

Arbitrage Spreads
and the Market Pricing of Proposed Acquisitions

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Abstract

This paper examines arbitrage spreads and returns following acquisition announcements in 362 cash tender offers spanning the 1981-1995 period. We document considerable abnormal returns to risk arbitrage using various investment strategies, holding periods, and benchmarks. Arbitrage spreads in acquisitions, defined as the percentage difference between the bid price and market price one day after the initial announcement, exhibit a positive mean, with considerable cross-sectional variation. We model these spreads as the visible component of total arbitrage returns; they represent the “price” paid to earn subsequent returns. Empirically, they are significantly related to bid premiums, pre-offer runup, initial managerial attitude about the offer, and the existence of rumors about the offer. Significant abnormal volume is observed around our offers and enhanced explanatory power is noted in a regression using cases with higher abnormal volume. Analysis of the relation between initial arbitrage spreads and subsequently revealed offer characteristics is consistent with market anticipation of the duration and price resolution of the offers.

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1. Introduction

Invariably, the market price of a target firm adjusts upward following the announcement and filing of an acquisition bid. The remaining gap between bid and market price represents an arbitrage spread, money apparently “left on the table”.¹ This spread anticipates the price resolution of the target’s shares and indicates the market pricing of the target conditional on the announced bid price. We know little about the characteristics of this spread, its determinants and its relation to subsequently realized returns. To understand these issues, we model the arbitrage spread and subsequently test the implications of this model on a sample of 362 cash tender offers. Our model decomposes total arbitrage returns into two parts: an initial, visible component represented by the spread and the subsequently realized return. We argue that the initial spread represents the “price” paid for the opportunity to earn subsequent returns. Thus, the magnitude of this spread will be driven by factors related to the probability of bid revision and success. Empirically, we document large arbitrage returns earned from simple trading rules implemented the day after an acquisition announcement. We also

¹ We use the term arbitrage in the popular sense of the word. Strictly speaking, arbitrage involves simultaneous riskless transactions exploiting price differences. Our situation is not riskless: the offer may not be consummated at the bid price. Readers may prefer to substitute the phrase “acquisition spread” or “speculation spread” in place of arbitrage spread. Similarly, we refer to any purchase of shares in the post announcement period as arbitrage activity. We recognize that investors other than arbitrage funds may also be participating in these purchases.

measure the relation of the arbitrage spread to subsequent returns and document factors important in the post-announcement pricing of acquisitions.

To preview our results: The mean arbitrage spread, defined as the percentage difference between the initial bid price and the closing market price on the day after the acquisition announcement, is positive with considerable cross sectional variation. Arbitrage spreads are significantly, negatively related to subsequent returns. We also find significantly positive abnormal volume prior to an acquisition attempt. Cross-sectional analyses document that the magnitude of the spread is significantly related to factors known at the time of the offer: bid premia, target managerial ownership, target managerial attitude towards the offer, and the existence of pre-offer rumors and runups. Supporting the assertion that these factors are important in arbitrage pricing, our results are significant only in the set of offers likely to have increased arbitrage activity – those with high abnormal volume. We also document a significant relation between initial arbitrage spreads and factors unknown at the time of the initial bid, evidence consistent with market anticipation of the duration and price resolution of the offers.

The remainder of this paper is organized as follows: Section 2 discusses related literature. In section 3 we develop the relation between total arbitrage returns and its components, outline the hypotheses to be tested and describe our sample. Section 4 presents evidence on gains from arbitrage activity following acquisition announcements. We also test for abnormal trading volume around acquisitions using the empirical models of Schwert (1996) and Lakonishok and Vermaelen (1990). The final part of section 4 presents univariate and multivariate tests relating arbitrage spreads to bid and target characteristics. Conclusions are discussed in Section 5.

2. Background

2.1 Related Literature

The topic of arbitrage, especially as applied to acquisitions, gained prominence in the middle 1980s with the fame and subsequent notoriety of Ivan Boesky. While arbitrage is undoubtedly as old as the existence of markets, much remains unknown about arbitrage activity in general and its role in acquisitions in particular. To advance our understanding, we focus on the initial post market arbitrage spread following acquisition attempts. The literature that relates to this issue can be grouped into three categories: 1) anecdotal evidence, 2) the evolution of market prices in successful and unsuccessful acquisitions and 3) the magnitude of arbitrage profits following particular events. To the best of our knowledge, the literature does not contain an analysis of the cross-sectional determinants of arbitrage spreads in acquisitions.

An early example of the anecdotal approach is "Risk Arbitrage II" (1982) by Guy P. Wyser - Pratte, a revision of the author's (1969) MBA thesis completed at NYU. The book is filled with useful case discussions and illustrations of the arbitrage process around acquisitions. Similar points and illustrations are contained in Boesky's "Merger Mania" (1985).

Early academic work related to the topic includes Samuelson and Rosenthal (1986) and Brown and Raymond (1986). Both sets of authors examine the evolution of post announcement price movements of target shares as predictors of offer success. Samuelson and Rosenthal analyze 109 single bidder, cash tender offers announced between 1976 and 1981. Brown and Raymond perform a similar analysis using 71 acquisitions from the 1980 to 1984 period. Not surprisingly, both articles find that the trend in market pricing of target shares over the post-announcement period is an

accurate indicator of offer success (prices rise for successful offers while they fall for unsuccessful offers).²

Several studies report large, significant arbitrage profits related to restructuring activity. Larcker and Lys (1987) examine long positions by arbitrageurs as disclosed in a sample of 94 SEC 13-D filings from December 1977 to December 1983. These 13-ds must be filed when a party acquires more than 5% of a company's stock or materially increases its holdings. Obtaining their data from the *Insiders Chronicle*, the authors analyze cases where the announced objective of the party purchasing shares is "arbitrage or other business activities or to participate in a potential merger or tender offer". The authors report mean and median excess returns to arbitrageurs of 5% and 3%, respectively, from the time of their investment to the resolution of the offer.

Lakonishok and Vermaelen (1990) analyze abnormal stock returns and trading volume surrounding repurchase tender offers. Using various trading rules they report weekly returns averaging approximately 9%. They also note significantly positive abnormal returns in the two years subsequent to the repurchase -- a factor attributed primarily to small firms in the sample.

Dukes, Frohlich, and Ma (1992) examine arbitrage activity around 761 cash tender offers filed between 1971 and 1985 and report returns of approximately 25% for a 50-day period. Karolyi and Shannon (1998) report annualized returns to arbitrageurs exceeding 25% for 37 Canadian acquisition targets during the year 1997.

There are several recent theoretical papers related to arbitrage. Cornelli and Li (1998) present an analysis of the importance of toeholds to arbitrageurs. They also model the link between trading volume and the number of arbitrageurs involved in a particular deal. Shleifer and Vishny (1997) examine the implications of arbitrage for

² In related work, Brown and Ryngaert (1992) find that tendering rates in acquisitions over the 1978 to 1986 period increase with bid premia and that proxies for capital gains tax liabilities also help

security pricing. Gomez (1999) models takeovers and freezeouts, the latter being defined as cases where a bidder acquires a large block of shares and subsequently forces conversion of the remaining shares. In his model, increased arbitrage activity implies increased bid premia.

3. Research Design

3.1 The Components of Arbitrage Returns

Assume that risk arbitrageurs respond to the first formal acquisition announcement for a target firm at time t_0 and purchase shares in that firm the following day for price P_1 .³ Holding these shares until completion of the offer yields:

$$AR_i = (P_F - P_1) / P_1 \quad (1)$$

where AR_i is the percentage return to arbitrage for acquisition i and P_F is the final price received for shares purchased. Let BP represent the first announced bid price for the target's shares.⁴ Rewriting $P_F - P_1$ we see that the arbitrage return has two components, one visible just subsequent to the announcement [$BP - P_1$] and one subsequently observed and dependent on revisions of the bid or realized price [$P_F - BP$]. Thus,

$$AR_i = AS_i + (P_F - BP) / P_1 \quad (2)$$

explain tendering behavior.

³ We choose the following day to define a specific, realizable strategy in our estimates. In practice, arbitrageurs are likely to time their trades advantageously, purchasing and selling as prices and information dictate. Moreover, arbitrageurs will continuously monitor the spread throughout the term of the offer and invest as perceived opportunities arise.

⁴ Seven percent of our formal bid announcements are preceded by rumors. Obviously, purchasing on the rumor would add an additional dimension of risk. We focus on the first formal announcement for two reasons: first, it provides a definitive and more homogeneous benchmark for the analysis of arbitrage returns. A second reason is the stated policy of many arbitrageurs of not investing until the deal is announced. In addition we wish to compare components of the initial spread with variables

where $AS_i = (BP - P_1)/P_1$, the arbitrage spread to trader i ,

The arbitrage spread is the visible component representing “money apparently left on the table”. If all shares are accepted at price BP arbitrageurs earn the difference $BP - P_1$. This arbitrage spread can be viewed as the amount “paid” for the opportunity to earn the subsequent return $(P_F - BP) / P_1$. Smaller spreads (less money left on the table) imply a higher price for the opportunity to earn subsequent returns.

