The Performance of Merger / Risk Arbitrage and Sweetened Offers in Hostile Takeovers

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Herein we explore merger/risk arbitrage performance for hostile/unsolicited offers. We find that, regardless of merger outcome, the possibility of a sweetened offer generally adds a key risk factor. Moreover, the probability of receiving one or more sweetened offers is found to be significantly related to a merger type thereby signaling information asymmetry regarding post-merger improvement. Accordingly, we develop a simple sweetening prediction model which may prove helpful to those involved in merger/risk arbitrage, especially for hostile/unsolicited takeover attempts.

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1. Introduction

In this paper, we report the results of our study of the impact of sweetened offers on the performance of merger/risk arbitrage involving hostile/unsolicited takeover efforts. Merger/risk arbitrage is an investment strategy designed to extract the spread between a takeover target's offer and market price during the takeover attempt period. Merger/risk arbitrageurs usually take a long position in the target's stocks for a cash offer around the time of the takeover announcement. A short position in the bidder's stock is usually also established for a stock offer in order to hedge against possible adverse fluctuations in the value of the offer resulting from changes in the bidder's stock price. If the takeover attempt is friendly and easily consummated, the merger/risk arbitrageurs will generally earn the initial spread between the target's offer price and market price that arbitrageurs pay for the target stock. When the takeover attempt fails without serious resistance or competition, typically the bidder's (target's) stock price will rise (fall). The merger/risk arbitrageurs are likely to lose money on one or both parts of the merger/risk arbitrage position. On the other hand if the takeover attempt involves hostile/unsolicited offers, the target's resistance and merger competition will often result in a sweetened offer which directly impacts the spread and the performance of the long and/or short positions established by the merger/risk arbitrageurs.

Merger/risk arbitrage has long been popular on Wall Street where it is viewed as a means of generating relatively reliable returns. Several scholars also have explored merger/risk arbitrage spread, profitability and determinants/risk factors. Branch and Wang (2008) report that an average spread (between the target's offer and market price two days after the takeover announcement) is 6.10%. The spreads tend to be determined by various factors such as the target's termination fee provision, merger transaction size, relative size of the target, etc. Baker and Savasoglu (2002) report that merger/risk arbitrage tends to generate an annual abnormal return of 7.2 to 10.8%. Merger completion (risk) is one major risk factor determining merge/risk arbitrage returns. Branch and Yang (2006) explore the performance of merger/risk arbitrage when takeover attempts failed. They find that failed takeover attempts tend to produce an average annual return of -14%. Stock offers (mergers) are more likely to generate greater merger/risk arbitrage losses than cash offers (tender offers). Mitchell and Pulvino (2001) find that the annual abnormal return of merger/risk arbitrage averages 4% after subtracting transaction costs. Merger/risk arbitrage returns are positively related to market returns in severely declining markets but not correlated with market returns in flat and

appreciating markets. Hsieh and Walkling (2005) explore the roles of merger/risk arbitrageurs, defined as institutions that, during a merger attempt, increase their ownership of the targets. They find that changes in merger/risk arbitrageurs' ownership tend to relate positively to merger completion, bid premium, offer revision, and the return for investors.

Extending the existing research, we explore the role of sweetened offers in explaining the performance of merger/risk arbitrage and the underlying determinants of the chance of receiving sweetened offers for hostile/unsolicited takeover attempts. Because sweetened offers are relatively rare and various market responses are complex, their role has received relatively little attention in the merger/risk arbitrage literature. None the less, when they do occur in response to target's resistance and/or merger competition, sweetened offers constitute an important factor in the takeover process. The chance of receiving sweetened offers and the extent of sweetening constitute additional risk factors facing merger/risk arbitrageurs. These new risk factors, as key determinants, are expected to impact the chance of merger completion and the initial spread as the takeover attempt proceeds and thereby help determined the performance of merger/risk arbitrage. Especially when a merger/risk arbitrageur is involved in a hostile/unsolicited takeover attempt with a relatively low chance of takeover success by the initial bidder, he or she may want to assess the chance of receiving a sweetened offer. Such an offer, if it arises, would reduce the risk of loss from takeover failure.

We suspect that the likelihood of a sweetening of the offer may relate to information asymmetry regarding post merger performance and/or bidder overconfidence. Information asymmetry regarding post-merger performance may cause the bidder and the target to value the target differently, leading the bidder to initiate a hostile/unsolicited offer which the target resists as inadequate. Or information asymmetry may lead the bidder to become involved in competition to take over the target. Regardless of any information asymmetry, the bidder's overconfidence (regarding its ability to extract merger synergy) can also encourage the bidder to initiate a hostile/unsolicited offer for the target, thereby leading to the target's resistance and competition for the takeover. Thus information asymmetry and/or overconfidence are expected to relate positively to the chance of receiving favorable sweetened offers.

In this paper first we test how sweetened offers, as a potentially key determinant, impact the performance of merger/risk arbitrage regardless of merger outcome. Next we test whether sweetened offers reduce the risk of loss in hostile takeover failure and whether the number of upward or downward sweetened offers significantly impacts merger/risk arbitrage performance. We use OLS regression to explore the impacts of sweetened offers. Interaction variables between successful/unsuccessful takeovers and sweetened/unsweetened offers are used in order to control for the impact of merger outcome.

