummy variable for an initial tender offer. ST is a dummy variable for stock payment. TFT and TFB are dummy variables for termination fee options for targets and bidders, respectively. ME is the number of merger experience the bidder had prior to this merger attempt. TLI means the targets' current ratio prior to the merger announcement. PREOW is a dummy variable for the bidder's pre takeover-ownership position in the target. Standard errors are parentheses.
1)***, ** and * means significance at 99%, 95% and 90% confidence intervals, respectively.
2) Standard errors are in parentheses.

5. Implication: Models with In Sample and Out of Sample Tests

We utilize the previous sections' (in sample) findings to assemble a model estimating the risk arbitrage profitability (annualized excess return) for each merger attempt. We fit a stepwise OLS and logistic regressions requiring an entry p-value of 0.2. Panel 1 of Table 6 contains our developed Model (14): The profitability is a function of

the target's number of pre-merger institutional owners (FNIH) in the failed merger attempt, dummy variables for offer revisions (SW), merger completion (MS), initial tender offer (IT), and pre-merger market return (30 days daily compounded value-weighted market CRSP return prior to the merger announcement).

When we use Model (14), however, information about merger completion (MC) and offer revisions (SW) is unavailable. Thus Models (15) and (16) are developed in order to estimate the probabilities of merger completion and offer revisions, respectively. At first Y_{MCi} and Y_{SWi} are estimated from Model (15) and (16), respectively. Then using Y_{MCi}, Y_{SWi} and Equation (6), we re-estimate the probability of merger completion or offer revisions.

$$P(MC_i \ or \ SW_i) = \frac{\exp(Y_{MCi} \ or \ Y_{SWi})}{1 + \exp(Y_{MCi} \ or \ Y_{SWi})} \tag{6}$$

Where P ($MC_i \ or \ SW_i$) *is the probability for merger completion or sweetened offer* revisions during the takeover attempt period for *i*th takeover attempt.
Plugging these probabilities into Model (14, Equation (7)), we estimate the profitability of risk arbitrage. Here FNIH is estimated by multiplying NIH by (1- $P(MC_i)$):

Profitability (annualized excess return) = -0.0641-0.0072×NIH×(1- $P(MC_i)$) + 0.1552 × P(MW) + 0.3175 × P(SW) + 0.4434 × PRMK + 0.3984 × IT   (7)

We explore the significance of Model (14, Equation (7)) on our in sample test of 461 takeover attempts for the 1993-2006 period and then on our out of sample test of 42 takeover offers for the year of 2007 period. Using the estimated profitability (annualized excess return) of each takeover attempt, we generate four risk arbitrage portfolio groups regardless of the merger announcement date. In Panel 2 of Table 6, r<- 0% is a portfolio group composed of takeover attempts with estimated profitability less than - 0%. As the range of the estimated profitability (annualized excess return) increases, the average risk adjusted actual annualized excess returns in both in and out of sample groupings tend to improve from -0.1049 to 0.5588 and from -0.4648 to 1.0025, respectively. In literature, however, there has been an argument that this annualized excess return measurement does not represent actual/realistic return achieved by investors. Thus we explore the performance of buy and hold risk arbitrage (BHRA) portfolio which reflects investors' risk arbitrage trading position over time using the estimated profitability from Model (14, Equation (7)). Each merger attempt is in or out of BHRA portfolios as a merger attempt is announced, consummated, or terminated. In our test, four buy and hold risk arbitrage (BHRA) portfolios reflecting the ranges of estimated profitability are set up. Panel 3 of Table 6 shows the performance of BHRA strategy using out of sample in the year of 2007. As the estimated profitability range increases, Sharpe ratios tend to improve from -7.3601 to 22.6981 and then confirm the effectiveness of Model (14, Equation (7)) in screening in profitable investment opportunities.