3.2 Understanding the arbitrage spread

The importance of the initial arbitrage spread is apparent from its relation to subsequent returns. Arbitrageurs gain or lose the difference between their purchase and subsequent tendering or selling price. The arbitrage spread is endogenously determined through the actions of arbitrageurs bidding in the post announcement period and determining the price P_1 . This price is set cognizant of expected risks and returns associated with the acquisition. For a fixed bid price, the post announcement market price P_1 uniquely determines the subsequent rate of return to arbitrageurs. This assumes, however, that the bid will be successful at the bid price, and that all of the shares of arbitrageurs are tendered and accepted. In reality, upward revisions in the bid price are frequent and generate greater returns. Conversely, downward revisions, partial tender offers or bid failures produce lower or even negative returns. As Shleifer and Vishny (1997) note, “...in most real world situations arbitrageurs also face some long-run fundamental risk. In other words, their positions payoff only on average, and not with probability one.”

In addition to the potential gains and losses through share purchases, costs to arbitrageurs also include the use of funds tied up during the acquisition process. The

often announced concurrently with the formal bid. We will, however, examine the impact of rumors on the arbitrage spread.

longer the acquisition process takes and the higher the interest rate, the higher the carrying costs of funds involved.

At any point, firm value is the weighted average of possible share prices times the probability of realizing these share prices. Incorporating the distribution of possible payoffs and anticipated holding costs, the expected return to arbitrageurs subsequent to the announcement of a tender offer j can also be expressed as:

$$E(\text{return}_j) = \sum_F \text{Prob}_F (P_F - P_1) / P_1 - H_j$$

Or equivalently,

$$E(\text{return}_j) = AS_i + \sum_F \text{Prob}_F (P_F - BP) / P_1 - H_j \quad (3)$$

where Prob_F is the probability of being able to sell the firm for P_F dollars, and H is the percentage holding cost involved in the transaction.

3.3 Testable Implications

This analysis suggests several testable implications: First, to the extent that arbitrage spreads are the price paid for subsequent returns, there should be a negative relation between the two components. Second, the variables expected to drive the magnitude of the arbitrage spread are those related to subsequent returns. Some of these factors are known at the time of the bid (e.g., target managerial attitude about the offer and the size of the bid premium); some factors are subsequently revealed (e.g., outcome of the offer, final price resolution, and the duration of the offer). Third, Wall Street wisdom asserts that arbitrageurs are neutral towards target management and particular bidders. Indeed, success of any single bidder is not important to an arbitrageur. The identity of the winning bidder is only important if it affects the price resolution and terms of the offer. Fourth, these relations should be stronger in situations where

increased arbitrage activity is present. In subsequent sections, we examine the overall return and its components testing the significance of each of these implications.

3.4 Sample Selection

Our list of target firms covers the period from January 1, 1981 to December 31, 1995 and is obtained from Securities Data Corp. (SDC). We select all cash tender offers where the bidder seeks to own 100% of the firm, the value the transaction exceeds \$10 million, and where the target is listed on the NYSE, AMEX, or NASDAQ exchanges 20 trading days prior to the acquisition announcement date.⁵ In addition, as a check on our data, we require that the acquisition be announced in a major newspaper covered by Lexis-Nexis. Financial and public utility companies are excluded.

Our calculation of arbitrage spreads and our trading strategies stem from the first formally announced bid for a particular target. The existence of rumors concerning the acquisition is noted from Lexis-Nexis and is analyzed in a latter part of the paper. In subsequent sections, we compare arbitrage spreads and subsequent returns to target and bid characteristics. Ownership of the target firm by officers and directors, blockholders and bidders is obtained from proxy statements filed before the offer is announced. Institutional ownership is obtained from the S&P Stock Guide. Data on managerial attitude and on the disposition and outcome of the offer is obtained from SDC and Lexis-Nexis. We also use SDC to code dummy variables for: a) the existence of previous acquisition activity in the target's 3-digit SIC industry, b) to note whether the bidder is experienced in acquisitions and c) to note the number of advisors employed by

⁵ A few transactions in our sample involve target firms smaller than \$10 million. This is due to our treatment of preceding offers--if an offer shows up in our initial sample and we determine that there

the bidder⁶. The latter is a proxy for the degree of seriousness of a particular bidder. Volume, run-up and other price and return data are derived from CRSP.

4. Results

4.1 Returns to arbitrage

We begin our analysis by calculating the traditional abnormal returns around the first announcement of the tender offer. The first announcement is defined as the first formal acknowledgement of an acquisition attempt by a bidder. We concentrate on the first bidder for a particular target, meaning that no other bid activity is mentioned in the preceding six-month period. Our results, not shown for brevity, are typical of the acquisition literature: the average target firm earns 20.4% in the two-day announcement period (-1, 0) and smaller positive abnormal returns in the pre-announcement period.

4.1.1 Average Arbitrage Spreads

Of primary interest is the distribution of arbitrage spreads. Table 1 reveals that the mean and median arbitrage spreads over the entire sample are 1.86% and 1.96%, respectively. Thus, the typical stock price of a target firm on the day after the acquisition announcement increases to an amount just below the initial bid price. Note, however, that there is considerable cross-sectional variation in the arbitrage spread. The minimum and maximum spreads are -30% and 42%, respectively. In fact, over 23% of

was a tender offer in the prior 6 months, we include the prior tender offer in our sample as the initial offer and drop the subsequent offer.

⁶ The importance of reputable financial advisors to the acquisition process has been first noted in non-academic literature (Boesky (1980)). The idea suggested by Boesky has been studied among others by Rau (1999) who notes that advisor reputation is built on the ability to complete deals. Since financial advisors might serve several roles, such as finding a suitable target, target valuation, arranging financing etc. we choose to use a proxy for the seriousness of a bidder by a dummy variable set equal to one if the bidder employs more than one financial advisor.

the spreads are negative, representing post announcement stock prices in excess of the stated bid price.

Panel B reveals the number of firms and mean spread partitioned by year of the sample. The largest number of firms enter our sample in the mid- to late-1980's and in the very last year of our sample, 1995. The decline in acquisition activity noted in the late 1980's and early 1990's is consistent with Comment and Schwert (1995). The mean spread is positive in all but the first year of the sample.

These observable arbitrage spreads can be considered "money left on the table", the price paid for the opportunity to earn subsequent acquisition returns. Smaller spreads represent a higher price in that the visible return is lower.

4.1.2 Average Arbitrage Returns

Post-announcement returns to arbitrageurs using various trading strategies and risk adjustments are reported in Table 2. All strategies assume purchase at the closing price on the day after the first formal announcement. Abnormal returns are cumulated over periods of one to eight pseudo-weeks (e.g., five trading days) subsequent to day t_1 . The first column shows raw returns. Since the focus of our research is on understanding the cross sectional variation in the arbitrage spread and its relation to subsequent returns, we do not elaborate on the appropriate risk adjustment procedure. Nevertheless, the next three columns report returns for strategies of investing in the target's stock minus the value-, equal-weighted CRSP index, and size benchmark provided by CRSP. A total of 362 firms are in our sample. Arbitrageurs buying the target firm one day after the acquisition announcement and closing their position one week later earn an excess return of 1.42 to 1.54% (102 to 115% on annualized basis).

Mention of the phrase "arbitrage and mergers" brings to mind visions of wildly speculative activity. In contrast, most arbitrageurs report that they attempt to minimize

both market and idiosyncratic a risk.⁷ One way to do this is through hedging with shares of the bidder or by purchasing options. Although we concentrate on the strategy of buying the target firm, we also examine the strategy of buying the target and shorting the bidder. This simple strategy is an attempt to lock in the arbitrage spread and avoid market exposure. Predominantly used in stock acquisitions, it is consistent with the small negative drift associated with bidding firm returns in the post announcement period. The 'Buy Target & Short Bidder' column returns are calculated as return on target's stock minus the return on the first bidder's stock; only observations where both returns can be obtained are included in this sub-sample. Since many bidders are not listed on the NYSE, AMEX, or NASDAQ exchanges, our sample size is reduced. Returns are generally enhanced, particularly for the first week following the acquisition announcement. Arbitrageurs buying the target and shorting the bidder earn an average excess return of 1.88% (the corresponding annualized return is 156%) in the one-week following the acquisition announcement. This simple hedging strategy also reduces market exposure: the average portfolio beta is 0.71 for the "buy the target" strategy but drops to -0.14 for the "buy the target – short the bidder" strategy.