Second, we seek to understand the underlying variables which impact the chance of sweetening. Accordingly, we use OLS and logistic regressions to examine hypotheses regarding information asymmetry and overconfidence. We use merger type (tender offer) and payment method as information asymmetry proxies. The bidder's merger experience in the three years prior to a hostile takeover announcement serves as an overconfidence proxy. Various conditional variables such as the bidder's pre-takeover attempt ownership, horizontal takeover attempt, merge competition caused by a hostile/unsolicited takeover, resistance (anti-takeover measures), pre-merger market conditions, the bidder's debts or liquidity, etc are also considered.

Third, we use a stepwise logistic regression to develop a prediction model designed to assist merger/risk arbitrageurs set up their portfolios for situations involving hostile/unsolicited takeover attempts.

We find that sweetened offers are often a major factor in the performance of merger/risk arbitrage for hostile/unsolicited offers. The first (last) sweetened offer price represents an average increase over the original offer price level of 11.64% (19.39%) during an average of 60 (132) days. Merger/risk arbitrage for sweetened/successful (unsweetened/successful) offers by any bidder tends to generate an average raw return of 13.90% (5.53%) for an average holding period of 148 (116)

days. Sweetened/unsuccessful (unsweetened/unsuccessful) offers by any bidder tend to generate an average raw return of 8.88% (-1.62%) for an average holding period of 118 (119) days.   Regression test results with annualized merger/risk arbitrage returns and interaction variables also indicate that the sweetened offers significantly improve the overall performance of merger/risk arbitrage regardless of the success/failure of the takeover attempt.   Sweetened offers also reduce losses for the merger/risk arbitrageur even if the original bidder's takeover attempt fails.   The number of upward sweetened offers, rather than that of downward (un)sweetened offers, is likely to have a significant impact.   Hypothesis test results show that information asymmetry associated with merger type (tender offer) tends significantly to increase both the chance of receiving sweetened offers and the number of sweetened offers.   This finding is consistent with conditional variables expected to relate to the performance of merger/risk arbitrage.   We do not, however, find a consistent and significant impact of overconfidence (past merger experience by the bidder).   Lastly, our in and out of sample test results show that the prediction model based on our finding may assist merger/risk arbitrageurs improve their selection of hostile/unsolicited offers and thereby enhance their risk adjusted performance.   These findings indicate that the attitudes of the bidder and the target may introduce to merger/risk arbitrageurs additional risk factors to be considered in setting up their portfolios.

2. Hypotheses Regarding Underlying Variables for Receiving Sweetened Offers

Under the information asymmetry hypothesis, the chance of receiving a sweetened offer relates to acquisition type. Acquisition attempts can be classified into two general types: merger offers and tender offers. With a successful merger offer two or more firms agree to combine into a single firm. With a tender offer, in contrast, the bidder announces a willingness to pay the target firms' shareholders a specified price per share, thereby seeking to bypass the target's managers and board of directors.   A tender offer is often announced in unsolicited/hostile takeover attempts. [1] According to the relevant literature, the choice of acquisition type is believed to signal information asymmetry regarding the bidder's expectations for post-merger improvement.   For example, Hirshleifer and Titman (1990) argue that any activities reducing the degree of information asymmetry between the bidder and (target) shareholders would improve the chance of offer success. The bidder needs to communicate its expected potential post-merger improvement directly to the target shareholders.   Thus the bidder's decision to launch a tender offer would suggest a certain level of information asymmetry regarding potential post-merger improvement (synergy). Supporting this argument, Morck, Shleifer and Vishny (1988) show that tender offers are often used to take over poorly performing targets.   Martin and McConnell (1991) document a high turnover ratio of the target's managers for the two years that follow a tender offer, indicating that the bidder frequently tries to remove poorly performing managers in an effort to achieve post-merger improvement.   Kohers, Kohers and Kohers (2007) find that tender offers tend to target value firms (underperforming, high book to market) rather glamour firms (outperforming, low book to market). Furthermore Loughran and Vijh (1997) find that tender offer bidders tend to generate a much higher average post-merger abnormal return (43% more than matching firms) than do (friendly) merger offer bidders (15.9% less than matching firms) during the five post-completion years.   Thus the tender offer bidder generally enhances post-merger performance more than the (friendly) merger offer bidder.   Accordingly, the announcement of a hostile tender offer is believed to signal the potential for post merger improvement and the existence of information asymmetry.

The choice of payment method has also been cited as signaling information asymmetry regarding the prospects for post merger improvement.   For example, Hansen (1987) and Eckbo and Thorburn (2000) argue that the bidder may prefer a stock offer when the target's post-merger improvement is uncertain.   Thereby would the bidder's and target firm's shareholders share the

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[1] In friendly takeover attempts, however, a tender offer is pre-arranged with the target firm's managers or board of directors. It is commonly used as part of a two-step merger offer.

exposure to overpayment risk, as both would own stock in the combined firm. A bidder, who places a high value on the target and expects to derive a significant benefit from the takeover (synergy), would be more likely to offer cash. Loughran and Vijh (1997) find that the cash offer bidders earn a much higher post-merger abnormal return (18.5% more than matching firms) than stock offer bidders (24.2% less than matching firms) during the five post-merger years. Thus a hostile cash offer would generally suggest that the bidder is optimistic about the potential for post-merger improvement.

Such information asymmetry can lead the bidder to initiate a hostile/unsolicited offer in a situation involving an existing merger attempt. And signaling effects associated with merger type or payment method can lead the target's management to reevaluate and resist the offer price for either bargaining purposes or because of a desire to remain independent. This merger competition and resistance is likely to increase the chance of receiving sweetened offers.