Table 6. Implication: Stepwise Regression and Out of Sample Test
Panel 1: Stepwise Regression with in sample data

	Model (14)	Model (15)	Model (16)
Intercept	-0.0641	2.0018***	-3.1475***
	(0.1732)	(0.3038)	(0.6526)
FNIH	-0.0072***		
	(0.0008)		
MC	0.1552		
	(0.1741)		
SW	0.3175***		
	(0.1069)		
PRMK	0.4434		
	(0.4029)		
IT	0.3984**		2.7981***
	(0.1923)		(0.5837)
POBIH		-2.4148*	
		(1.2492)	
POIH			2.0598**
			(0.8761)
ΔPOIH			-2.2437**
			(1.1216)
ΔPOBIH			0.7606
			(0.4744)
IS		-2.1237	
		(1.4247)	
US		-1.3938**	2.0008***
		(0.5904)	(0.6244)
ST			0.5809*
			(0.3484)
TFT		2.1980***	-0.8506*
		(0.4897)	(0.3482)
TFB		-1.2387**	
		(0.5591)	
PREOW			0.9968**
			(0.5188)
Adj R-square	0.2803	0.2042	0.2989

This panel reports the result of the stepwise regression with entry p-value =0.2. 461 merger attempts during the year of 1993 to 2006 are used. Model (15) tests the chance of merger completion. Model (16) tests the chance of offer revision (sweetened offers).

1) ***, ** and * means significance at 99%, 95% and 90% confidence intervals, respectively.

2) Standard errors are in parentheses.

Panel 2: In and Out of Sample Test Result

Percentile	r < - 0%	0%≤ r < 10%	10% ≤ r < 20%	r ≥ 20%
		In Sample		
Annualized	-0.1655	0.0674	0.1463	0.4044
Excess Return	(1.5772)	(0.7994)	(0.3283)	(0.7236)
Risk Adjusted Return	-0.1049	0.0843	0.4455	0.5588
Number of Merger Attempts	99	189	143	29
		Out of Sample		
Annualized	-0.2260	0.0627	0.0658	0.1563
Excess Return	(0.4862)	(0.2722)	(0.1543)	(0.1559)
Risk Adjusted Return	-0.4648	0.2304	0.4266	1.0025
Number of Merger Attempts	2	14	17	6

This panel reports in and out of sample test results with the stepwise regression (Panel 1). 460 merger attempts during the year of 1993 to 2006 are used to do in sample test. Then 42 merger attempts during the year of 2007 are used to do out of sample test. Annualized excess return is an average annualized excess return from Equation (3)*365/merger period. Risk adjusted return is a ratio of annualized excess return to its standard deviation. Standard deviations are parentheses

Panel 3: Buy and Hold Risk Arbitrage Strategy with Out of Sample

	r < - 0%	0%≤ r < 10%	10% ≤ r < 20%	r ≥ 20%	Equal Weighted CRSP	3 Month T-Bill
Return	-0.1440	0.0653	0.1099	0.1172	0.0251	0.0189
STDEV	0.0221	0.0045	0.0045	0.0043	0.0080	0.0000
Sharp Ratio	-7.3601	10.2758	20.3745	22.6981	0.7720	

This panel shows the performance of Buy and Hold risk arbitrage strategy during the period of 3/1/2007 through 10/1/2007.

3. Conclusion and Discussion

Herein we investigate the role of pre-merger institutional ownership in determining the performance of risk arbitrage. We explore whether pre-merger institutional ownership takes an active or passive role when a merger attempt is announced. Our test results reveal that pre-merger institutional ownership tends to involve in short term trading, taking a passive role during the merger attempt. They are noticed to relate to losses in risk arbitrage for failed merger attempts rather than successful merger attempts. And our simple implication based on this finding shows that pre-merger ownership information can be used to assist investors to build a portfolio with profitable investment opportunities.

Our test results also reveal an interesting point in analyzing the risk arbitrage performance: nonlinear influence of several variables. In addition to the number of pre-merger institutional owners, G-Index and initial spread shows opposite influence the risk arbitrage performance, depending on merger success and failure. This nonlinear influence would weaken the statistical significance of variables. Thus it suggests that when we analyze the risk arbitrage performance and relevant factor analysis, we need to take care of this nonlinear issue.

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