Lakonishok and Vermaelen (1990) categorize results for trading strategies in repurchase offers based on the size of the initial post-acquisition spread. The intent is to concentrate in stocks where the anticipated spread is large enough to cover any transaction costs. However, this criterion is less applicable in acquisitions where many offers are revised. Indeed, we view the arbitrage spread as endogenously set by arbitrageurs anticipating the possibility of subsequent bid revision. Nevertheless, following the lead of Lakonishok and Vermaelen, we calculate returns split by arbitrage spreads less than 3% and greater than or equal to 3%. Our analysis, omitted for brevity,

⁷ See, for example, "Ivan Boesky They Ain't", Barrons, October 25, 1993

produces mixed results: smaller spreads are associated with higher returns in some market comparisons and time periods and lower returns in others.

4.2 Characteristics of the sample

In an effort to understand the large cross sectional distribution of arbitrage spreads revealed in Table 1, we have conjectured that they represent the price paid to earn subsequent acquisition returns revealed in Table 2. We begin our analysis of arbitrage spreads and the returns associated with them by examining bid and offer characteristics of firms in our sample. Following this we test the linkage between these characteristics, arbitrage spreads, and subsequent returns.

We examine the nature of cross-sectional distribution of arbitrage returns by calculating an average daily abnormal return that would be earned over the life of each acquisition attempt. To do this we first calculate the cumulative abnormal return from the close of trading on day one to the earliest of the completion date or t_{+90} . These CARs are then averaged over the number of days cumulated to arrive at an average daily abnormal return.

Table 3 reveals considerable cross-sectional and time series variation in arbitrage returns. The number of observations per year and the average abnormal returns also vary over time. The average abnormal return ranges from a low of -0.06% in 1985 to a high of 0.33% in 1981. Although, the median abnormal return over the entire sample is positive, nearly 40% of the individual returns are negative. In spite of the abnormal returns reported in Table 2, we note that a strategy of buying the target one day after the initial announcement and holding over the post-announcement period earns negative abnormal returns in 40% of the cases.⁸ Of course, it is likely that this

⁸ Nevertheless, this strategy appears profitable over our sample period. In results, not reported, we simulate portfolio returns for a strategy of buying a target firms' stock 1 day after announcement and holding until the resolution of the offer. A transaction cost of 1.5% is charged for buying and selling

analysis understates the returns that could be earned by informed arbitrageurs actively selecting deals and holding periods.

4.3 Price Revisions and Initial Arbitrage Spreads

In subsequent sections we attempt to understand the distribution of initial arbitrage spreads by comparing them to characteristics of the acquisition bids and of the target firms. We explore bid characteristics in the remaining columns of Table 3. Over 78% of the bids are friendly or neutral in nature. More than 71% of the bids involve a single bidder. The most striking feature of this table is that nearly 97% of all bids are ultimately completed.⁹ Of course, the amount lost in the few unsuccessful deals could still result in financial disaster for an arbitrageur.¹⁰ Additional uncertainty results from the length of time it takes to complete a bid and the degree of any bid revisions. Nearly 42% of the bids are revised.

The distribution of bid revisions, defined as the revision ratio, is shown in Table 4. The revision ratio is the last bid price divided by the first announced bid price. Since our arbitrage spreads are calculated around this first announced price, bid revisions

on the open market. When there is no tender offer occurring on a particular day, the return for the value-weighted portfolio is spliced in. The return on this portfolio is 492% from 1981 to 1995. The return on the value- and equal-weighted market portfolio is 214% and 278% over the same period. We note that this result does not appear sensitive to the starting points examined by this research. The risk arbitrage portfolio outperforms the market portfolios by a factor of two over any subperiod examined. In addition to 1981, for example, we replicate this strategy for starting periods beginning in 1984, 1987, 1990, and 1993.

⁹ This completion rate surprised us. Discussions with arbitrageurs, however, support these figures. In addition, we confirmed the validity of this result using a sample of successful and unsuccessful offers from W.T. Grimm as well as from SDC. It should be noted that the completion rate is target specific; the typical success/completion rate reported in the literature takes the point of view of a particular bidder. If we assume all multiple bids involve just two bidders (a conservative assumption) our bidder specific success rate is 75% ($350 / (362 + 103)$) which is comparable to the existing literature.

¹⁰ Riva Atlas in Institutional Investor (1999) mentions, for example, that the 1989 leverage buyout of UAL Corp., not only destroyed the takeover boom but also left numerous risk arbitrageurs with huge losses. Also, Long-Term Capital took considerable positions in takeover deals (e.g. Tellabs and Ciena Corp., Travelers Group-Citicorp, Worldcom-MCI, and Berkshire Hathaway-General Re Corp.). While some deals collapsed, other were affected by market panic that sent stock price plunging, leaving the fund with considerable losses.

represent additional changes in returns to arbitrageurs. The mean and median revision ratios are 1.08 and 1.0, respectively. A few bids actually involve downward revisions from the first announced price.¹¹ We will return to this revision ratio and its relation to the initial arbitrage spread at the end of the paper.

To this point we have examined arbitrage returns and arbitrage spreads but have not documented that arbitrage trading exists around these offers. The next section investigates this question.

4.4 Abnormal volume around tender offers

Evidence of arbitrage activity is consistent with abnormal trading volume for the target firms. Following Lakonishok and Vermaelen (1990) and Schwert (1996), we examine abnormal trading volume for target firms around their tender offer announcements. We use three measures of abnormal volume, the mean and median of the Lakonishok and Vermaelen measure and the mean volume growth measure of Schwert. (Means and medians are similar for the Schwert measure.) The Lakonishok and Vermaelen variable is the ratio of event volume relative to pre-announcement volume. Under the null hypothesis, the mean ratio is one. Normal trading volume is calculated as the average daily volume computed from days -52 to day -25 relative to the announcement. Due to large skewness, we report sample mean and median values of this ratio. We also calculate an abnormal volume growth measure based on Schwert. Schwert's model assumes that daily trading volume growth rate is a function of its own lagged volume growth rate and concurrent and lagged market volume growth rates. The parameters of the model are estimated over a window from -379 to -127 days prior to the first bid. The abnormal volume measure is a sum of daily prediction errors from day -42

¹¹ For example, the bid for Tonka was revised downward from \$7 to \$5 when the offer was amended to include purchase of the bonds. Similarly, Pacific Gamble Robinson accepted a second friendly bid at \$28 over a hostile initial bid at \$29.

till day -1 , relative to the takeover bid¹². Under the null hypothesis of no abnormal trading, this measure is zero.

Table 5 presents the analysis of abnormal volume. The ratio of event period volume to normal volume, averaged across all firms in the sample, is significantly greater than one as many as 23 days before the acquisition announcement. The high-level abnormal volume continues through and past the announcement day. The mean value, however, is distorted by the existence of extreme outliers. Indeed, the median abnormal volume ratio is less than one up until 4 days prior to the acquisition announcement. Median values substantially larger than one are noted on date -1 and continuing throughout the post announcement. The abnormal volume growth measure of Schwert (1996) also indicates significant abnormal volume beginning with day -1 . All three measures of abnormal volume indicate significant trading activity just before and continuing after the announcement of the tender offer.

4.5 Variables influencing the arbitrage spread

The results so far have established that a) there is a large cross sectional distribution of arbitrage spreads, b) there are sizeable arbitrage returns from simple post acquisition trading strategies, and c) there is significant abnormal trading before and after acquisition announcements. We now attempt to link these results together, explaining the arbitrage spread in terms of variables known and unknown at the time of the bid and incorporating the impact of abnormal trading.

The relevant variables from our equation (3), the model of arbitrage spreads, are those that influence either the probability of realizing a particular price (Prob_F), the magnitude of that price (P_F), holding costs (H_j), the latter presumably related to the duration of the offer, and the cost of funds invested by the arbitrageur.

¹² We also test event window -1 to 2 to measure abnormal trading volume. There is no qualitative

4.5.1 Probability factors

Factors related to the probability of tendering at a particular price are those affecting the probability of bid revision. Bid revision will in turn be related to target managerial attitude, the distribution of power in the target firm, the size of the bid premium, characteristics of the target firm and its industry, and the experience of the bidder.

Target managerial attitude is known to influence the outcome of an offer. Walkling (1985) shows that success rates for a particular bidder are dramatically lower in contested offers. Arbitrageurs however do not care who acquires a particular firm, only that they are able to realize an appropriate return on investment. Nevertheless, hostile offers are more likely to involve multiple bidders increasing the *probability of bid revision* by the initial or subsequent bidders; smaller spreads are expected. Friendly offers imply a smaller chance of revision and are expected to be associated with larger spreads (i.e., a lower P_1 relative to the announced bid price).