Hubris based overconfidence may also help explain the chance of receiving a sweetened offer. According to Roll's hubris hypothesis (1986), the bidder's valuation error or overconfidence often leads to overpayment and little or no value creation for the bidder. Odean (1998) argues that overconfident investors tend to trade more aggressively and deliver more information in the market, thereby improving market efficiency. However, Rau and Vermaelen (1998) argue that the bidder's sub par post-merger performance results from its over-extrapolation of its past performance. Delong and DeYoung (2007) find that in bank merger attempts, the bidders tend to learn from past experience how to extract synergy more successfully. These arguments and findings imply that a bidder who has attempted many takeovers may be overconfident about extracting post-merger improvement and thus tend to be inclined to overpay in an effort to succeed with the takeover attempt. Empirically aligned with this argument, Fuller, Netter and Stegemoller (2002) find that the bidders making the first (fifth) bid for public targets tend to earn an abnormal return of – 0.88% (-1.73%). Thus the market tends to respond negatively to merger announcements associated with possible overpayment risks resulting from the bidder's overconfidence. Overconfidence resulting from past merger experience (number of merger attempts involved) may lead the bidder to initiate a hostile/unsolicited takeover offer, possibly causing merger competition or target's resistance which will increase the chance of receiving sweetened offers.

3. Data

We identify two types of takeover attempts as hostile/unsolicited: 1) an offer that the target's board officially rejected but the bidder continues to pursue; 2) a takeover attempt that was not discussed with the target's managers or board prior to its announcement. SDC data channel classifies the first type as hostile and the second as unsolicited. We identify 892 hostile/unsolicited takeover attempts (both types) over the 1992-2005 period. The frequency of hostile/unsolicited takeover attempts declined over this period. Many hostile/unsolicited takeover attempts involved private firms. The limited availability of accounting, stock price and takeover deal information from Compustat, CRSP and Lexis-Nexis reduced our sample size to 169 hostile/unsolicited takeover attempts.

Panel 1, 2, 3 and 4 in Table 1 contain descriptive characteristics of the sample. The average transaction size was $2,539.82 million (market value of target). The average takeover attempt period was 130 days. The average pre-takeover announcement bidders' debt to asset ratio and current ratios were 57.24% and 39.18%, respectively. The bidder's average number of takeover announcements in the three years preceding a hostile takeover announcement was 4.96. Thirty-seven percent of our sample offers involved horizontal/focused mergers, based on the 4 digits of SIC of the bidder and the target. Thirty-eight percent announced 100% cash payments on the date of the merger proposal. Forty percent of the sample utilized a (hostile) tender offer without pre-arrangement with the target firm during the takeover attempt period. A merger was completed in 20% of the sample due to hostile/unsolicited offers intervening in in-process merger attempts. Forty-seven percent experienced at least one sweetened offer during the takeover attempt

period. Though not shown in the table, an average of 1.74 sweetened offers occurred during the takeover attempt period.

Table 1
Data Description

Panel 1: Transaction Size, Merger Periods, Bidder's Debt Ratio, Liquidity Ratio and Merger Experience

	Transaction Size (Unit: $million)	Merger Period (Unit: Days)	Bidder's Debt Ratio	Bidder's Current Ratio	Bidder's Merger Experience
Mean	$2,539.82	130	0.5724	0.3918	4.96
Median	$349.32	85	0.5729	0.4093	3.00

Panel 2: Deal Characters of Hostile Takeover Attempts

	Horizontal Merger	Cash Payment	Tender Offer	Merger Competition	Sweetened Offer
Count (%)	62 (37%)	65 (38%)	67 (40%)	33 (20%)	79 (47%)

	Resistance of Target	Taken-over Offer
Count (%)	73 (43%)	83 (49%)

Panel 3: Reasons of Resistance from Resisting Targets

	Inadequacy of the offered price	Uncertainty in financing, regulatory approval, offered value or synergy	Termination fees
Count (%)	41 (56%)	13 (18%)	4 (5%)

Panel 4: Applied Anti-Takeover Measures from Resisting Targets

	Poison Pill	Law Suits	Stock Repurchase	Restructuring	White knight	Revising bylaws	Golden Parachute
Count (%)	37 (51%)	17 (23%)	10 (14%)	9 (12%)	9 (12%)	5 (7%)	3 (4%)

Panel 5: Change of Offered Prices

	Offered Price Change Until the 1st sweetening	Offered Price Change Until the last sweetening
Mean	0.1164**	0.1939**
Median	0.1071	0.1563
Average Period until the Sweetened Date	60	132

Panel 6: Return of Merger/Risk Arbitrage for Sweetened or Successful Takeover by Any Bidder

	Successful	Unsuccessful	All
Sweetened	0.1390**	0.0888**	0.1295**
Unsweetened	0.0553*	-0.0162	-0.0011
All	0.1198**	0.0021	0.0599**

Note: In Panel 2 and 3, the percentages of sample size (169) are in parentheses. In panel 4, the percentages of hostile takeovers with anti-takeover measures (73) are in parentheses. **significant at $\alpha = 5\%$ level and *significant at the 10% level in t-tests.

Two percent experienced downward offer-price revisions. Forty-three percent of targets resisted with anti-takeover measures. Forty-nine percent of targets were taken over by either the initial or a competing bidder during the takeover attempt period.

Fifty-six percent of resisting targets claimed that the inadequacy of the amount offered was the primary reason for their resistance/rejection. Eighteen percent of these targets explained their opposition as due to the uncertainty of takeover financing, offer amount, regulatory approval or

synergy. In cases where an existing friendly takeover was underway, termination fees and no shopping or standstill provisions were also noted in response to the hostile/unsolicited offer. Of those targets that resisted with various anti-takeover measures, fifty-one, twenty-three and fourteen percent used poison pills, law suits against the bidder and stock repurchases, respectively. Twelve percent of the resisting targets undertook value-enhancing restructuring plans selling non-core divisions, taking over other potential targets or inviting white knights to take part in the process. Some targets used other anti-takeover measures such as revising their bylaws to limit the influence of the bidder on the takeover decision or establishing golden parachutes for senior managers. Sometimes, the target countered the takeover attempt with an offer to acquire the bidder's shares (Pac Man defense).

As Panel 5 in Table 1 shows, the first sweetened offer from the original or competing bidder tended to increase the offer price level by 11.64% during an average of 60 days. The last offer tended to increase the offer price level by 19.39% during an average of 132 days.

4. Return Calculation

Mitchell and Pulvino (2001), Baker and Savasoglu (2002) and Hsieh and Walkling (2005) identify two types of merger/risk arbitrage return measurements, depending on the payment methods – cash or stock payment. In a cash offer, merger/risk arbitrageurs are assumed only to set up a long position in the targets' stocks. Such positions do not need a hedge as the value of the consideration offered (cash) is insensitive to market conditions. In a stock offer, in contrast, merger/risk arbitrageurs are assumed to buy the target's stock and to hedge by shorting the acquirers' shares.

Here, we follow Hsieh and Walkling's merger/risk arbitrage return measurement.[2] The trading position is set up one day after the takeover announcement and held until the consummation or termination date. First, we estimate daily returns for cash (Equation (1)) or stock offers (Equation (2)) and then a daily compound return from one day after the takeover announcement until the consummation or termination date (Equation (3)).

$$r_{it} = \frac{P_{it}^T + D_{it}^T}{P_{it-1}^T} - 1 - r_{ft} \tag{1}$$

Where r_{it} is a daily return of merger/risk arbitrage for a takeover attempt i at time t; P^T_{it} is a target's stock price in a takeover attempt i at time t. P^T_{it-1} is a target's stock price in a takeover attempt i at time t-1; D^T_{it} is a dividend payment for a target's stock in a takeover attempt i at time t; r_{ft} is a three month T-bill rate / 365.

$$r_{it} = \frac{P_{it}^T + D_{it}^T}{P_{it-1}^T} - 1 - r_{ft} - (\frac{P_{it}^A + D_{it}^A}{P_{it-1}^A} - 1 - r_{ft}) \times \delta \times \frac{P_{it-1}^A}{P_{it-1}^T} \tag{2}$$

Where P^A_{it} is a bidder's stock price in takeover attempt i at time t. P^A_{it-1} is a bidder's stock price in takeover attempt i at time t-1; D^A_{it} is a dividend payment for a bidder's stock in takeover attempt i at time t; δ is an exchange ratio.

$$r_i = \prod_{t=1}^{E} (1 + r_{it}) - 1 \tag{3}$$

Where r_i is a daily compounded merger/risk arbitrage return for a takeover attempt i; t =1 is one day after the takeover announcement; E is the consummation or termination date.

As Panel 6 in Table 1 shows, merger/risk arbitrage trading positions for hostile/unsolicited takeover attempts generated an average raw return of 5.99% for an average holding period of 129

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

days.[3]   The merger/risk arbitrage trading position for sweetened (unsweetened) offers generated an average return of 12.95% (-0.11%) for an average holding period of 151 (114) days.   The merger/risk arbitrage trading position on successful (unsuccessful) takeover offers by any bidder during the takeover attempt period generated an average return of 11.98% (0.21%) for an average holding period of 141 (118) days.

In order to control for the impact of merger completion by an initial or competing (any) bidder on that of sweetened offers, we recalculate the returns in terms of various interactions between sweetened and successful takeover offers. Sweetened/successful (unsweetened/successful) takeover offers by any bidder tend to generate an average raw return of 13.90% (5.53%) for an average holding period of 148 (116) days.   Sweetened/unsuccessful (unsweetened/unsuccessful) takeover offers by any bidder tend to generate an average raw return of 8.88% (-1.62%) for an average holding period of 118 (119) days.

5. Regression Tests

We further explore the impact of sweetened offers on the performance of merger/risk arbitrage, using OLS regressions with the annualized return (ANR = Equation (3) × 365 / merger period) as the dependent variable.   As in the previous return calculation, interaction variables between successful/unsuccessful takeover and sweetened/unsweetened offer are used in order to control the impact of merger completion by initial or competing bidder.   Equations (4) and (5) are fit in order to test whether sweetened offers tend to improve (reduce) the performance (risk of loss) of merger/risk arbitrage in the successful (failed) takeover attempts.   Due to the positive impact of sweetened offers on the target stock price, in Equation (4), we expect the coefficient of the interaction variable of sweetened/successful takeover offers by any bidder (SWCO) to be greater than the coefficient of the interaction variable of unsweetened/ successful takeover offers by any bidder (USWCO).   The coefficient of the interaction variable of sweetened/unsuccessful takeover offers by any bidder (SWNCO) is expected to be significantly positive, indicating sweetened/unsuccessful offers usually outperform unsweetened/unsuccessful offers (intercept).