The *distribution of power* in the target firm is also known to affect the outcome of an offer. We consider the shareholdings of four distinct groups: officers and directors, blockholders, institutions, and bidders. The ownership of officers and directors can be used to encourage or thwart acquisition by a particular bidder. Hence, conditioning on managerial attitude can be important.¹³ Hostile management with increased shareholdings is more likely to remain independent, implying larger spreads. Friendly management with increased shareholdings will be better able to bargain for higher premia. If this bargaining has not occurred prior to the announcement, spreads will be smaller. Otherwise, the impact of ownership may already be reflected in the premia

impact on the results.

¹³ The role of blockholders and institutions in an offer is also likely to depend on their relationship with management [Brickley, Lease, and Smith (1988)]. Unfortunately, we do not have data on the nature of these relationships.

offered. Toeholds by the bidding firm increase their influence over the managerial team and will increase the bargaining power of that bidder.¹⁴ Since this lowers the probability of bid revision, spreads are expected to increase with bidder toeholds. Traditional sources of data on these shareholdings (from proxy statements, Value Line, etc.) are unlikely to reflect any recent changes in ownership. *Unusual volume* activity, *rumors* of acquisition activity and *runups* of target stock price are other indicators of shifts in ownership distribution; each of these factors is likely to be associated with increased arbitrage activity and the accumulation of shares in more neutral hands. These arguments imply a lower spread with the anticipation of bid revisions. Several of these factors are likely to be correlated with other bid characteristics. Rumors, for example, could be more prevalent in friendly acquisitions which are expected to be associated with larger spreads. Consequently, the impact and significance of these factors is an empirical issue.

Larger percentage *bid premiums* will deter competing bids and make the probability of bid revision less likely; lower spreads are expected. *Poor financial condition* of the target may imply synergistic opportunities with many bidders. This will increase the probability of bid revision and should also lower spreads. Another proxy for synergistic opportunities is the *existence of a previous acquisition* in the target's industry; again, smaller spreads are expected. *A bidder's experience* in the acquisition process should give it a competitive edge and make it more likely that they will complete the acquisition. To the extent that this implies a lower probability of revision, larger spreads are expected.

¹⁴ Alternatively, toeholds are a way to hedge the position of an initial bidder if a subsequent bidder acquires the target.

4.5.2 Factors affecting holding costs

Arbitrageurs investing in acquisition targets incur holding costs proportional with the *cost of funds* and the *duration of the offer*. In practice, of course, shares may be sold prior to the completion of an offer. However, successful offers generally involve a higher price at the completion of an acquisition. Spreads are expected to increase with both the cost of funds and the duration of the offer. *Microstructure effects* may also influence the cost of arbitrage activity. In particular, investments in small priced stocks may involve higher costs related to the discrete amounts at which shares are traded. That is, the typical 1/8 increment in tick size is a higher percentage of share price for smaller priced stocks [Bali and Hite (1998)]. In addition, stocks with smaller capitalization are likely to be less liquid, which would also increase the cost of taking positions in the target firm.

4.6 Sample characteristics

Table 6 reveals the distribution of continuous variables for our sample. Measured 42 days prior to the announcement date of the tender offer, our mean and median firm has a market value of equity of \$338 million and \$93 million respectively. As is typical, firm size exhibits considerable skewness. Equity holdings of officers and directors average 20% but are considerably dispersed. Insider ownership at the first and third quartile's is 4% and 32%, respectively. Blockholders, defined as individuals or institutions owning more than 5% of shares outstanding and who are not obvious insiders, have mean and median holdings of 16% and 12% respectively. As with other measures of ownership, the range is large; the minimum is 0% and the maximum is 87%. Mean institutional ownership is 37% and 35%, respectively. The skewness of target size is also apparent in the number of institutional holders of their stock. On average, 71 firms hold shares in a target firm; the median (35 firms) is much smaller.

Sixty-one percent of targets had takeover activity in the prior year in their 3 digit SIC industry (as defined by SDC). Although we will not explore the myriad possibilities involving options trading around acquisitions, we will examine whether the existence of options on the target firms is related to arbitrage spreads; 16% of our targets had listed options.¹⁵

The bid premium is calculated as the dollar premium (bid price - P_b) divided by P_b (where P_b is the average pre-bid price from $t = -30$ to $t = -10$ relative to announcement date of the tender offer). Mean and median values are 47% and 42%, respectively. Although the median firm does not have a toehold by a bidder, there are some targets where bidder ownership is very large. The maximum bidder ownership is 87%.¹⁶

Arbitrageurs intending to tender target shares are concerned with the duration of a tender offer. Alternatively, arbitrageurs selling in the open market prior to the completion of an offer will face purchasers concerned about offer duration. Offers lasting extended periods of time involve added holding costs and greater uncertainty. The typical (median) offer in our sample lasts for 48 days. The mean of 72 days is considerably higher due to the presence of extreme values in the sample. The longest bid lasts for over a year and a half (565 days).¹⁷

4.7 Univariate comparisons arbitrage spreads with ex-ante characteristics

We begin our analysis of the determinants of the arbitrage spread splitting the sample above and below the median of the continuous variables. Table 7 presents a univariate analysis comparing the mean spread across these two groups. Recall that

¹⁵ The authors would like to thank Sorin Sorescu (University of Houston) and Bart Danielsen (De Paul University) for providing data on option listing.

¹⁶ The corresponding 90th, 95th, and 99th percentiles of toehold are 15.6%, 47.6%, and 67.7%, respectively. Sensitivity tests without extreme values (larger than the 95th percentile – 47.6%) produce similar results.

¹⁷ This was the unsolicited bid for Kollmorgen initiated by Vernitron Corp. on 12/15/88. After extensive negotiations, the bid was resolved in June 1990.

the low spread offers are associated with greater price adjustment towards the bid price. We have conjectured that observations with smaller arbitrage spreads have a greater implied probability of realizing the bid (or higher) price than cases with larger arbitrage spreads. Univariate results indicate that mean spreads are significantly smaller in offers where target firms are larger, have smaller managerial ownership, smaller bid premia, and where the target managerial attitude is hostile. Arbitrage spreads are also significantly smaller for targets having more institutional shareholders. Since several of these variable are related, we reserve interpretation until the multivariate results are presented in the next section.

Finally, we note that arbitrageurs can manage risks by hedging positions. This is facilitated if options exist on the target firms shares. Univariate results indicate insignificantly smaller spreads on targets with listed options.

4.8 Multivariate comparison of spreads to ex-ante characteristics

Several variables analyzed in the previous table are related. In particular, institutional interest, the existence of options, and size are known to be significantly correlated. As a consequence, the multivariate importance of these variables may differ. To examine this, Table 8 presents the results of multivariate regressions explaining the cross sectional variation in the arbitrage spread. P-values are shown beneath the coefficients. Coefficients significant beyond the 0.10 level are shown in bold.

Starting with regression 1, we note that arbitrage spreads are significantly smaller for larger target firms. Spreads are also significantly positively related to the size of the bid premium, dummy variables coded for friendly or neutral managerial attitude, and the existence of a prior rumor. Larger firms are likely to attract more arbitrage activity because of their high institutional interest, increased liquidity and information. Offers involving higher bid premiums are less likely to attract competing offers and

subsequent bid revisions. Consequently, the initial post announcement price adjusts less than would be expected if subsequent revisions were anticipated. Similarly, friendly/neutral offers are also less likely to attract revised bids, an effect which translates into higher levels of spread.

The 7% of our cases where the tender offer announcement is preceded by a rumor are associated with significantly higher spreads. The significance of the dummy variable coded to one for the existence of a pre-offer rumor is enhanced if the dummy is coded one only for rumors that actually mention a specific bidder name. (Both definitions of rumor, however, produce significant coefficients.)

In regression 2 we add an explanatory variable measuring the run-up in stock price from date -42 to -1 [Schwert (1996)]. Increased runup is consistent with the accumulation of pre-announcement positions by arbitrageurs. Related to this, firms with higher levels of run-up are associated with significantly lower levels of spread. Abnormal volume is insignificant in our regressions. Using different windows (e.g. 0 to 1) for measuring abnormal trading volume yields similar results.

The level of managerial ownership is insignificant in the first two regressions. Nevertheless, managerial ownership can be used to enhance or thwart an acquisition attempt and the importance of managerial shareholdings to bid outcomes and bid revisions is likely to be conditioned on managerial attitude. In regression 3 we create two variables interacting managerial shareholdings with managerial attitude about the offer. Spreads are significantly positively related to managerial ownership in hostile acquisitions. Managements with higher levels of shareholdings have increased power to repel unwanted acquisitions and less need for rescue by white knights.