In Equation (5) we retest the role of sweetened offers, considering other conditional variables which have been found to relate to the bid premium and/or merger/risk arbitrage performance. Moeller, Schlingermann and Stulz (2004) argue that the bid premium is positively associated with the size of the bidder.   Thus we use the log value of (Target Asset Value/Bidder Asset Value) prior to the hostile takeover announcement to proxy for relative size (SI).   Branch and Yang (2003) show that cash payment tends to improve the chance of merger completion.   Thus a dummy variable for cash payment (CA) is considered.   Betton and Eckbo (2000) argue that the bidder's pre takeover-ownership of the target would tend to be negatively related to the bid premium. In our test, a dummy variable for the bidder's pre-bid ownership of the target (PREOW) is used to proxy for the bidder's pre-bid ownership.   Mitchell and Pulvino (2001) show that market performance both before and during the takeover attempt are positively related to merger/risk arbitrage performance. Thus, the daily compounded value weighted CRSP index returns during the merger period (MK) and during 30 days prior to the hostile takeover announcement (PRMK) are considered.

In Equation (6) and (7), we test the impact of upward sweetened offers (UPSW, the number of sweetened offers) and downward sweetened offers (DOSW, the number of downward offer revision).   In Equation (6), we expect that due to the positive (negative) impact of the upward sweetened (downward) offers, a coefficient for UPSW (DOSW) would be positive (negative).   In Equation (7), we retest the roles of UPSW and DOSW with conditional variables in Equation (5).

$$ANR = a + \beta_1 SWCO + \beta_2 SWNCO + \beta_3 USWCO \tag{4}$$

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[3] Though not shown here, the average spread one day after the hostile takeover announcement was 6.35%.   Thirty four percent of hostile takeover offers generated negative spreads.

$$ANR = a + \beta_1 SWCO + \beta_2 SWNCO + \beta_3 USWCO + \beta_4 CA + \beta_5 SI + \beta_6 MK + \beta_7 PRMK + \beta_8 PREOW \tag{5}$$

$$ANR = a + \beta_1 UPSW + \beta_2 DOSW + e \tag{6}$$

$$ANR = a + \beta_1 UPSW + \beta_2 DOSW + \beta_4 CA + \beta_5 SI + \beta_6 MK + \beta_7 PRMK + \beta_8 PREOW \tag{7}$$

Next we apply logistic and OLS regressions to our hypotheses for receiving sweetened offers. We explore information asymmetry and overconfidence in order to help understand the determinants of offer sweetening. A dummy variable, SO (= 1 for one or more sweetened offer and 0 otherwise) is the dependent variable in Equation (8), (9) and (10). In Equation (11), (12) and (13), the dependent variable is the number of sweetened offers (UPSW). We expect significantly positive coefficients for the dummy variables of tender offers (TEN) and/or cash payment (CA) under the information asymmetry hypothesis. Under the overconfidence hypothesis, a positive and significant coefficient is expected for the number of merger attempts the bidder has been involved in three years prior to a hostile/unsolicited takeover announcement (NOM). In addition to the conditional variables that have been used in the previous tests, other conditional variables supposedly influencing the chance of receiving sweetened offers are considered; the bidder's debt ratio (ADE, proxied by the bidder's total debt to total asset ratio prior to the hostile/unsolicited takeover announcement), the bidder's liquidity ratio (ALQ, proxied by the bidder's current asset to total asset ratio prior to the hostile/unsolicited takeover announcement), the dummy for merger competition caused by the hostile/unsolicited offer (CBP), the dummy variable for horizontal/focused mergers (SIND, 1 for the same 4 digits of SIC), the dummy variables for the existence of anti-takeover measures (RES), poison pills (POS), litigations against the bidder (LS), stock repurchases (REP), white knights (WK), and focusing/restructuring (COB), growth potential of the target (TMB, measured by the market to book ratio prior to the merger announcement where the market value is the market price 30 days before the merger announcement), and initial spreads (IS, measured by the ratio of the spread to the target stock price one day after the hostile/unsolicited takeover announcement).[4]

$$SO = a + \beta_1 TEN + \beta_2 CA + \beta_3 NOM + \beta_4 CBP + \beta_5 ADE + \beta_6 ALQ + \beta_7 SIND + \beta_8 RES \tag{8}$$

$$SO = a + \beta_1 TEN + \beta_2 CA + \beta_3 NOM + \beta_4 CBP + \beta_5 ADE + \beta_6 ALQ + \beta_7 SIND + \beta_8 RES + \beta_9 IS \\ + \beta_{10} TMB + \beta_{11} SI + \beta_{12} MK + \beta_{13} PRMK + \beta_{14} PREOW \tag{9}$$

$$SO = a + \beta_1 TEN + \beta_2 CA + \beta_3 NOM + \beta_4 CBP + \beta_5 ADE + \beta_6 ALQ + \beta_7 SIND + \beta_8 POS + \beta_9 LS + \beta_{10} REP \\ + \beta_{11} WK + \beta_{12} COB + \beta_{13} IS + \beta_{14} TMB + \beta_{15} SI + \beta_{16} MK + \beta_{17} PRMK + \beta_{18} PREOW \tag{10}$$

$$UPSW = a + \beta_1 TEN + \beta_2 CA + \beta_3 NOM + \beta_4 CBP + \beta_5 ADE + \beta_6 ALQ + \beta_7 SIND + \beta_8 RES \tag{11}$$

$$UPSW = a + \beta_1 TEN + \beta_2 CA + \beta_3 NOM + \beta_4 CBP + \beta_5 ADE + \beta_6 ALQ + \beta_7 SIND + \beta_8 RES \\ + \beta_9 IS + \beta_{10} TMB + \beta_{11} SI + \beta_{12} MK + \beta_{13} PRMK + \beta_{14} PREOW \tag{12}$$

$$UPSW = a + \beta_1 TEN + \beta_2 CA + \beta_3 NOM + \beta_4 CBP + \beta_5 ADE + \beta_6 ALQ + \beta_7 SIND + \beta_8 POS + \\ \beta_9 LS + \beta_{10} REP + \beta_{11} WK + \beta_{12} COB + \beta_{13} IS + \beta_{14} TMB + \beta_{15} SI + \beta_{16} MK + \beta_{17} PRMK + \beta_{18} PREOW \tag{13}$$

We split our data into in and out-of samples. In-sample, which has 148 hostile/unsolicited takeover attempts during the period of 1992 to 2003, is used to test our hypotheses and develop our

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[4] Jindra and Walkling (2004) find that the spread one day after a cash tender offer announcement is negatively related to the probability of a revision of the offer price.

models. Out -of sample, which has 21 hostile/unsolicited takeover attempts during the period of 2004 to 2005, is used to explore the significance of the simple sweetening prediction model that we develop.

Table 2 contains our results for the equations (4 through 7) where the dependent variable is the annualized merger/risk arbitrage return. In Equation (4), the coefficient of the interaction variable of sweetened/successful takeover offers by any bidder (SWCO, β=1.1899) is higher than that of unsweetened/successful takeover offers by any bidder (USWCO, β=0.5775). The coefficient of sweetened/unsuccessful takeover offers by any bidder (SWNCO, β=1.1524) is statistically significant and positive at α = 5%. Furthermore the statistical insignificance of the coefficient of unsweetened/successful takeover offers by any bidder (USWCO) indicates that the performance of the unsweetened/successful takeover offers by any bidder is not statistically different from that of unsweetened/unsuccessful takeover offers by any bidder (intercept) which is significantly negative. The test results of Equation (5) (with conditional variables) are also consistent with those of Equation (4).

Table 2
Risk Arbitrage Returns and Test Result

	Equation 4	Equation 5	Equation 6	Equation 7
Intercept	-0.5856***	-0.5552**	-0.2931	-0.3152
	0.0069	0.0217	0.1041	0.1495
UPSW			0.4272***	0.4056***
			0.0023	0.007
DOSW			-0.0178	0.0032
			0.9799	0.9965
SWCO	1.1899***	1.1572***		
	0.0002	0.0005		
SWNCO	1.1524**	1.1000**		
	0.0212	0.0420		
USWCO	0.5775	0.5830		
	0.2199	0.2287		
CA		0.0515		0.1564
		0.8717		0.6174
SI		-0.0384		-0.0697
		0.6650		0.4391
MK		0.8956		0.6701
		0.5616		0.6812
PRMK		-0.5587		-1.1034
		0.8709		0.7530
PREOW		-0.4474		-0.4394
		0.2291		0.2489
R-Sq	0.1028	0.1136	0.0632	0.0780

Note: Table 2 presents results of OLS regressions. 148 hostile takeover attempts during 1992 to 2003 are used for our tests. The dependent variable is an annualized return of merger/risk arbitrage (=raw return*365/merger period). P-values are below coefficients. ***, ** and * means statistical significance at α = 1%, 5% and 10% levels, respectively.

In Equation (6), the coefficient of the variable for the number of upward sweetened offers (UPSW, β=0.4272) is significantly positive at α = 1%. The positive and significant impact of the number of the upward sweetened offers on merger/risk arbitrage performance is consistent with conditional variables in Equation (7). Taken together, these results support our expectation that the existence of sweetened offers in hostile takeovers enhances the profitability of merger/risk arbitrage positions even when the hostile bidder is unsuccessful. The greater the sweetening, the more positive is the profitability impact.

The above discussed results are unsurprising. They may, however, be useful to merger/risk arbitrageurs who can predict the likelihood of a sweetening. Knowing not only how important sweetening is to the performance of merger/risk arbitrage positions in hostile takeover attempts but also how to assess its likelihood, is potentially quite worthwhile to those in the merger/risk arbitrage business. That topic is the next subject to be addressed.

Results from our sweetened offer determinant tests are reported in Table 3. Equation (8), (9) and (10) show that the coefficients of the dummy variable for tender offers during the takeover attempt (TEN, β = 1.6420, 1.5883 and 1.5656) are significant and positive in explaining the chance of receiving sweetened offers at α = 1%, regardless of the existence of conditional variables. The merger competition caused by the unsolicited/hostile offer (CPB, β = 1.1764, 1.1287 and 1.0766) also is significantly positive at α = 10%. The coefficients for the existence of anti-takeover measures during the takeover attempt (RES, β =0.9261 and 0.9035) are consistently significant and positive at α = 5%. The pre-takeover debt level of the bidder (ADE, β = 1.9348, 2.5377 and 2.4185) has positive impacts on the chance of receiving sweetened offers at α = 10%.