The existence of previous acquisition activity in the target firms three-digit SIC code (as defined by SDC) is likely to be indicative of either restructuring or synergistic opportunities available from acquisition of the firm. Greater arbitrage activity and smaller

arbitrage spreads are expected. In addition, experienced bidders with experience in acquisitions (i.e., listed as a bidder in the previous three years as indicated by SDC) could achieve a higher level of success. Alternatively, experienced bidders may never intend on completing an acquisition but profit from toeholds they acquire. Nevertheless, dummy variables for both acquisition activity in the industry and bidder experience are insignificantly related to arbitrage spreads as revealed by regression 4. Another factor related to bidder experience is the existence of multiple advisors for the bidder. Bidders with multiple advisors are likely to be taken more seriously by arbitrageurs. A dummy variable set equal to one for the 51 cases with multiple advisors has a significantly negative coefficient. (Results for bidder size, not shown, produce a negative, but insignificant coefficient.)

To control for microstructure effects we include a dummy variable set equal to one if market price at t-20 is less than \$5. This recognizes the fact that the discrete nature of price quotes has more impact on low-priced stocks [Bali and Hite (1998)]. This variable enters with a significantly positive coefficient. We also add variables related to option trading, various time periods and hot and cold markets. First, we include a dummy variable set equal to one if options are traded on the target firm's stock. With regard to time, the academic literature indicates a varying nature of acquisition activity over the sample period. Popular press reports also suggest differing concentrations of arbitrage activity over time. Consequently, we split our sample period into thirds adding two dummy variables set equal to one for offers occurring in years 88 through 91, and 92 through 95, respectively. Offers occurring in other years are set equal to zero. We also test the significance of two dummy variables set equal to one in "hot markets" and "cold markets." Hot and cold markets are those in which the number of acquisitions in a particular month is in the upper or lower quartile of the distribution of this variable, respectively. None of the variables related to the existence of traded options, time

periods, or “hot and cold markets” are significant, nor do they materially alter the remaining coefficients. In results not reported, we find no relation between a measure of the cost of funds, the brokers call rate, and arbitrage spreads.¹⁸

Arguably, not all offers attract arbitrage activity. If arbitrage activity is driving our results, then mixing offers with and without such activity will confound our analysis. We examine the importance of this by splitting the sample at the median of abnormal trading. Regression 5 examines the 177 cases with higher than median abnormal trading; regression 6 examines the remaining cases. Supporting our claim that arbitrage activity is pricing offer characteristics in the spread, we find increased explanatory power in the high volume firms. The adjusted R squared is over 14% in the high volume cases but only 5% in the low volume cases. Moreover, several variables lose their significance in the low volume cases.

4.9 Does the spread anticipate offer outcomes?

The preceding results indicate significant abnormal returns from trading strategies surrounding the post acquisition period. We also demonstrate that the considerable cross-sectional variation in arbitrage spreads is related to target and offer characteristics known at the time of the bid. In this section we examine the initial market pricing of information known only after the fact. Specifically, how does the arbitrage spread relate to bid revisions, bid success, the existence of multiple bidders and the final price of the offer?

Table 9 reveals the relation between post-announcement characteristics of the offer and the size of the arbitrage spread. Panel A presents the distribution of bid characteristics, known only after the announcement, across high and low spread groups. Our results indicate that offers in the low arbitrage spread group have a significantly

¹⁸ The brokers call rate is measured at the beginning of the month prior to the acquisition

higher probability of involving multiple bidders and being revised than cases in the high arbitrage spread group. Offer outcomes are distributed independently across high and low spread groups. Arbitrageurs are generally unconcerned about the identity of the successful bidder as long as they are tendering their shares for maximum profit. Of course, the small number of withdrawn offers complicates the analysis. Panel B reveals the percentage arbitrage spread across offer categories. Arbitrage spreads are significantly smaller in revised offers, but insignificantly different across offer outcomes or competition variables.

Table 10 presents multivariate results relating arbitrage spreads with subsequently revealed characteristics, controlling for firm size. Our results indicate that spreads are not related to whether a particular bidder wins, are marginally, but insignificantly, smaller if multiple bids materialize and are independent of offer outcome. The insignificance of outcome is surprising and may be an artifact of the small number (12) of withdrawn cases. The insignificance of competition (multiple bids) appears surprising until we consider that revision is the driving factor and that both single and multiple bids are revised. Sixty percent of bid revisions involve multiple bidder deals; 40% of bid revisions are single bidder deals.

One of the implications of our initial model is that the magnitude of the initial arbitrage spread is negatively related to subsequent returns as revealed in the revision ratio. Regression 7 confirms the expected negative link between the initial arbitrage spread and subsequent returns. The coefficient suggests that, controlling for firm size, an additional 1% increase in the revision ratio is associated with a decrease in the spread of 0.13%. That is, an additional 1% return resulting from a bid price revision costs the arbitrageurs 0.13% today due to the higher price for target's shares (smaller spread).

The magnitude of this tradeoff is undoubtedly driven by uncertainty surrounding revisions.

We also find that spread is significantly positively related to the duration of the offer. Positive coefficients on the duration of an offer are consistent with longer offers being more costly to arbitrageurs. Interestingly, the coefficient of .0002 implies an annual interest rate of approximately 7%, which appears realistic for our sample period. The mean and median annual broker's call rate measured over the months of our sample period is 8.7% and 8.5%, respectively. The call rate itself, however, is not significant in our regressions.

In summary, the results of table 10 indicate that market pricing in determining the initial arbitrage spread anticipates both subsequent price activity for the target firm and the length of time the offer is outstanding.

5. Summary and Conclusions

In spite of over two decades of active research on acquisitions, much remains unknown about risk arbitrage activity around acquisition announcements and its effect on pricing of a target firm's stock. This paper analyzes arbitrage returns and arbitrage spreads surrounding cash tender offers between 1981 and 1995. Using a sample of 362 offers for 100% of a firm's shares, we find that trading strategies based on buying the target firm one day after acquisition announcements are highly profitable. Arbitrage spreads are significantly negatively related to subsequent arbitrage returns. We also find significant abnormal volume surrounding the typical offer.

The arbitrage spread, defined as the percentage difference between the initial bid price and the target's closing price on the day after the acquisition announcement is endogenously determined by post market acquisition activity. While arbitrage spreads are, on average, positive, they exhibit considerable cross-sectional variation. In fact,

over 23% of the spreads are actually negative, indicating post announcement prices higher than the bid price. In order to understand the post-announcement pricing of the target's stock, we compare arbitrage spreads to bid and target characteristics. Spreads are found to be significantly related to bid premiums, pre-offer run-up, managerial attitude about the offer, and the existence of rumors about the offer. These variables have enhanced explanatory power in the subset of offers likely to experience increased arbitrage activity – those with high abnormal volume.

In the final section, we compare arbitrage spreads to characteristics unknown at the time of the bid. Spreads are significantly, positively related to the duration of an offer and significantly negatively related to the actual revision ratio that materializes. These results are consistent with market anticipation of the duration and price resolution of the offer.

Table 1: Distribution of Acquisition Related Arbitrage Spreads

Panel A reports the distribution of arbitrage spreads for the sample of 362 cash tender offers filed between January 1, 1981 and December 31, 1995. Panel B reports mean arbitrage spreads by year of the sample. The arbitrage spread is defined as $(BP - P_1) / P_1$ where BP is announced bid price by the first bidder, and P_1 is market price one day after the first announcement of the tender offer.

Panel A: Distribution of Arbitrage Spreads

	Mean	Min	Q1	Median	Q3	Max	Standard Deviation	% Negative
Arbitrage Spread (%)	1.86	-30.10	0	1.96	4.35	41.46	6.99	23.1%

Panel B: Average Arbitrage Spread by Year of the Sample

Year	Total Acquisitions per year	Arbitrage Spread
81	7	-1.71%
82	9	3.23%
83	7	1.26%
84	19	2.98%
85	29	2.31%
86	47	0.05%
87	31	0.30%
88	65	2.70%
89	39	1.04%
90	18	4.42%
91	7	2.00%
92	5	0.94%
93	11	2.66%
94	24	3.57%
95	44	1.85%
Total	362	1.86%

Table 2: Post-Announcement Arbitrage Returns

This table reports post-announcement abnormal returns for trading strategies involving 362 tender offers over the period 1981 – 1995. Abnormal returns are cumulated over periods of one to eight pseudo-weeks (e.g., five trading days) subsequent to day $t + 1$. The first four columns report returns for the target's stock, target's stock minus the value-, equal-weighted CRSP index, and size benchmark provided by CRSP. 'Buy Target & Short Bidder' column returns are calculated as return on target's stock minus the return on first bidder's stock—only observations where both returns can be obtained are included in the sample. β is the average beta of each portfolio under consideration (equal-weights are assumed). Beta is estimated using 200 daily observations, beginning 260 days prior to the earlier of either rumor or announcement date.