Equation (11), (12) and (13) show that both the tender offer (TEN, β = 0.7413, 0.7330 and 0.7159) and a merger competition caused by the hostile/unsolicited offer (CPB, β = 0.6222, 0.6060 and 0.5605) are significantly and positively related to the number of sweetened offers (multiple bids) during the hostile takeover attempt period at α = 1%. The coefficients for the existence of anti-takeover measures (RES, β =0.4519 and 0.3945) and the pre-takeover debts of the bidder (ADE, β = 0.7022, 0.8338 and 0.8296) are also consistently significant and positive at α = 5% and 10%, respectively. Among anti-takeover measures, restructuring plan (COB) and anti bidder litigation (LS) positively impact the chance of receiving sweetened offers and the number of sweetened offers at α = 10%, respectively. Though statistically weak or inconsistent, horizontal merger attempts (SIND) positively relate to the number of sweetened offers. We could not, however, find a consistently significant role for overconfidence (pre-takeover bidders' merger experience, *NOM*) in explaining either the chance of receiving sweetened offers or the number of sweetened offers.

These findings support the view that information asymmetry regarding post-merger improvement significantly and consistently increases the chance of receiving one or more sweetened offers in hostile/unsolicited takeover attempt situations. This finding also helps explain why tender offers positively impact the target shareholders' wealth during the hostile takeover attempt period (Schwert, 2000).

6. Implication: Models with In-Sample and Out of Sample Tests

Based on the previous section's findings and the in-sample data set (148 hostile takeover attempts), we develop a sweetening (logistic) prediction model [Equation (17) and Table 4] composed of four variables; 1) tender offer during the takeover attempt period (TEN), 2) merger competition caused by an hostile/unsolicited offer (CPB), 3) pre-takeover bidder's debt ratio (ADE) and 4) the target's resistance (existence of anti-takeover measures) during the takeover attempt period (RES).

In order to construct this prediction model properly, we must only employ ex-ante information, that is, information available as of the takeover announcement date. Information regarding merger terms and target's resistance, however, is not often available on the announcement date of the hostile/unsolicited offers. Thus applying ex-ante information to a stepwise logistic regression with

an entry p-value = 0.2, we develop the first step prediction (logistic) models for the tender offer

Table 3
Logistic and OLS Regressions Test Results: Chance of Receiving Sweetened Offers

	Equation 8	Equation 9	Equation 10	Equation 11	Equation 12	Equation 13
Intercept	-2.8293***	-3.0646***	-2.9093***	-0.4159	-0.5018	-0.4241
	0.0046	0.0058	0.0098	0.2036	0.162	0.2472
TEN	1.6420***	1.5883***	1.5656***	0.7413***	0.7330***	0.7159***
	0.0001	0.0006	0.0010	0.0001	0.0001	0.0001
CA	0.5614	0.2409	0.2996	0.1139	0.0848	0.1280
	0.1908	0.6036	0.5262	0.4785	0.6307	0.4768
NOM	-0.0505	-0.0497	-0.0644*	-0.0195	-0.0163	-0.0218
	0.1388	0.1689	0.0993	0.1216	0.2360	0.1333
CPB	1.1764**	1.1287*	1.0766*	0.6222***	0.6060***	0.5605***
	0.0309	0.0527	0.0601	0.0013	0.0039	0.0078
ADE	1.9348*	2.5377**	2.4185*	0.7022*	0.8338*	0.8296*
	0.0739	0.0402	0.0533	0.0639	0.0502	0.0564
ALQ	0.5966	0.7645	0.8093	0.3113	0.4019	0.4173
	0.5180	0.4481	0.4337	0.3380	0.2553	0.2498
SIND	0.2700	0.3334	0.2578	0.2707*	0.2766*	0.2330
	0.5159	0.4468	0.5717	0.0728	0.0885	0.1757
RES	0.9261**	0.9035**		0.4519***	0.3945**	
	0.0224	0.0416		0.0030	0.0199	
POS			0.4145			0.2370
			0.4567			0.2464
LS			0.8871			0.4837*
			0.2380			0.0761
REP			0.4226			-0.0050
			0.6749			0.9887
WK			0.8627			0.1223
			0.3786			0.7334
COB			1.8800*			0.5134
			0.0626			0.1494
IS		-0.9295	-0.9367		0.0558	-0.0120
		0.3697	0.4084		0.8933	0.9782
TMB		0.0161	-0.0024		-0.0106	-0.0166
		0.7746	0.9677		0.6195	0.4546
SI		-0.0985	-0.1729		0.0049	-0.0128
		0.4519	0.2368		0.9213	0.8122
MK		1.6121	2.8147		1.0330	1.3007
		0.5183	0.2884		0.2214	0.1354
PRMK		-5.2596	-3.1272		0.0543	0.7316
		0.3168	0.5549		0.9775	0.7110
PREOW		-0.1060	-0.4485		-0.0031	-0.1315
		0.8514	0.4427		0.9880	0.5419
R-Sq	0.3531	0.3590	0.3762	0.3513	0.3534	0.3567

Note: 148 hostile takeover attempts during 1992 to 2003 are used for our tests. P-values are below coefficients. ***, ** and * means statistical significance at α = 1%, 5% and 10% levels, respectively.

[Equation (14)] and the resistance [Equation (15)] in Panel 1 of Table 4. Using Equation (14), Equation (15), and Equation (16), we are able to estimate the probabilities of a tender offer and the target's resistance for each ith hostile/unsolicited takeover attempt.

$$Y_{TENi} = a + \beta_1 CA_i + \beta_2 CPB_i + \beta_3 PREOW_i \tag{14}$$

$$Y_{RESi} = a + \beta_1 CA_i + \beta_2 CPB_i + \beta_3 ADE_i + \beta_4 SIND_i + \beta_5 SI_i \tag{15}$$

$$P(TEN_i, RES_i, or\ SW_i) = Exp(Y_{TENi}, Y_{RESi}, or\ Y_{SWi}) \div [1 + Exp(Y_{TENi}, Y_{RESi}, or\ Y_{SWi})] \tag{16}$$

$$Y_{SWi} = a + \beta_1 P(TEN_i) + \beta_2 CPB_i + \beta_3 ADE_i + \beta_4 P(RES_i) \tag{17}$$

Table 4
Implication: Prediction Models and Performance of Merger/Risk Arbitrage Portfolios
Panel 1: Prediction (Logistic) Models

	Equation 14	Equation 15	Equation 17
Intercept	-1.4711***	-1.3634**	-2.1882***
	0.0000	0.0178	0.0005
TEN			1.6935***
			0.0001
CA	1.8040***	0.9939***	
	0.0001	0.0090	
CPB	1.2161**	1.4602*	1.0980**
	0.0130	0.0784	0.0380
ADE		1.4602*	1.3071
		0.0784	0.1376
RES			0.9856**
			0.0128
SIND		0.6345*	
		0.0879	
SI		0.2225*	
		0.0521	
PREOW	1.1672**		
	0.0140		
R-sq	0.2951	0.1313	0.3229

Panel 2: Accuracy of the Sweetening Prediction Model

	0<P(SW)≤ 0.33	0.33<P(SW)≤0.66	0.66<P(SW)≤1	Total
Average Estimated Probability	0.2909	0.4919	0.7718	0.5298
Average Number of Sweetened Offers Received	0.0000	0.8462	1.8000	0.9524
Risk Adjusted Raw Return	-1.6972	0.4118	2.5415	0.3761
Risk Adjusted Annualized Return	-0.9305	0.0416	2.1954	-0.0257
Number of Hostile Takeovers	3	13	5	21

Note: In Panel 1, 148 hostile takeover attempts during the years of 1992 to 2003 are used to estimate the logistic models receiving tender offers (Equation 14), and target' resistance (Equation 15), and sweetening offers (Equation (17)). In Panel 2, 21 hostile takeover attempts during the year of 2004 to 2005 are used to test the significance of Equation (17). P(SW) is an estimated probability of receiving sweetened offers from Equation (17). Risk adjusted raw return means a ratio of an average return to its standard deviation. Risk adjusted annualized return means a ratio of an average annualized return to its standard deviation. In Panel 1, P-values are below coefficients. ***, ** and * means statistical significance at α = 1%, 5% and 10% levels, respectively.

Where P (*TEN$_i$*, *RES$_i$, or SW$_i$*) is the probability for a tender offer, target's resistance or sweetened offers during the takeover attempt period for *i*th takeover attempt; *i means i*th takeover attempt.

Then plugging the probabilities of the tender offer and the resistance into Equation (17) and the estimate of Equation (17) into Equation (16), we are able to estimate the probability of receiving sweetened offers for each ith hostile/unsolicited takeover attempt.

In order to test the significance of the sweetening prediction models [Equation (17)], we undertake an out-of-sample test of 21 hostile/unsolicited offers for the 2004 - 2005 period. Using the estimated probabilities of receiving sweetened offers, we generate three merger/risk arbitrage portfolios with different probability ranges. In Panel 2 of Table 4, $0 < P(SWi) \leq 0.33$ is a portfolio group composed of hostile/unsolicited takeover attempts with estimated probabilities of receiving sweetened offers between 0 and 0.33.   As the estimated probability range increases, the average (actual) number of sweetened offers received tends to increase from 0.00 to 1.8.   The risk adjusted raw (annualized) return of the portfolio, a ratio of return to standard deviation, tends to improve to 2.5415 (2.1954) from -1.6972 (-0.9305).   Thus the simple sweetening prediction model based on our findings may be useful in enhancing the performance of merger/risk arbitrage in hostile takeover attempts.

7. Summary and Conclusion

Herein we explore the arbitrage opportunities which arise in hostile/unsolicited takeover attempts.   Hostile/unsolicited takeovers attempts tend to involve the target's resistance and merger competition which do not commonly occur in friendly takeover attempts.   In addition to the spread and the chance of merger completion by the initial bidder, merger/risk arbitrageurs who consider setting up trading positions in hostile/unsolicited offers need to consider the likelihood of offer sweetening. In this paper, we explore both the impact of sweetened offers on performance as well as the underlying determinants of the chance of receiving the sweetened offers in hostile/unsolicited offers.

We find that, regardless of takeover completion, sweetened offers, which are often caused by information asymmetry regarding the post merger performance, tend to play an important role in explaining the performance of merger/risk arbitrage for hostile/unsolicited offers.   Our sweetening prediction model based on the findings may well help merger/risk arbitrageurs more effectively select their investment in hostile/unsolicited offers thereby enhancing their performance in merger/risk arbitrage.   While our small sample size may lead to information bias, these results imply that depending on the attitudes of the target and the bidder in the takeover attempt, merger/risk arbitrageurs have to consider different risk factors.   That is, in friendly merger offers, merger/risk arbitrageurs may have to consider the risk factors largely influencing the chance of merger completion in order to achieve the initial spread.   In hostile/unsolicited takeover offers, however, they may need to focus on the risk factors influencing the chance of receiving sweetened offers rather than chance of merger completion.

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