# of trading days	Target Raw Return	Value weighted index	Equal weighted index	Size Benchmark	N	Buy Target & Short Bidder	N
5	1.82%	1.54%	1.42%	1.53%	362	1.88%	225
10	2.48%	1.82%	1.60%	1.82%	361	2.40%	224
15	3.91%	3.22%	2.87%	3.20%	361	3.65%	224
20	4.41%	3.47%	3.07%	3.58%	348	3.33%	217
25	5.20%	3.94%	3.43%	4.04%	235	3.27%	140
30	5.98%	4.47%	3.90%	4.62%	194	4.01%	110
35	6.40%	4.79%	4.25%	5.05%	156	4.96%	85
40	6.56%	4.68%	4.09%	4.85%	137	5.11%	74
β		0.71			360	-0.14	217

Table 3: Distribution of Acquisition Bids over the Sample Period by Year and Offer Characteristics

This table shows the distribution of acquisition bids and average abnormal returns (AARs) in excess of the CRSP value-weighted market index for 362 tender offers filed between 1981 and 1995. AAR is calculated as a cumulative abnormal return from the close on day one until the earliest of t_{+90} or completion of the deal. We normalize this by dividing by the number of days over which the cumulative abnormal return is compounded. An offer is defined as completed when a bidder acquires controlling majority and merges with a target. The multiple bidder dummy is set equal to 1 when a second bidder submits or is rumored to submit a bid. An offer is defined as revised when initial offer price does not equal the last offer/transaction price. Attitude is coded with respect to the first bidder. All unsolicited tender offers are classified as friendly.

Year	Total per Year	Average Daily Abnormal Return	% Of Cases With Positive Abnormal Returns	Outcome		Bid Revisions		Competition		Attitude	
				Completed	Withdrawn	Revised	Unrevised	Multiple Bidders	Single Bidder	Friendly	Hostile
81	7	0.33%	85.71%	7	-	4	3	3	4	6	1
82	9	0.24%	88.89%	9	-	3	6	2	7	9	-
83	7	0.05%	57.14%	7	-	3	4	3	4	6	1
84	19	0.04%	57.90%	17	2	8	11	7	12	17	2
85	29	-0.06%	41.38%	28	1	11	18	8	21	19	10
86	47	0.05%	48.94%	47	-	22	25	12	35	37	10
87	31	0.17%	54.84%	30	1	18	13	12	19	22	9
88	65	0.23%	75.39%	62	3	39	26	33	32	42	23
89	39	0.08%	64.10%	38	1	17	22	8	31	31	8
90	18	0.08%	55.56%	18	-	2	16	1	17	17	1
91	7	-0.02%	57.14%	7	-	3	4	-	7	7	-
92	5	0.07%	60.00%	5	-	1	4	2	3	4	1
93	11	0.20%	63.64%	11	-	4	7	3	8	11	-
94	24	0.13%	79.17%	23	1	5	19	3	21	20	4
95	44	0.04%	45.46%	41	3	11	33	6	38	37	7
Total	362	0.11%	60.22%	350	12	151	211	103	259	285	77
Proportion of Sample	100%	-	-	96.7%	3.3%	41.7%	58.3%	28.5%	71.5%	78.7%	21.3%

Table 4: Distribution of Revision ratio

This table shows the distribution of revision ratio for a sample of 362 cash tender offers filed between January 1981 and December 1995. Revision ratio is defined as last offer/transaction price divided by initial bid price.

Panel A: Distribution of Revision ratio						
Mean	Min	Q1	Median	Q3	Max	Standard Deviation
1.08	0.71	1.00	1.00	1.13	2.13	0.14

Panel B: Frequency Distribution of Revision ratio				
Range	Number of Observations	Proportion of Sample	Cumulative Number of Observations	Cumulative Proportion of Sample
< 1.00	5	1.38%	5	1.38%
1.00	211	58.29%	216	59.67%
(1.00, 1.10)	35	9.67%	251	69.34%
[1.10, 1.20)	50	13.81%	301	83.15%
[1.20, 1.30)	33	9.12%	334	92.27%
[1.30, 1.40)	14	3.87%	348	96.13%
[1.40, 1.50)	7	1.93%	355	98.07%
[1.50, 1.60)	4	1.10%	359	99.17%
[1.60, 1.70)	1	0.28%	360	99.45%
≥ 1.70	2	0.55%	362	100.00%

Table 5: Abnormal Trading Volume around Tender Offer Announcements

Trading volume around the announcement of tender offers relative to normal trading volume. Normal trading volume is the average daily volume computed from days –50 to –25 relative to the announcement (Lakonishok and Vermaelen (1990)). Under the null hypothesis of no abnormal trading, the mean ratio is one. $Pr \geq |S|$ is based on a Signed Rank Statistic. Abnormal volume growth measure is based on Schwert (1996). The event window for this measure begins 42 days prior to the announcement date.

Day	Average Abnormal Volume Ratio	t-statistic	Median Abnormal Volume Ratio	$Pr \geq S $	% > 1	Abnormal Volume Growth Measure	t-statistics
-24	1.00	0.05	0.64	0.99	29%	-0.079	-0.31
-23	1.19	1.78	0.63	0.99	35%	-0.176	-0.63
-10	1.71	4.32	0.83	0.65	43%	0.113	0.33
-9	1.92	3.71	0.85	0.03	44%	0.214	0.59
-8	1.72	3.21	0.77	0.70	40%	0.160	0.48
-7	1.81	3.66	0.89	0.19	44%	0.203	0.61
-6	1.96	4.65	0.89	0.04	46%	0.319	1.00
-5	2.13	5.22	0.94	<0.001	47%	0.416	1.23
-4	2.08	6.02	0.94	<0.001	48%	0.432	1.20
-3	2.24	6.06	1.00	<0.001	49%	0.588	1.61
-2	2.40	6.74	1.11	<0.001	52%	0.675	1.86
-1	4.12	6.00	1.58	<0.001	58%	1.018	2.86
0	32.77	9.66	18.18	<0.001	88%	3.507	7.75
1	24.22	10.77	13.59	<0.001	93%	4.130	10.39
2	12.74	10.96	7.05	<0.001	88%	3.161	6.97
3	8.93	10.25	4.46	<0.001	87%	2.555	6.02
4	8.83	9.16	3.80	<0.001	84%	2.257	5.43
5	7.27	9.46	3.24	<0.001	76%	1.987	4.75
6	5.85	5.61	2.32	<0.001	73%	1.479	3.88
7	6.05	5.67	2.02	<0.001	70%	1.226	3.11
8	4.64	9.23	1.91	<0.001	69%	1.130	2.85
9	4.85	9.18	2.18	<0.001	65%	1.050	2.58
10	4.82	5.33	1.74	<0.001	63%	0.885	2.13

Table 6: Distribution of Target, Bidder, and Offer Characteristics

This table reports the distribution of continuous variables associated with 362 tender offers filed between January 1981 and December 1995. Return on equity and return on assets are calculated as earnings before interest, taxes, and depreciation and amortization scaled by market value of equity 42 days prior to the announcement day or by book value of assets. Measures of market capitalization are expressed in thousands of dollars and are obtained by multiplying share price by number of shares outstanding forty two days prior to or at the announcement date of the tender offer as indicated. Market to Book equal market value of equity 42 days prior to the bid plus book value of debt scaled by book value of assets. O&D Ownership and Institutional Ownership are variables reflecting the share ownership of officers and directors and institutions as reported in a proxy statement and S&P Guide (institutions). Blockholders are defined as the sum of holdings of all outsiders (non-obvious insiders) who hold more than 5% as reported in a proxy statement. Number of shareholders is collected from proxy statements while number of institutional holders is from S&P Guide. The bid premium is calculated as the dollar premium (bid price - P_b) divided by P_b (where P_b is the average pre-bid price from $t = -30$ to $t=-10$ relative to announcement date of the tender offer). The revision ratio is defined as last offer/transaction price divided by initial bid price. Toehold represents the percentage of shares held by the bidder prior to the announcement of the tender offer. Duration of tender offer reports the number of days between the announcement of the tender offer and either the announced date of purchase of tendered shares or date of the first newspaper article indicating withdrawal of the offer. Runup measures return from 42 days prior to till the day of the announcement. Stock price < \$5 is a dummy variable set to one if the average price of the target between days -30 to -10 is less than \$5 and to zero otherwise. Previous acquisition codes for the presence of takeover activity in targets 3 digit industry in a prior year (=1 and 0 otherwise). Experienced bidder is a dichotomous variable equal to one if the first bidder in our sample attempted an acquisition in prior three years and zero otherwise. Multiadv is set equal to 1 if bidder employed multiple financial advisors and to zero otherwise (source: SDC).

	Mean	Min	Q1	Median	Q3	Max	Standard Deviation
Panel A: Target-Specific Characteristics							
Holdings of Officers and Directors (%)	20.02	.03	4.14	12.67	31.9	89.6	19.76
Blockholder Ownership (%)	16.45	0	5.2	12.03	25	87	16.84
Institutional Ownership (%)	36.68	0	20.02	34.97	53.07	89.78	21.21
Number of Shareholders	4,968	20	761	1,994	4,800	67,910	8,549
Number of Inst. Holders	71	0	18	35	71	2,425	153
Previous Acquisition in Target's Industry	0.61	0	0	0	1	1	0.49
Option on Target	0.16	0	0	0	0	1	0.37
Stock Price < \$5	0.12	0	0	0	0	1	0.33
Panel B: Bidder/Offer-Specific Characteristics							
Bid Premium (%)	46.56	1.11	25.09	41.85	59.49	215.64	29.71
Toehold (%)	5.87	0	0	0	1.6	87.1	15.06
Revision ratio	1.08	0.71	1	1	1.13	2.13	14.14
Duration of Tender Offer (days)	72	14	35	48	81	565	62
Runup	13.96%	-38.50%	-0.55%	11.73%	25.69%	81.56%	19.86%
Rumor	0.07	0	0	0	0	1	0.25
Multiadv	0.14	0	0	0	0	1	0.35
Experienced Bidder	0.43	0	0	0	1	1	0.50

Table 7: Distribution of Arbitrage Spread Sample is Split at the Median of Continuous Variables and by Offer Characteristics

The arbitrage spread equals $(BP - P_1)$ divided by P_1 where BP is bid price, P_1 is market price one day after announcement of the tender offer. Return on equity and return on assets are calculated as earnings before interest, taxes, and depreciation and amortization scaled by market value of equity 42 days prior to the announcement day or by book value of assets. Measures of market capitalization are expressed in thousands of dollars and are obtained by multiplying share price by number of shares outstanding as of 42 days prior to or at the announcement date of the tender offer as indicated. Market to Book equals market value of equity 42 days prior to the bid plus book value of debt scaled by book value of assets. O&D Ownership and Institutional Ownership are variables reflecting the share ownership of officers and directors and institutions as reported in a proxy statement and S&P Guide (institutions). Blockholders are defined as the sum of holdings of all outsiders (non-obvious insiders) who hold more than 5% as reported in a proxy statement. Number of shareholders is collected from proxy statements while number of institutional holders is from S&P Guide. The bid premium is calculated as the dollar premium (bid price - P_b) divided by P_b (where P_b is the average pre-bid price from $t = -30$ to $t = -10$ relative to announcement date of the tender offer). Toehold represents the percentage of shares held by the bidder prior to the announcement of the tender offer. Abnormal volume measures are based on (i) abnormal volume growth rate Schwert (1996) and (ii) on Lakonishok and Vermaelen (1990). The event window for measure (i) begins 42 days prior to the announcement date. The normal volume for measure (ii) is the average trading volume in the interval -50 to -25 days prior to the announcement. Attitude is coded with respect to the first bidder. All unsolicited tender offers are classified as friendly. Option is defined as traded when an option is listed on American, New York, Chicago, Pacific, Philadelphia, or Midwest option exchange around the announcement date. Runup measures return from 42 days prior to till the day of the announcement. Stock price < \$5 is a dummy variable set to one if the average price of the target between days -30 to -10 is less than \$5 and to zero otherwise. Previous acquisition codes for the presence of takeover activity in targets 3 digit industry in a prior year (=1 and 0 otherwise). Experienced bidder is a dichotomous variable equal to one if the first bidder in our sample attempted an acquisition in prior three years and zero otherwise. Multiadv is set equal to 1 if bidder employed multiple financial advisors and to zero otherwise (source: SDC). Number in parentheses denotes number of observations in a subsample. t-statistics are calculated based on unequal variances across subsamples. ***, **, * signify difference of means at 1, 5, and 10 percent levels of significance, respectively.

Panel A: Target-Specific Characteristics

Variable	Average of Arbitrage Spread (%) for:		t-statistic
	Group of Below Median of Variable	Group of Above Median of Variable	
Market Capitalization	3.00 (181)	0.71 (181)	3.16***
Holdings of Officers and Directors	0.57 (181)	3.15 (181)	-3.57***
Blockholder Ownership	1.85 (181)	1.86 (181)	-0.01
Institutional Ownership	2.26 (169)	1.25 (169)	1.31
Number of Shareholders	2.36 (193)	1.28 (169)	1.43
Number of Inst. Holders	2.52 (174)	0.95 (164)	2.05**
Previous Acquisition in Target's Industry	2.41 (143)	1.50 (219)	1.18
Option on Target	2.02 (305)	0.98 (57)	0.93
Stock Price < \$5	1.34 (317)	5.50 (45)	-3.91***

Table 7, continued

Panel B: Bidder/Offer-Specific Characteristics			
Variable	Average of Arbitrage Spread (%) for:		t-statistic
	Group of Below Median of Variable	Group of Above Median of Variable	
Bid Premium	1.13 (181)	2.58 (181)	-1.98**
Toehold	2.02 (260)	1.45 (102)	0.62
Attitude	-0.05 (77)	2.37 (285)	-2.05**
Runup	2.44 (181)	1.28 (181)	1.58
Rumor	1.68 (338)	4.38 (24)	-1.72*
Multiadv	2.19 (311)	-0.20 (51)	2.36***
Experienced Bidder	2.11 (207)	1.52 (155)	0.79
Abnormal Volume: Lakonishok and Vermalen (1990)	3.72 (177)	0.01 (177)	5.11***
Abnormal Volume: Schwert (1996)	2.22 (177)	1.51 (177)	0.94

Table 8: Regressions Explaining the Arbitrage Spread

The sample consists of 362 tender offers filed between January 1, 1981 and December 31, 1995. Market capitalization is expressed in thousands of dollars and is obtained by multiplying share price by number of shares outstanding as of 42 days prior to the first of the announcement or the rumor date of the tender offer. O&D Ownership variable reflects the share ownership of officers and directors as reported in a proxy statement. Blockholders are defined as the sum of holdings of all outsiders (non-obvious insiders) who hold more than 5% as reported in a proxy statement. Premium is calculated as the dollar premium (bid price - P_b) divided by P_b (where P_b is the average pre-bid price from $t = -30$ to $t = -10$ relative to announcement date of the tender offer). Attitude is a dummy variable equal to 1 when an offer is friendly and 0 otherwise (coded with respect to the first bidder). All unsolicited tender offers are classified as friendly. Toehold represents percentage of shares held by the initial bidder prior to the announcement of the tender offer. Option on Target records whether a firm has an option traded on its stock around the announcement date. Rumor is a dummy variable set equal to 1 if a bidder's name was rumored prior to public announcement of the offer (and to zero otherwise). Runup measures return from 42 days prior to till the day of the announcement. Abnormal volume growth measure is based on Schwert (1996). The event window for this measure begins 42 days prior to the announcement date. Stock price < \$5 is a dummy variable set to one if the average price of the target between days -30 to -10 is less than \$5 and to zero otherwise. Previous acquisition codes for the presence of takeover activity in targets 3 digit industry in a prior year (=1 and 0 otherwise). Experienced bidder is a dichotomous variable equal to one if the first bidder in our sample attempted an acquisition in prior three years and zero otherwise. Multiadv is set equal to 1 if bidder employed multiple financial advisors and to zero otherwise (source: SDC). High/Low volume splits sample by abnormal share of company traded prior to the announcement of the tender offer (volume methodology follows Schwert (1996)). p-values are reported in parentheses below each coefficient. Coefficients in bold are significant at better than 10% level.

Independent Variables	1	2	3	4	5 High Volume	6 Low Volume
Intercept	0.048 (0.198)	0.059 (0.116)	0.047 (0.227)	0.018 (0.697)	0.004 (0.959)	0.042 (0.467)
Log (Mkt Cap)	-0.006 (0.051)	-0.006 (0.027)	-0.006 (0.036)	-0.003 (0.375)	-0.004 (0.562)	-0.003 (0.544)
O&D ownership	0.032 (0.132)	0.033 (0.116)				
O&D * Friendly			0.023 (0.308)	0.027 (0.206)	0.034 (0.323)	0.017 (0.552)
O&D * Hostile			0.126 (0.028)	0.129 (0.021)	0.171 (0.054)	0.072 (0.337)
Blockholders	0.009 (0.691)	0.008 (0.724)	0.009 (0.712)	0.009 (0.714)	-0.029 (0.446)	0.036 (0.233)
Premium	0.027 (0.031)	0.038 (0.003)	0.039 (0.003)	0.035 (0.008)	0.042 (0.052)	0.028 (0.088)
Toehold	-0.022 (0.391)	-0.024 (0.352)	-0.033 (0.212)	-0.027 (0.289)	-0.032 (0.527)	-0.038 (0.211)
Attitude	0.015 (0.099)	0.016 (0.085)	0.027 (0.023)	0.031 (0.008)	0.051 (0.005)	0.0001 (0.991)
Rumor	0.038 (0.009)	0.038 (0.008)	0.039 (0.008)	0.039 (0.006)	0.058 (0.004)	0.003 (0.892)
Runup		-0.055 (0.004)	-0.052 (0.009)	-0.050 (0.008)	-0.069 (0.024)	-0.039 (0.150)
Abnormal Volume Growth rate			-0.303 (0.269)			
Stock price < \$5				0.028 (0.022)	0.022 (0.263)	0.038 (0.022)
Option on Target				0.007 (0.573)	0.014 (0.431)	0.009 (0.593)
Previous acquisition				-0.010 (0.313)	-0.007 (0.654)	-0.001 (0.950)
Experienced bidder				-0.004 (0.670)	-0.003 (0.855)	-0.019 (0.199)
Multiadv				-0.019 (0.072)	-0.033 (0.052)	-0.014 (0.329)
adj. R²	0.059	0.079	0.085	0.104	0.142	0.050
F-value	4.25	4.85	4.27	3.99	3.08	1.67
p-value for F	<0.001	<0.001	<0.001	<0.001	<0.001	0.067
N	362	362	354	362	177	177

Table 9: Distribution of Observations and Arbitrage Spreads Across Tender Offer Characteristics

Panel A reports the distribution of bid characteristics, known only after the announcement, across high and low arbitrage spread groups. The actual number of observations falling into each partition is reported. An offer is defined as withdrawn when target remains independent for at least three months after the withdrawal of tender offer. A tender offer is understood to involve multiple bidders when a second bidder submits or is rumored to submit a bid. An offer is understood to be revised when the initial offer price does not equal last offer/transaction price. The last column reports chi-square test of differences between expected and actual number of observation for each offer characteristic. Panel B shows distribution of arbitrage spread across bid characteristics known only after the announcement. Arbitrage spreads equal $(BP - P_1) / P_1$ where BP is bid price, P_1 is market price one day after announcement of the tender offer. t-statistics are calculated based on unequal variances across subsamples. ***, **, * denote significance at 1, 5, and 10 percent levels, respectively.

Characteristics of tender offer		Number of observations		Total	Chi-square statistic
		Below Median Spread	Above Median Spread		
Competition	Multiple Bidders	62	41	103	5.05**
	Single Bidder	122	137	259	
Bid Revisions	Revised	93	58	151	12***
	Unrevised	91	120	211	
Outcome	Completed	179	171	350	0.42
	Withdrawn	5	7	12	
Total		184	178	362	

Bid Characteristic	Arbitrage Spread (%)		t-statistic
	Yes/Revised/Completed	No/Unrevised/Withdrawn	
Multiple bidders	0.71	2.31	-1.51
Outcome	1.83	2.56	-0.35
Revision	0.03	3.21	-3.93***

Table 10: Regressions Comparing the Initial Arbitrage Spread with Actual Offer Outcomes

The sample consists of 362 tender offers filed between January 1, 1981 and December 31, 1995. The dependent variable is Arbitrage Spread calculated as $(BP - P_1)$ divided by P_1 where BP is bid price, P_1 is market price one day after announcement of the tender offer. Market capitalization is expressed in thousands of dollars and is obtained by multiplying share price by number of shares outstanding as of 42 days prior to the first of the announcement or the rumor date of the tender offer. Winner is a dichotomous variable set to one if the bidder that acquired the target in question made the first offer (zero otherwise). Outcome is a dummy variable equal to one if target gets acquired and to zero if it remains independent for at least three months after the withdrawal of tender offer. The revision ratio is defined as last offer/transaction price divided by initial bid price. The competition dummy variable equals 1 if an offer involves multiple bidders and zero otherwise. Duration of tender offer reports the number of days between the announcement of the tender offer and either the announced date of purchase of tendered shares or date of the first newspaper article indicating withdrawal of the offer. p-values are reported in parentheses below each coefficient. Coefficients in bold are significant at better than 10% level.

Independent Variables	1	2	3	4	5	6	7
Intercept	0.102 (0.001)	0.111 (>0.001)	0.124 (0.001)	0.242 (>0.001)	0.254 (>0.001)	0.248 (>0.001)	0.242 (>0.001)
Log (Market Cap.)	-0.008 (0.021)	-0.008 (0.003)	-0.008 (0.001)	-0.007 (0.006)	-0.007 (0.005)	-0.007 (0.005)	-0.006 (0.006)
Winner	0.010 (0.238)						
Competition		-0.012 (0.147)					
Outcome			-0.009 (0.646)			0.007 (0.730)	
Revision ratio				-0.134 (>0.001)	-0.157 (>0.001)	-0.158 (>0.001)	-0.134 (>0.001)
Duration of offer					0.0002 (0.002)	0.0002 (0.002)	
adj. R2	0.028	0.030	0.025	0.097	0.119	0.12	0.097
F-value	6.168	6.537	5.558	20.305	17.187	12.889	20.30
p-value for F	0.002	0.002	0.004	>0.001	>0.001	>0.001	>0.001

References

- Bali, Rakesh, Gailen, L., Gailen, 1998, Ex dividend day stock price behavior: discreteness or tax-induced clientele? *Journal of Financial Economics*, 47, pp. 127-159.
- Bhagat, S., Hirshleifer, D., 1996. Do Takeovers Create Value? An Intervention Approach. Working Paper 9505-03-R. University of Michigan Business School, Research Support.
- Boesky, Ivan, 1985. *Merger Mania*. Holt, Rinehart and Winston.
- Brickley, James, A., Ronald C. Lease, and Clifford W. Smith, Jr., 1988, Ownership structure and voting on antitakeover amendments. *Journal of Financial Economics*, 20, pp. 267-292.
- Brown, D., Ryngaert, M., 1992. The Determinants of Tendering Rates in Interfirm and Self-Tender Offers. *Journal of Business*, Vol. 65, No. 4. 529-556.
- Brown, K., Raymond, M., Autumn 1986. Risk Arbitrage and the Prediction of Successful Corporate Takeovers. *Financial Management*, 54-63.
- Bulow, J., Huang, M., Klemperer, P., 1996. Toeholds and Takeovers. CEPR Discussion Paper, No. 1468.
- Comment R. and G. William Schwert (1995), "Poison or Placebo? Evidence on the deterrence and wealth effects of modern antitakeover measures" *Journal of Financial Economics* 39, 3-43.
- Cornelli, F., Li, D. Risk Arbitrage in Takeovers. 017-98. Rodney L. White Center for Financial Research. The Wharton School, University of Pennsylvania.
- Dukes, William P., Cheryl J. Frohlich, and Christopher K. Ma, 1992, Risk arbitrage in tender offers, *Journal of Portfolio Management*, 18, pp. 47-55.
- "Ivan Boesky They Ain't", Barrons, October 25, 1993
- Jaggia, S., Thosar, S., 1995. Contested Tender Offers: An Estimate of the Hazard Function. *Journal of Business and Economic Statistics*, Vol. 3, No. 1. 113-119.
- Karolyi, G., Shannon, J. Where's the Risk in Risk Arbitrage? Working Paper, No. 98-14. Richard Ivey School of Business, The University of Western Ontario.
- Lakonishok, J., Vermaelen, T., 1990. Anomalous Price Behavior Around Repurchase Tender Offers. *The Journal of Finance*, Vol. XLV, No. 2, 455-477.
- Larcker, D., Lys, T., 1987. An Empirical Analysis of the Incentives to Engage in Costly Information Acquisition. *Journal of Financial Economics* 18, 111-126.
- Rau, 1998, Investment bank reputation, contingent fee payments, and the performance of acquiring firms, *Journal of Financial Economics*, forthcoming.
- Samuelson, W., Rosenthal, L., 1986. Price Movements as Indicators of Tender Offer Success. *The Journal of Finance* Vol. XLI, No. 2. 481-499.
- Schwert, G., William, 1996. Markup Pricing in Mergers and Acquisitions. *Journal of Financial Economics*, 41, pp. 153-192.

Shleifer, A., Vishny, R., 1986. Large Shareholders and Corporate Control. *Journal of Political Economy*, 94, pp. 461-488.

Shleifer, A., Vishny, R., 1997. The Limits of Arbitrage. *Journal of Finance*, 52, pp. 35-55.

Welles, C., 1981. Inside the Arbitrage Game. *Institutional Investor*, August, pp. 41-58.

Wyser-Pratte, G., 1982. Risk Arbitrage II. Monograph Series in Finance and Economics. Salomon Brothers Center for the Study of Financial Institutions. New York University. 1-129.